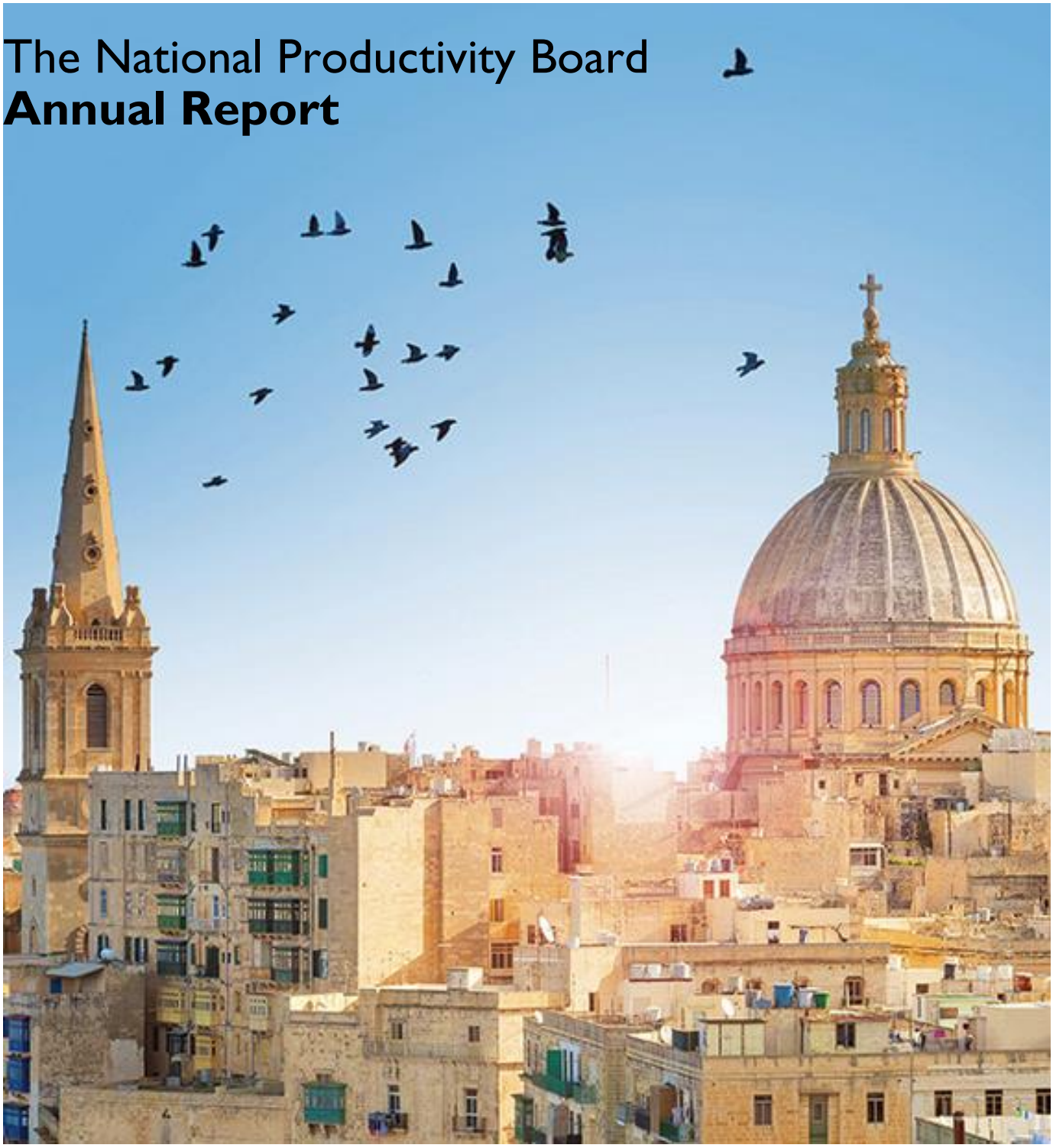
The National Productivity Board
Annual Report



November 2019

The NPB's Annual Report

November 2019

Following the Council Recommendation of 20 September 2016 on the establishment of National Productivity Boards (2016/C 349/01), Euro Area member states were invited to set up a productivity board with the scope of analysing developments and policies in the field of productivity and competitiveness, thereby contributing to foster ownership and implementation of the necessary reforms at the national level, and hence promote a more sustained economic growth and convergence.

The Malta National Productivity Board (NPB) was set up in 2019 and is comprised of a total of 11 members which includes:

- The Chairman (ex-ufficio Chair of MCESD) - John Bencini;
- A representative from the Economic Policy Department – Godwin Mifsud;
- A representative from the Central Bank of Malta – Ian Borg;
- 4 members that were nominated by the workers' organisations constituted bodies sitting in the Council – Christopher Attard, Josef Vella, Mario Sacco & Victor Carachi
- 4 members nominated by constituted bodies representing national employers' organisations sitting in the Council - Abigail Mamo, Joseph Farrugia, Kevin Borg & Vincent Degiorgio.

The main contributors of this annual report were: Godwin Mifsud (Director General of the Economic Policy Department in Malta), Chris Meilak (Associate Partner – Ernst & Young) and Gordon Cordina (Executive Director - E-Cubed Consultants).

Comments on the report would be gratefully received at the following addresses:

National Productivity Board

280/3, Republic Street,

Valletta, VLT1112,

Malta.

Email: john.bencini@gov.mt

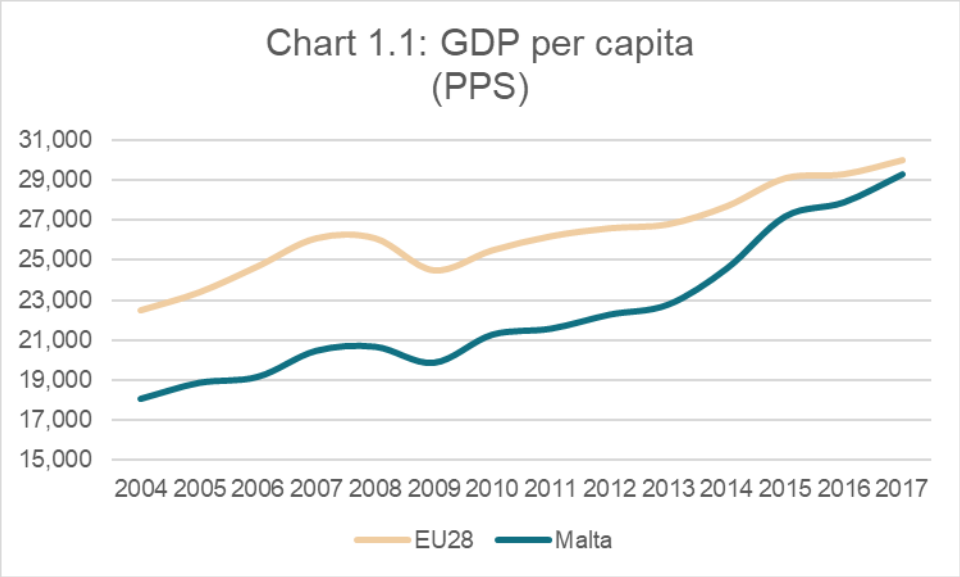
The NPB's Annual Report

November 2019

Chapter 1: Developments In Competitiveness

1. DEVELOPMENTS IN COMPETITIVENESS

As a small island open economy, Malta's survival depends on its ability to compete in a global and dynamic environment. Its export driven economy necessitates the efficient use of scarce resources to maintain a competitive edge over its competitors. Economic diversification further cements Malta's competitiveness and improves its resilience towards future shocks. Currently Malta is in the process of economic convergence with the rest of the EU. Chart 1.1 portrays developments in GDP per capita in purchasing power standards for Malta and the EU average. The convergence process has gathered traction since 2013, and in 2017 Malta's GDP per capita stood at around 97.6% of the EU28 average. In this respect, Malta seems to be making inroads with respect to other advanced economies, strengthening the competitiveness of its economy in the process. For Malta it is critical to sustain its competitive edge, through skills development, growth friendly investment and competitive exports.



(source: Eurostat)

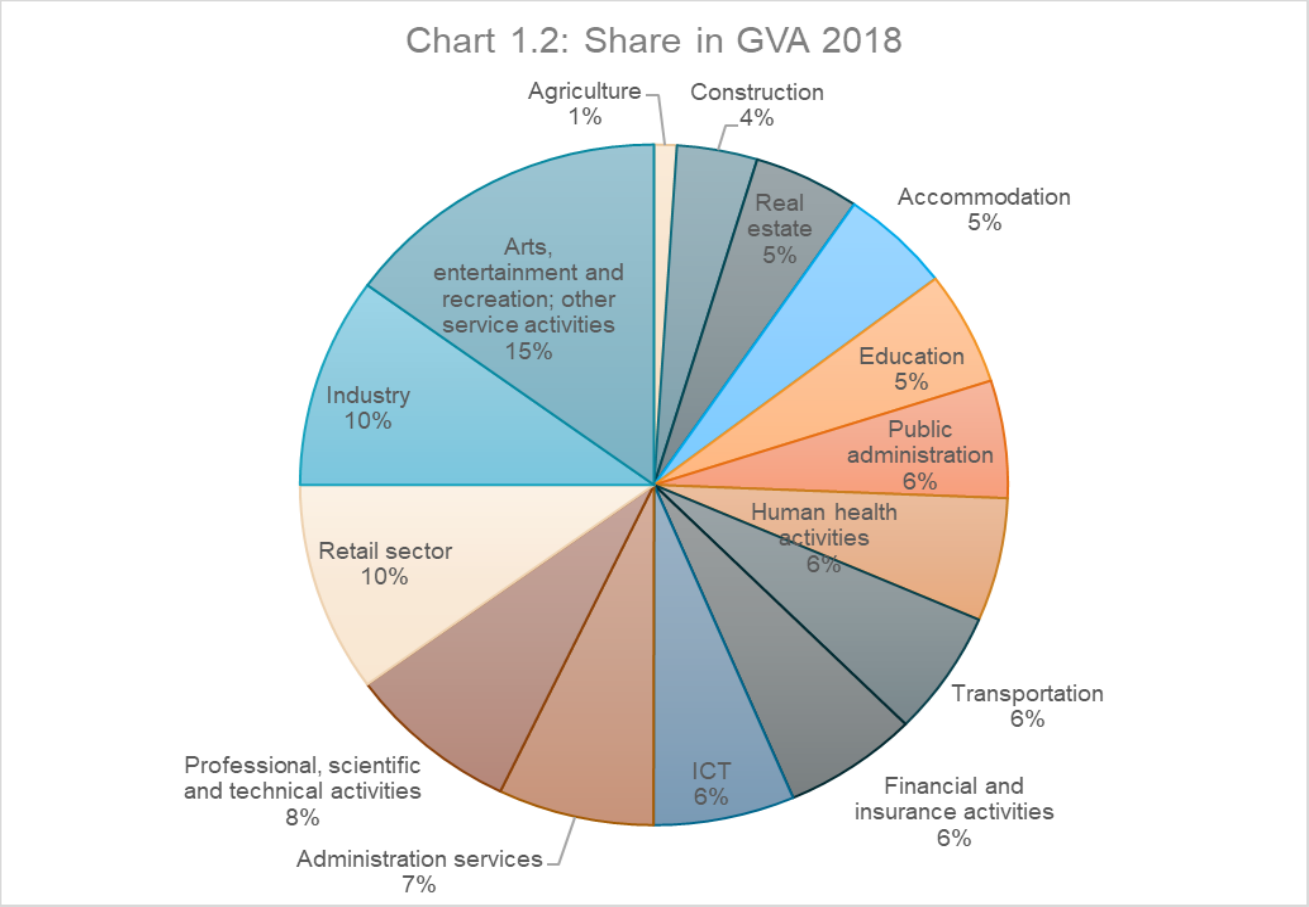
Though competitiveness is becoming a key word in economic analysis it is still a complex concept which is not easily measured using a single indicator. For this purpose, in this report, several indicators are used as a proxy for the different elements comprising competitiveness. To some extent, competitiveness can be analysed in two different dimensions, namely domestic competitiveness and external competitiveness. Whilst internal competitiveness shows the efficiency with which production adjusts to an ever-changing market environment, external competitiveness analysis a country's attractiveness relative to other competitor countries across the globe. In many ways, competitiveness ties in with domestic economic

performance, hence an understanding of Malta's main drivers of economic growth is required to understand competitiveness.

1.1 Malta's Economic Structure

Sectoral GVA

In recent years, Malta has registered significant growth rates mainly owing to strong performances registered in the services industry. This sector is well diversified and export-oriented, whilst its main sub-sectors, such as remote gaming and tourism having strong links to the local economy. Looking at the Gross Value Added (GVA) by sector in Malta, economic diversification is evident as pointed out in Chart 1.2. Apart from the arts, entertainment and recreation sector, other important activities include manufacturing, retail and financial services sectors, which account for a substantial share of Malta's GVA.



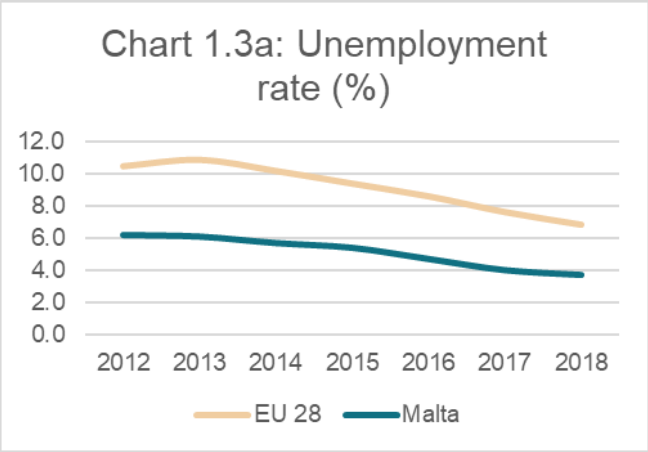
(source: NSO)

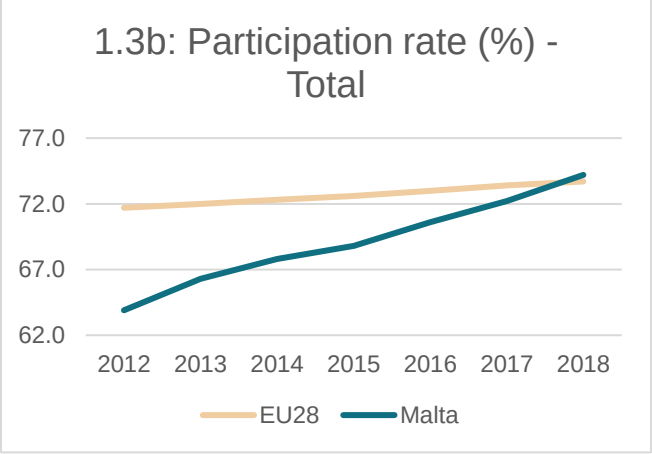
In 2018 economic growth was broad-based. NSO figures[1] show that construction increased by 10.3 per cent, arts entertainment and recreation services had a growth rate of 11.3 per cent, administration and support services grew by 11.7 per cent and real estate services also grew by 13.0 per cent between 2017 and 2018.

1.1.1 Labour Market: Unemployment, labour Productivity and Unit Labour Cost

Developments in the Maltese labour market are indicative of a strong and growing economy with an unemployment rate that is lower than the EU average. Chart 1.3a shows how Malta's unemployment rate has been consistently below that of the EU average over the past decade or so. As of 2018 Malta's unemployment rate stood at 3.7 per cent whilst that of the EU 28 average was 6.8 per cent. In terms of participation, Charts 1.3b to 1.3d show the evolution of Malta's participation rate by gender. Malta's overall participation rate (74.2 per cent) has exceeded that of the EU average (73.7 per cent) in 2018. A decomposition by gender reveals that both female and male participation rates have been consistently on the rise, though the female participation rate is still below the EU average by around 5.2 percentage points. On the other hand, the male participation rate exceeds the EU average by 5.3 percentage points.

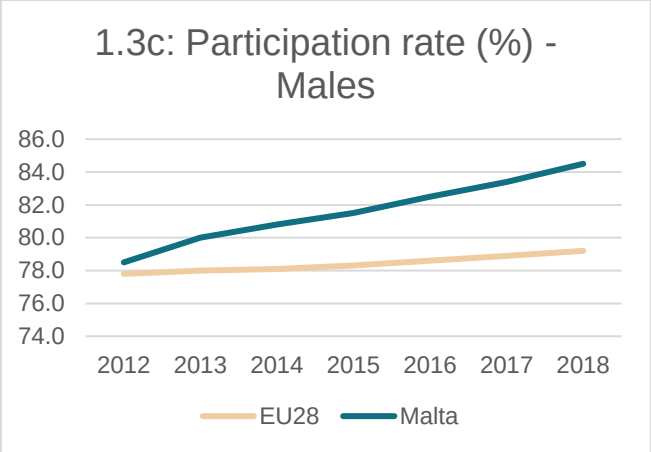
Certainly, a key factor driving labour market outcomes in recent years has been foreign labour. This development introduced new skills and helped address labour market shortages. Active labour market

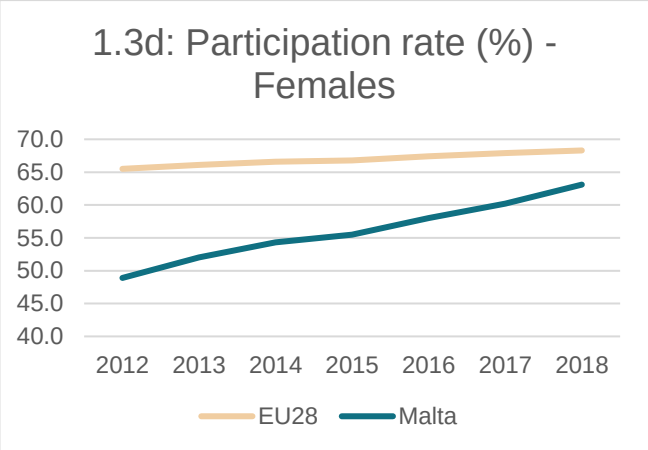




[1] https://nso.gov.mt/en/News_Releases/View_by_Unit/Unit_A1/National_Accounts/Pages/Gross-Domestic-Product.aspx

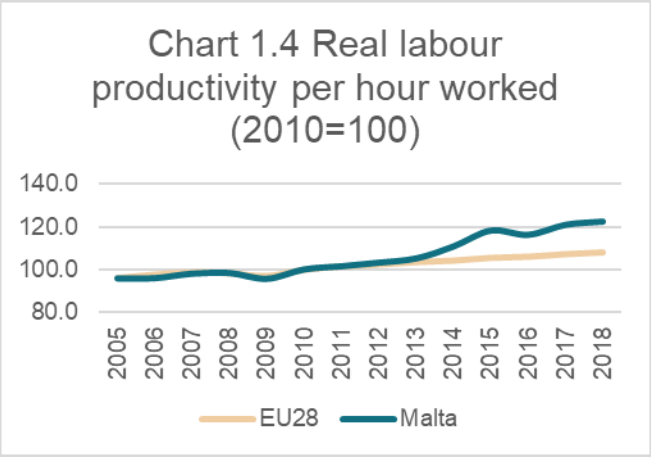
policies, including active ageing efforts and the pension reforms also contributed to support participation within the labour market.

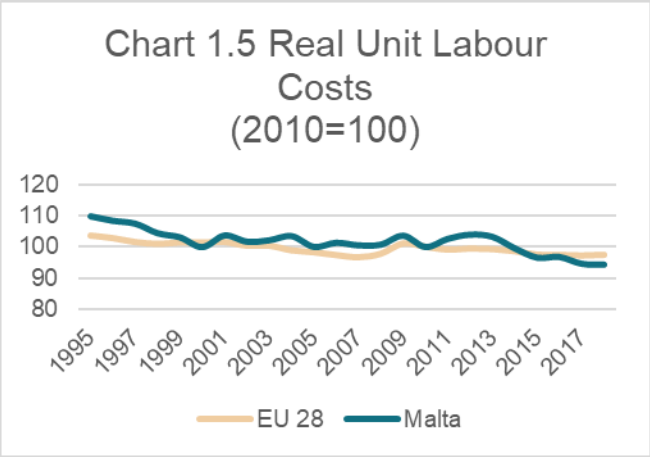




(source: Eurostat)

Competitiveness in the labour market refers to the efficiency with which labour inputs produce the necessary output and the cost to employ such labour. In terms of productivity, the real labour productivity per hour worked shows the ratio of output (proxied by real GDP) to the total number of hours worked. Chart 1.4 shows an increase in labour productivity per hour worked. This indicator by-passes issues related to part-time and full-time employment differences. It is evident that post-2013 there was a significant jump in productivity per person employed which surpassed the EU 28 average trend. A similar observation can be made with respect to real unit labour cost index. Real unit labour costs (RULC) measures the average cost of labour per unit of output and is calculated as the ratio of compensation of employees to actual units of production. Chart 1.5 shows an index of this indicator to facilitate comparisons between Malta and the EU28. A downward trajectory for both trends can be observed in Chart 1.5, with Malta's RULC dipping below that of the EU28. Both developments point towards improvements in competitiveness, in terms of both output and cost.





(source: Eurostat)

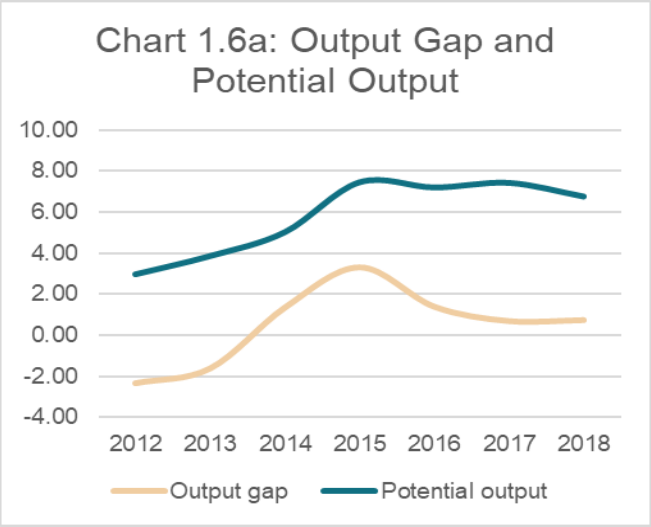
The General picture in the Labour market indicates a growing economy through higher productivity levels that outpaced growth in labour costs. This begs the question on the extent to which developments in technology and human capital played a role in enhancing productivity.

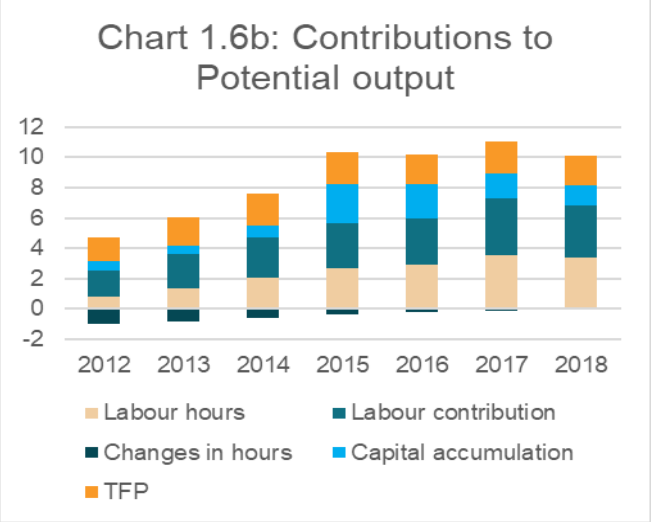
1.1.2 Output Gap and Potential Output

Output gap estimates still show that the economy is performing below its potential, meaning that actual output is lower than what the economy can produce when its factors of production are employed at full capacity. From Chart 1.6a it is evident that potential output surged between 2012 and 2015 and stabilised thereafter reaching 6.75 per cent in 2018. To explain this trend, chart 1.6b shows different factors which have contributed to potential output over the 2012-2018 period. It is evident that most of the increases in potential output can be attributed to capital accumulation, labour hours and labour contributions. It is also evident that the slight drop in potential output observed in 2018 is partially due to a broad-based drop in all contributing factors involved particularly in labour and capital accumulation. Over the past years it is evident that labour inputs have been instrumental in increasing potential output through several factors including:

1. The growth in the working age population;
2. The growth in the participation rate;
3. A drop in the natural rate of unemployment (NAIRU); and
4. The increase in investment.

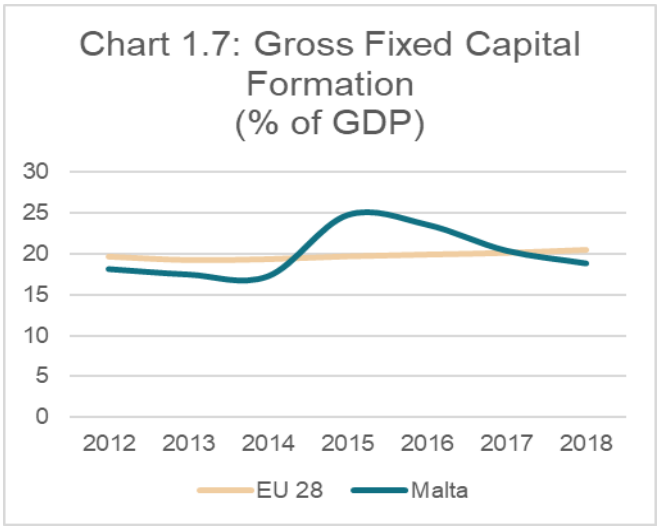
As an example, the natural rate of unemployment – which is the unemployment rate when the economy is at its potential level – has been declining substantially from 7.6 per cent of the labour force in 2004 to around 4.2 per cent in 2018. The increase in foreign workers has also contributed to the growth in the working age population and in potential output. At the same time, such developments increases the economy's dependency on foreign labour inputs in supporting further growth. Investment will be discussed in the next section. *(source: EPD calculations)*

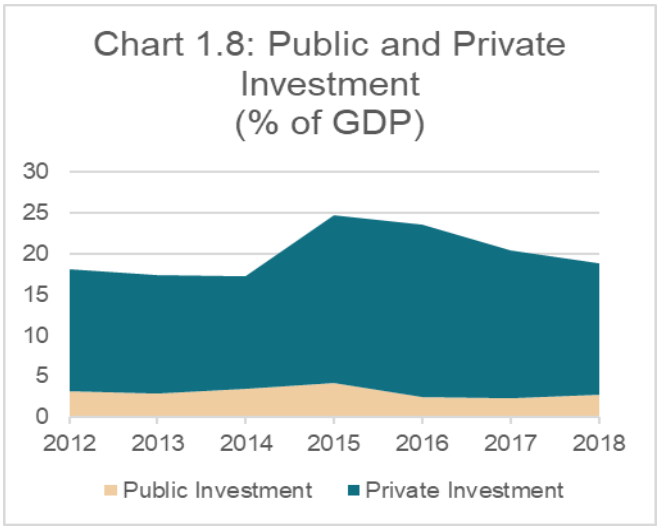




1.1.3 Investment

Investment levels are a good indication of an economy which aims to keep up with an ever-dynamic global environment. In Malta, investment increased sharply in 2015 (see chart 1.7), reaching 24.7 per cent of GDP and then declined steadily thereafter to reach 18.8 per cent of GDP in 2018. This increase is a result of large investments of one-off nature in the energy sector between 2014 and 2015. Investment in the EU 28 is comparatively stable and has not seen any significant increases between 2012 and 2018. Malta





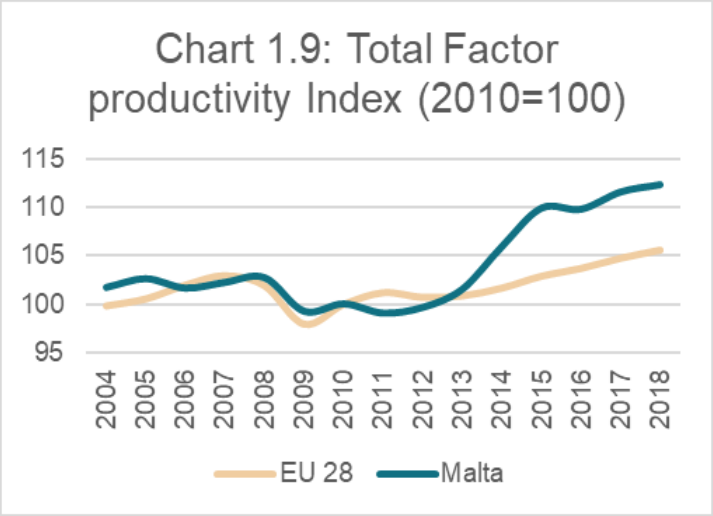
only surpassed the EU average ratio up to 2017, from thereon investment as a percentage of GDP in Malta dipped below that of the EU average. Looking at the decomposition between private and public investment in Malta, chart 1.8 shows that total investment is mainly composed of private investment and amounted to around 85.2 per cent of total investment in 2018. In this regard, it is worth nothing that plans are under way to strengthen further investment particularly, through the gas interconnector and the upgrade to the road networks

(source: Eurostat)

1.1.4 Total Factor Productivity (TFP) and Human Capital

Total factor productivity captures output gains within an economy which are unrelated to capital and labour inputs. TFP is essentially the residual value of productivity gains after accounting for labour and capital inputs and is normally associated with the contribution of technology to economic growth.

Chart 1.9 shows a simple time series evolution of TFP index for Malta and the EU. Malta's TFP has been on a similar trajectory to that of the EU 28 until the pre-crisis period. From then onwards, developments in TFP for Malta took an upward turn and significantly surpassed that of the EU average.

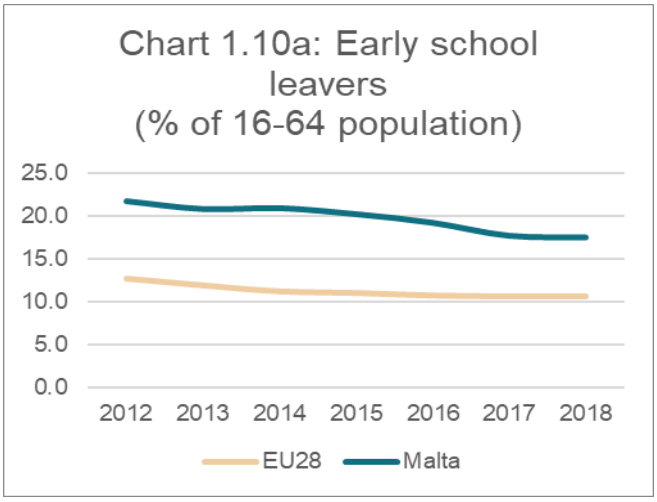


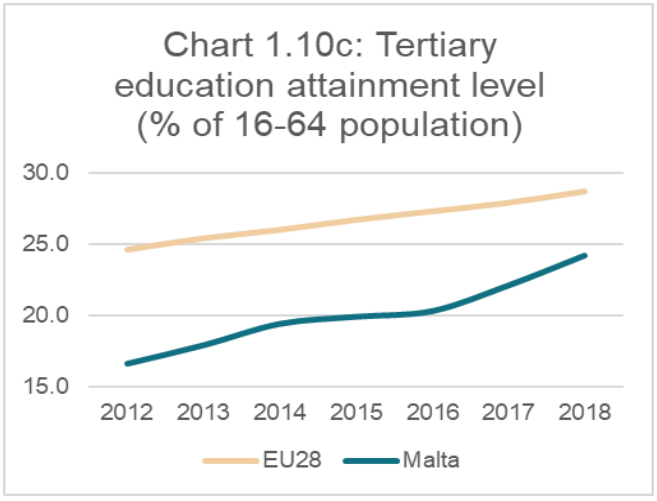
(source: Eurostat)

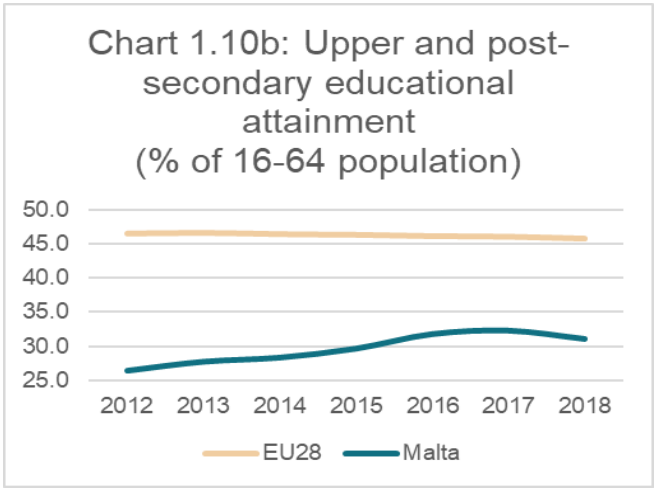
Apart from TFP, another factor determining potential growth is the evolution of skills. Chart 1.10a shows Malta's early school leaving rate compared to that of the EU28. Though the early school leaving rate has been on the decline, Malta still lags the EU28 average by 6.9 percentage points. In terms of educational attainment level, the upper secondary and post-secondary educational attainment levels as a percentage

of the population are 14.7 (chart 1.10b) percentage points below that of the EU28 average in 2018. When it comes to tertiary education, Malta is 4.5 percentage points below the EU28 average (chart 1.10c). The increase in migrant workers and the higher participation rate by skilled younger women has contributed greatly to the development of human capital.

The Europe 2020 targets for education suggest that the share of early school leavers should be reduced to under 10 per cent, while at least 40 per cent of the 30 to 34-year-old cohort would complete tertiary education. In this respect, Malta lags behind on both counts. At present, the early school leaving rate stands at 17.5 per cent, whilst tertiary educational attainment levels for those pertaining to the 30-34-year-old bracket stands at 34.2 per cent, which is above the Maltese target of 33 per cent. In this respect, whilst the gains experienced in recent years are encouraging, the main indicators show that Malta still has room for improvement.







(source: Eurostat)

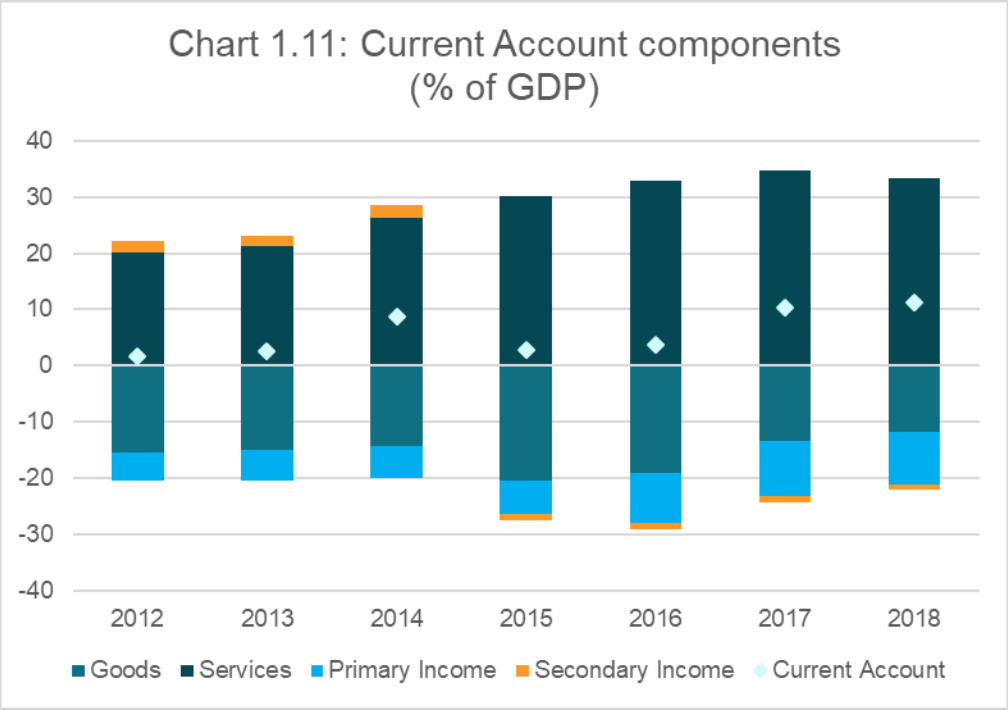
1.2The External Sector

1.2.1 Current Account Developments

Being a small open economy, Malta is susceptible to external shocks, thus the importance of maintaining a healthy and competitive economy vis-à-vis other competitor countries cannot be overstated. As seen in the first section, the leading economic sectors in Malta are outward-oriented, with strong net exports registered in the personal, cultural and recreational services, the financial services and the tourism sectors.

Despite Malta's inherent vulnerabilities from external shocks, the current account has been registering a strong surplus balance over the past few years. Such a surplus is mainly composed of strong net exports of the services sector. In turn, most of the services net exports is due to substantial remote gaming exports, tourism exports and transport services exports. This accentuates the fact that services' net exports are not reliant only on a single industry. Furthermore, several structural changes increased the current account surplus:

- The 'servicification' of the Maltese economy, is causing the import content of exports to decline;
- Energy reforms in Malta reduced its oil dependency, hence reducing oil importation as well as exposure to vagaries in the international price of oil



(source: Eurostat)

Chart 1.11 outlines the evolution of the current account balance between 2012 and2018 together with its respective components. The services net export balance is the largest contributor to the overall net export figure in the current account, with an overall net export balance of 33.2 per cent of GDP in 2018. This large net export figure is mainly composed of financial services net exports (4.1 per cent of GDP), tourism net exports (9.16 per cent of GDP) and the personal, cultural and recreational services net exports (36.4 per cent of GDP). The services net export balance however is partially lowered by a net import figure in terms of other business services (17.5 per cent), where other business services are services related to professional and technical activities. Another important component of the current account is the goods net import balance which accounts for 11.9 per cent of GDP as of 2018.

The primary income account within the current account shows the income flowing in and out of Malta. In 2018, Malta's primary income account had a net payment balance of 9.2 per cent of GDP meaning that income flows from Malta to foreign jurisdictions outweigh income inflows to Malta. These flows may be partly seen as a corollary to Malta's success in attracting FDI. The secondary income account is only a minor component in the case of Malta and it shows any income transfers unrelated to any economic activity (such as pensions and personal transfers). In 2018, the secondary income account had a net payment balance of 1.0 per cent of GDP.

1.2.2 Exchange rate, Export market shares and competitiveness

External vulnerability is often linked to relative prices between Malta and its competitor countries. Exchange rate valuations often determine the extent to which a country is competitive in terms of the pricing of its exports and imports, relative to other countries. The Real effective exchange rate (REER) is a weighted average of a country's exchange rate vis-à-vis that of its main competitors (the main 42 competitor countries in this case). This indicator is constructed as follows:

$$REER_j = \prod_{i=1}^{42} \left(E_i^{w_i}\right)$$

Where: j – refers to the country in question

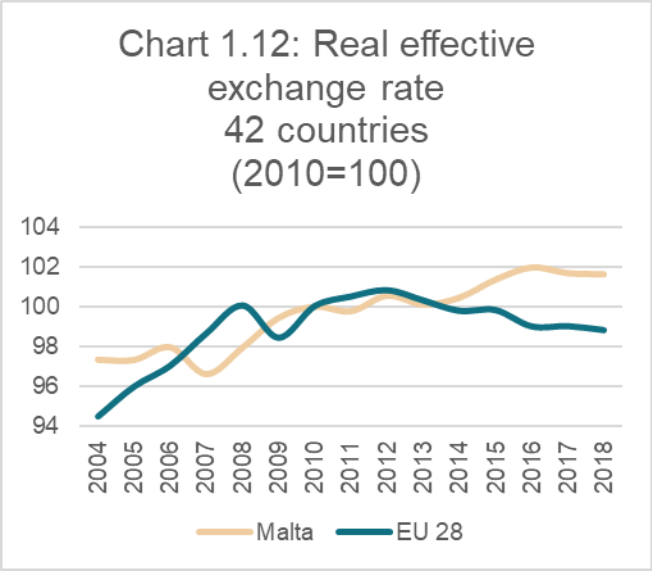
i – refers to the partner country

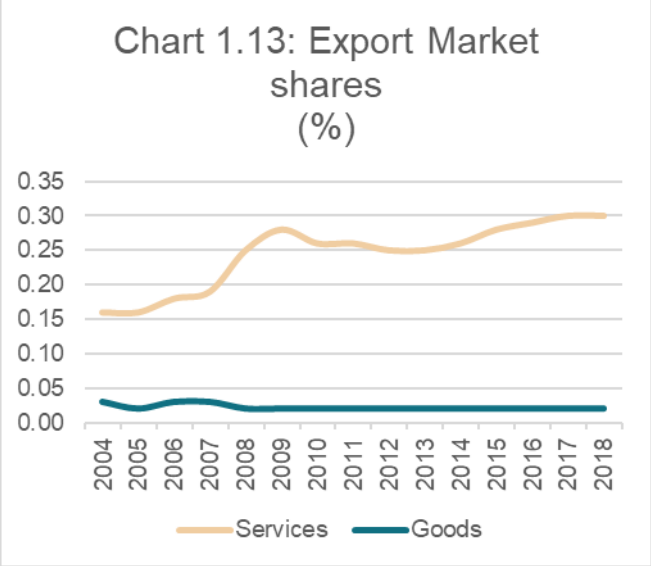
E – the inflation adjusted exchange rate of country j to country I

w – weight of country i, calculated based on trade levels

Such an indicator is affected by either changes in exchange rates (E) or else a change in the weights being used (W). The weights are in turn affected by the amount of exports and imports to and from the country in question.

The higher the REER value indicates an appreciation of the domestic currency relative to that of competitor countries. In other words, the larger the REER value may indicate a loss in cost competitiveness relative to competitor countries. Chart 1.12 shows how Malta's REER, based on the CPI, developed vis-à-vis that of the EU 28 average, where Malta's REER can be seen increasing above that of the EU average. This development may have been driven by the weakening of the pound sterling and the US dollar when compared to the euro over the period between 2013 up till 2018. This underscores Malta's external vulnerability towards external shocks in the form of exchange rate movements. The REER has one important limitation however, in that weights are computed using solely trade in goods. This is especially an issue for Malta given the importance of the services industry. Furthermore, comparability is not considered a strong suit of this indicator.





(source: Eurostat)

This warrants the use of other indicators, such as export market shares which indicate the degree of importance of a country's exports when compared to the rest of the world. A higher share would indicate a higher proportion of Maltese exports vis-à-vis the rest of the world. Malta's export market share is driven by the increase in services exports (chart 1.13). The EMS for goods remained relatively unchanged at around 0.02 per cent since 2004, whilst that of services increased from 0.16 per cent in 2004 up to 0.30 per cent in 2018. Box 1.1 below provides the results of economic research that investigates the developments in Maltese goods exports and imports in terms of a Gravity model.

Box 1.1: The gravity model for Maltese goods exports and imports[2]

Introduction

Gravity models are equations that attempt to explain trade flows between countries. Generally, they are based on theories of international trade which suggest that pairs of countries which are close, either geographically or in terms of cultural similarities, will tend to trade more often with each other than with more distant countries. Gravity models consider factors like geographical distance, languages or common historical links as determinants of trade flows. Furthermore, gravity models try to account for the possibility that larger countries with a larger combined "economic mass" will have a larger GDP and will tend to trade in larger volumes than countries with smaller economic mass. Hence, a relatively limited number of variables would describe a good proportion of trade patterns between countries. In turn, this explains why gravity models have gained prominence over alternative models of international trade.

The gravity model estimates for Malta

Trade data used in Ellul (2019) are sourced from the IMF Direction of Trade Statistics. They cover the period from 1960 to 2016. There are more than 200 countries and territories included, with coverage depending on data availability. Information relating to geographical distances, common cultural background, including languages and colonial history, are obtained from the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII) databases, following Mayer and Zignago (2011).[3] In terms of methodology, the basis for gravity models is Sir Isaac Newton's law of universal gravitation. One of the

[2]Prepared by Reuben Ellul. The author is a Principal Economist within the Economic Analysis Department at the Central Bank of Malta. The views expressed are those of the author and do not necessarily reflect those of the Central Bank of Malta. Any errors are the author's own.

[3] Mayer, T. and Zignago, S., (2011), 'Notes on CEPII's distances measures: the GeoDist Database,' CEPII Working Paper, 2011-25. The CEPII provides a large set of variables covering a wide array of geographical characteristics for almost all countries in the world.

earliest applications in economics belongs to Tinbergen (1962).[4] This model attempts to link trade flows between countries i and j with their respective GDP, geographical distance, and other factors affecting trade – such as common languages and cultural backgrounds (Anderson and van Wincoop, 2003).[5] In the simplest form, following Santos Silva and Tenreyro (2006),[6] the econometric model for stochastic gravity states that

$$T_{ijt} = K_0 \frac{M_{it}^{\beta 1} M_{jt}^{\beta 2}}{D_{ij}^{\beta 3}} \varepsilon_{ijt}$$

where T_{ijt} is the bilateral trade flow between countries i and j in period t, M_{it} and M_{jt} are the GDP of country i and country j in period t, respectively; D_{ij} is the bilateral distance between country i and j, K_0 is an unknown constant while $\beta 1$, $\beta 2$ and $\beta 3$ are unknown parameters. The basic equation is extended with other characteristics that affect bilateral trade, such as sharing a common border, historic colonial ties, entry into regional trade agreements, and tariffs. The equation is traditionally converted into linear form through logarithms, and estimated by ordinary least square (OLS) methods, such that

$$ln\, T_{i\,j\,t} = \alpha_0 + \beta_1\, ln\, M_{i\,t} + \beta_2\, ln\, M_{j\,t} - \beta_3 ln\, D_{i\,j} + \epsilon_{i\,j\,t}$$

where $\alpha_0 = ln\, K_0$ and $\epsilon_{i\,j\,t} = ln\, \varepsilon_{i\,j\,t}$. This approach, while popular, was not originally based on micro-founded economic theories. Theoretical foundations for gravity models were eventually developed in the

[4] Tinbergen, J., (1962), 'Shaping the World Economy; Suggestions for an International Economic Policy,' Books (Jan Tinbergen). Twentieth Century Fund, New York. Retrieved from http://hdl.handle.net/1765/16826.

[5] Anderson, J., E., and van Wincoop, E., (2003), 'Gravity with Gravitas: A Solution to the Border Puzzle,' American Economic Review, 93 (1): 170-192. DOI: 10.1257/000282803321455214

[6] Santos Silva, J., and Tenreyro, S., (2006), 'The Log of Gravity,' The Review of Economics and Statistics, 88, issue 4, p. 641-658.

1970s and 1980s. These equations included multilateral resistance terms to account for trade barriers, and elasticities of substitution between goods.

Ellul (2019) uses Ordinary Least Squares (OLS), Poisson pseudo-maximum likelihood (PPML) methods, zero-inflated Poisson methodologies, and a Heckman estimator to estimate gravity equations applied to different datasets and periods.[7] As a caveat, one has to remember that these methodologies have different assumptions which may lead to differing results. A number of attributes common in the gravity literature are included as regressors in the equation. These include partners' GDP level, and Malta's GDP, distance between Malta and its respective bilateral partner, population, partners' geographical size, a variable that accounts for a common official language, a variable that represents a common colonial background, as well as dummies to account for Malta's membership in the EU and its association agreement with the EEC

The main results from the study are that Maltese trade in goods is negatively affected by distance, and positively affected by a set of other variables which account for historical and cultural links.

The estimated values for the distance coefficients are broadly stable across methodologies and robustness checks employed (see Table 1). Nominal figures for the period 1960-2016 show how for every 10.0% difference in distance, exports and imports fall by 11.1% and 7.5% respectively, on average across the methodologies used. In real terms, a 10.0% difference in distance decreases real exports by 6.9%, on average, across the methodologies, and imports by 5.5%. Subsidiary gravity equations based on trade excluding fuel, aircraft and ships returned very close results to the previous estimates with respect to distance coefficients. However, differences emerged for the variables accounting for institutional and cultural backgrounds.

[7] For more details on the methodologies discussed in this paper, kindly refer to Ellul, R., (2019), "The gravity model for Maltese goods exports and imports," CBM Working Papers WP/01/2019, Central Bank of Malta.

Once these specific trade sectors are excluded, the likelihood of importing goods from countries with similar backgrounds becomes broadly insignificant.

Table 1
Estimates for variable coefficients

		Period	OLS	PPML	ZIP	Heckman (Exact Id.)	Heckman (Over Id.)	Heckman (2-step)	Average
Exports									
	Distance coefficient (elasticity)								
	Nominal	1960 - 2016	-1.1 ***	-0.7 **	-	-1.2 ***	-1.2 ***	-1.4 ***	-1.1
	Excl. trade in fuel, ships, aircraft.	2000 - 2017	-0.9 ***	-0.9 ***	-	-1.0 ***	-0.9 ***	-1.0 ***	-1.0
	Real	1960 - 2016	-0.9 ***	-	-	-0.5 ***	-0.9 ***	-0.5 ***	-0.7
	% more likely to trade								
	Nominal								
	Common language	1960 - 2016	59.2 *	-	-	-	-	68.6 ***	63.9
	Common colony	1960 - 2016	109.6 **	148.6 **	-	130.9 ***	124.3 ***	164.1 ***	135.5
	Excl. trade in fuel, ships, aircraft.								
	Common language	2000 - 2017	-	65.3 **	-	-	-	71.6 ***	68.5
	Common colony	2000 - 2017	87.5 *	115.9 ***	-	102.7 **	59.0 *	123.1 ***	97.6
Imports									
	Distance coefficient (elasticity)								
	Nominal	1960 - 2016	-0.6 ***	-1.1 ***	-	-0.7 ***	-0.7 ***	-0.7 ***	-0.7
	Excl. trade in fuel, ships, aircraft.	2000 - 2017	-0.9 ***	-1.0 ***	-	-0.9 ***	-0.9 ***	-0.9 ***	-0.9
	Real	1960 - 2016	-0.5 **	-0.9 ***	-0.8 ***	-0.3 *	-0.5 **	-0.3 ***	-0.6
	% more likely to trade								
	Nominal								
	Common language	1960 - 2016	158.5 ***	-	-	163.6 ***	160.2 ***	263.4 ***	186.4
	Common colony	1960 - 2016	-	148.6 **	-	-	-	71.9 ***	110.2
	Excl. trade in fuel, ships, aircraft.								
	Common language	2000 - 2017	209.8 **	-	-	206.0 ***	208.6 ***	-	208.1
	Common colony	2000 - 2017	-	-	-	-	-	33.7 ***	33.7

Sources: Ellul (2019); Author's calculations.

The importance of trade agreements

While data limitations and breaks in time series have to be considered, the estimates indicate that after correcting for variables such as country distance, country and population size, the EEC-Malta Association

Agreement and EU accession had strong and significant impacts on both exports and imports (see Table 2). However, the former had a stronger impact on goods exports than Malta's entry in the EU. In contrast, Malta's entry in the EU had a stronger impact on goods imports. This finding may reflect the fact the Association Agreement opened up European markets for Maltese exports, while import controls were only completely lifted in the run up to EU accession.

Table 2
Estimates for trade agreement coefficients

		OLS	PPML	ZIP	Heckman (Exact Id.)	Heckman (Over Id.)	Heckman (2-step)	Average
Exports								
	MT EC Agreement							
	Nominal	137.1 **	-	-	135.7 **	136.9 **	134.4 ***	136.0
	Real	1033.3 ***	520.8 ***	1081.1 ***	943.8 ***	2222.2 ***	918.8 ***	1120.0
	MT EU Membership							
	Nominal	-	-	-	-	-	-	-
	Real	662.7 ***	-	-	247.2 ***	379.9 ***	230.9 ***	380.2
Imports								
	MT EC Agreement							
	Nominal	112.6 **	-	-	108.6 **	111.1 **	108.3 ***	110.1
	Real	2218.9 ***	247.6 ***	775.9 ***	1747.3 ***	3655.3 ***	1342.3 ***	1664.5
	MT EU Membership							
	Nominal	448.8 ***	-	-	437.6 ***	445.1 ***	437.9 ***	442.3
	Real	3624.0 ***	284.8 ***	-	2061.3 ***	3478.0 ***	1701.4 ***	2229.9

Sources: Ellul (2019); Author's calculations.

Finally, one must note that over the roughly fifty years analysed, Malta passed through a sustained period of very strong change to its economic fabric. This history was marked by trade-driven economic success. In turn, this leads to particular data volatility which has to be highlighted, along with other limitations of this study.

The use of Customs data is affected by particular trade phenomena such as the re-export of fuel oils by Maltese bunkering operators and highly-integrated firm specific value-chin trade.

Such value chains may negate established norms in gravity modelling, such as distance. Moreover, services flows, which have grown significantly in recent years, are excluded from this analysis. The services sector may have experienced a different outcome to the manufacturing industry following EU accession. Finally, the imperfect measuring of price indices is also a caveat for the analysis of real trade flows.

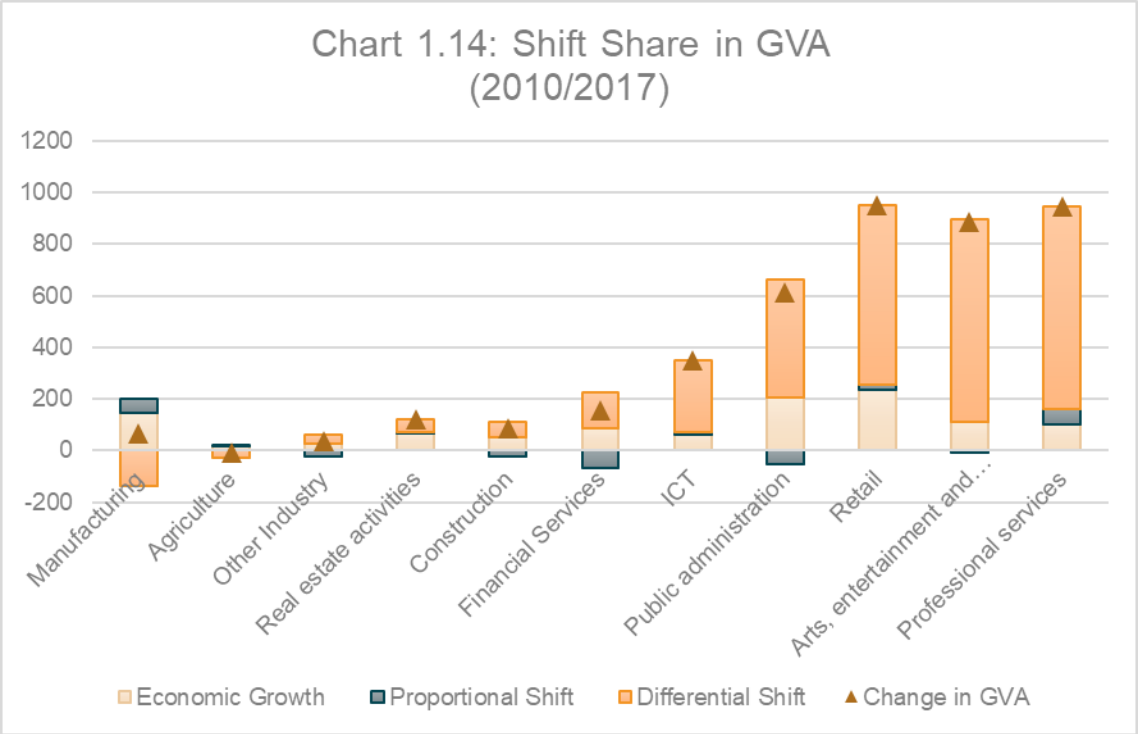
Estimates in the study show how Malta's economic progress benefitted from trade agreements. The very strong rates of goods export growth registered over the past decades are indicative of a complete structural change in the fabric of the Maltese economy since 1960. This change was facilitated by trade agreements. The success story for trade in goods may now be dwarfed by the more recent successes the Maltese economy is registering in services. However, the estimates presented here confirm how economic development in Malta comes arm-in-arm with greater trade integration.

1.2.3 Shift Share analysis in GVA

The shift share analysis, identifies whether Malta's increase in exports is a result of some domestic gain in competitiveness as opposed to some other external factor. Shift share attempts to allocate any gains in competitiveness to 3 different components:

1. The differential shift: This refers to any competitive gains attained in the region in question;
2. The proportional shift: This is an indicator of the gains attained from global industry demand conditions; and
3. Economic growth: Shows the gains in the global aggregate demand conditions.

The shift share analysis conducted on the GVA by sector for Malta shows regional competitiveness gains throughout most sectors. Chart 1.14 shows how regional competitiveness gains between 2010 and 2017 in professional services and the retail services are on par with those achieved by the gaming sector. Furthermore, differential shifts are also visible for the construction, financial services and the ICT sectors as well. This analysis indicates that the Maltese economy has maintained its domestic competitiveness. In terms of global industry demand conditions, the gains here are rather limited, such gains were mostly enjoyed by the manufacturing and the professional services industries. Gains due to the global demand conditions were also quite broad based, nevertheless the magnitude is much smaller than the gains observed in the domestic economy. This further indicates that competitiveness gains were exclusively attributed to the Maltese economy and were not influenced by external factors.



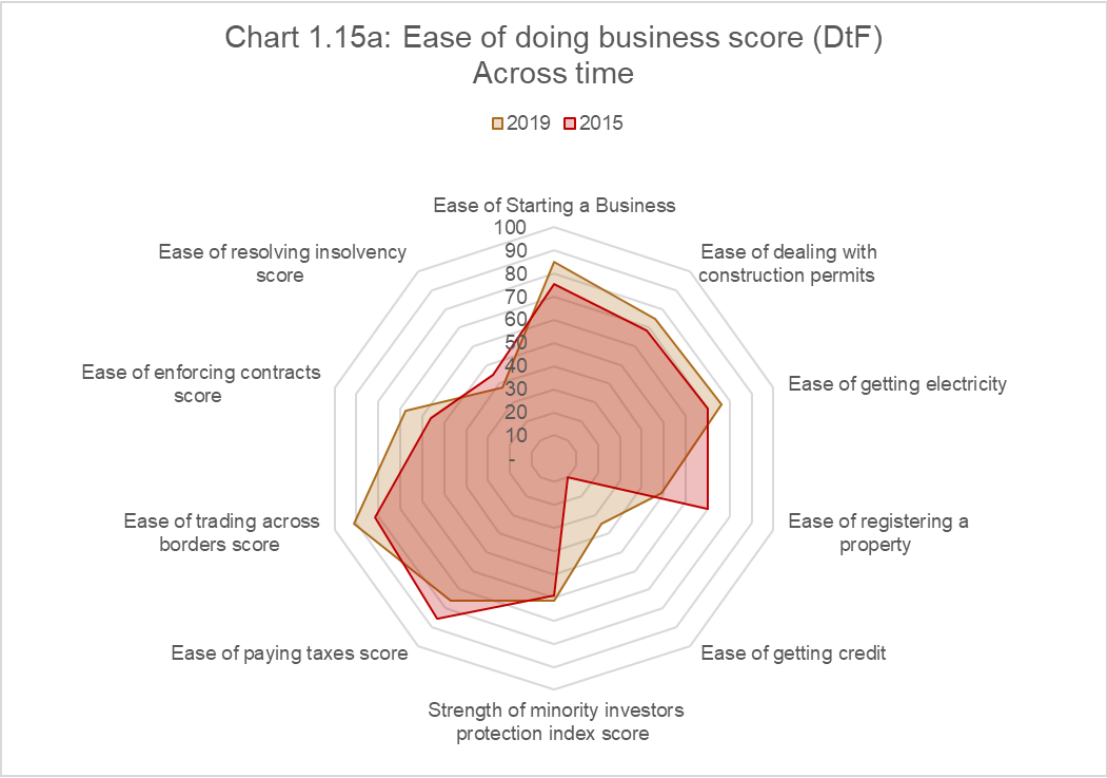
(source: Eurostat & EPD calculations).

1.3Competitiveness: An external perspective

An external perspective to the competitiveness of a country is given by both the World Bank and the World Economic Forum (WEF). Through its 'Doing Business' report, the World bank examines the ease of opening a business in various countries and ranks them according to several indicators. The WEF on the other hand issues the 'Global Competitiveness Report' and examines competitiveness through 12 broad indicators.

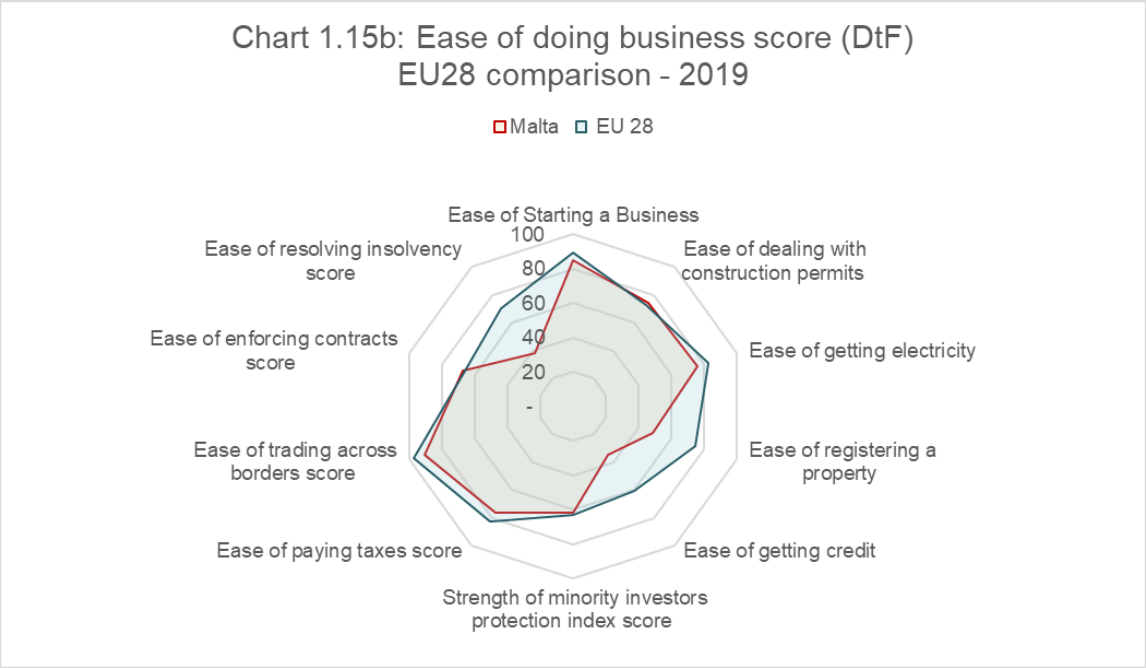
1.3.1 Doing Business Report

The Doing Business report analyses the ease with which business in general can start to operate within a particular jurisdiction. This study is based on survey data and looks at several indicators related to the business environment. From the surveys conducted, scores are then given to the respective countries and a distance to frontier approach is adopted to be able to create effective cross-country comparisons. The closer the score is to 100, the closer would that country be to the best performing country in a given indicator. Malta ranked 84th out of 190 countries in the 2019 report, an improvement of 10 places when compared to the 2015 report. Malta made improvements in most of the categories being examined, most notably with respect to the ease of trading across borders, the ease of enforcing contacts, the ease of



getting credit and the ease of starting a business (chart 1.15a). However, Malta lost its relative standing in the ease of resolving insolvency, the ease of paying taxes and the ease of registering a property score.

(source: World Bank)



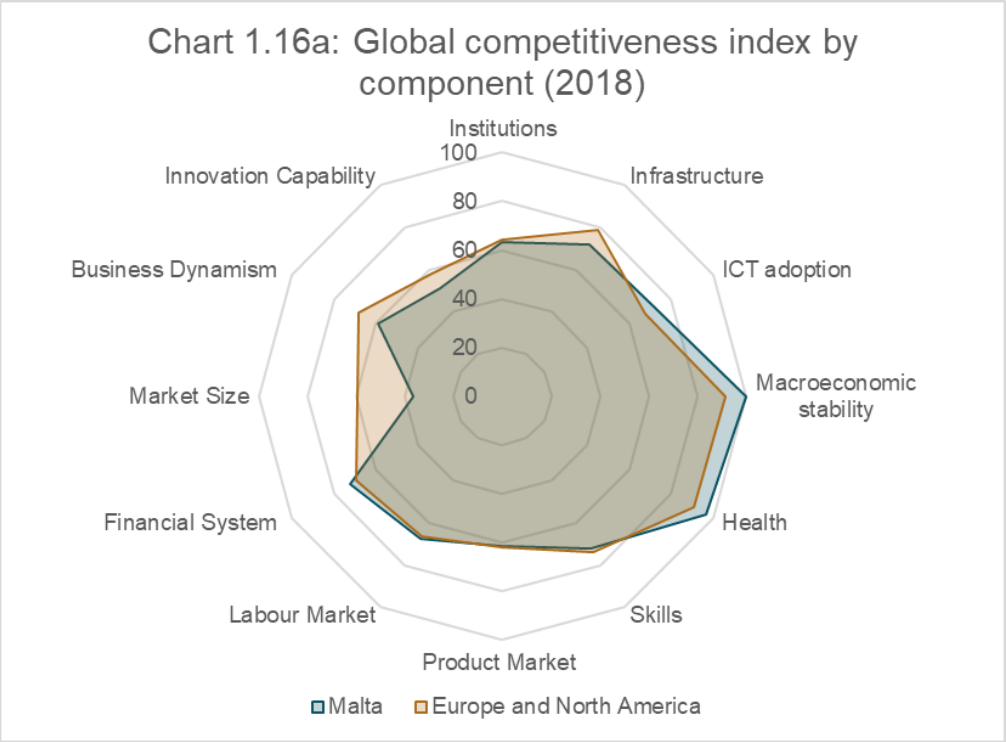
(source: World Bank)

As chart 1.15b shows, Malta fares well in terms of the ease of dealing with construction permits and the ease of enforcing contracts scores. Though in most of the indicators surveyed Malta is close to the EU average score, it still lags somewhat behind particularly with respect to the ease of resolving insolvency score, the ease of registering a property and the ease of getting credit. Even though improvements have been made since 2015, further effort is required to reduce the bottlenecks identified to ensure sustained competitiveness.

1.3.2 Global Competitiveness Report – World Economic Forum

Delving into the micro-economic sphere, the Global Competitiveness Report integrates well-established aspects with new and emerging levers that drive productivity and growth. Some of these areas include; innovation capability, skills, health, macroeconomic stability and the labour market. These indices show that Malta is faring quite well in comparison to European and North American countries in some specific domains. For instance, in terms of ICT adoption Malta fares better than the average of European and north American countries, due to improvements made in terms of internet and cellular connectivity. In the case of macroeconomic stability Malta obtains a score of 100 due to low levels of recorded inflation

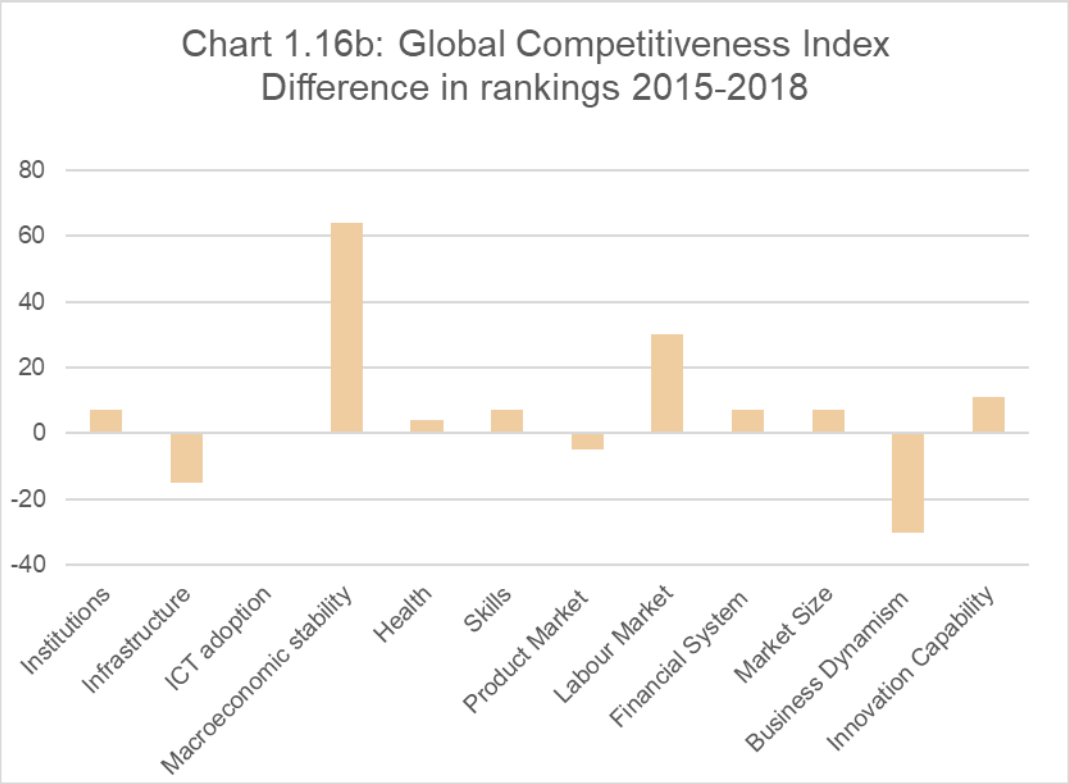
and stable debt dynamics. Malta also performs well when it comes to healthcare given its high life expectancy which is the main determinant of this indicator.



(source: World Economic Forum)

In other areas Malta is lagging other European and North American countries (chart 15). The most notable areas are Business Dynamism, Innovation Capability and Infrastructure apart from the market size. In terms of Business Dynamism, the index points towards issues related to the time required to start a business and insufficient growth of innovative companies. On the other hand, the need for investment in road infrastructure and higher levels of research and development is weighing on the scores achieved with respect to Infrastructure and Innovation Capability respectively. Given that in 2018, there was a change in methodology when it comes to the Global competitiveness index, time series comparisons are somewhat harder to perform. To partially bypass this problem, comparisons are drawn using Malta's rank in the 2015 and 2018 reports. Chart 1.16b shows how Malta's rank differs between these two periods. Improvements were made in strengthening institutions, Macroeconomic stability, Labour market and Innovation. Malta's rankings in these areas have improved during this period. However, in areas such as infrastructure, product market and business dynamism, Malta saw a drop in the rankings. In terms of infrastructure the report suggests that the drop is resultant from efficiency issues related to public transport, air transport and shipping transport. Product market issues relate to the complexity of Malta's tariff system however, these issues are common across the EU. This indicator is calculated as the weighted average of four criteria, namely: tariff dispersion, prevalence of tariff peaks, the prevalence of specific

tariffs and the number of distinct tariffs. Malta ranks 112nd place in this aspect. This score for this indicator is low across the EU. To be also noted that another factor weighing negatively on the Product Market score seems to be the efficiency in the clearance process where Malta is ranked 60th. In terms of business dynamism, Malta seems to lag particularly when it comes to insolvency and the cost and time to start a business, which is in line with the findings of the World bank Doing Business report.



(source: World Bank)

1.4Overall Conclusions

Malta's open economy leaves it susceptible to external shocks. At the same time, the diversified economic structure strengthens the resilience in managing macroeconomic shocks. The shift share in GVA presented in this report reveals that the growth registered in most of Malta's industries are attributed to mostly competitiveness gains rather than just to industry-specific or global demand conditions. In that regard, Malta's progress in converging towards the European standard of living can be attributed to the buoyant economic performance and in particular growth in its economic potential. Indeed, the rising economic

potential is in itself reflective of the growth in the working age population, rising participation and employment rates, decreasing NAIRU and rising investment. Furthermore, another important contributor to potential output growth is Total Factor Productivity which in recent years was quite robust and exceeded gains in the EU average. In the labour market, the unemployment rate is at an all-time low whilst the participation rate is increasing. Though the female participation rate is below that of the EU average, it is still steadily rising. Net exports in the services industry in general have also seen substantial increases since 2012, mostly owing to personal, cultural and recreational services sector, the tourism sector, financial services and the transport sector. This affirms Malta's diverse economic structure and is reflected in the significant current account surplus recorded in recent years.

Nonetheless, there is still some room for improvement. Malta needs to ensure that the factors determining competitiveness are supported with a view to ensure that the progress recorded in recent years can be supported over the longer term. In that regard there a number of indicators need to be monitored closely. The real effective exchange rate -which is an indicator of cost-competitiveness across countries- has been on the increase over the last few years, meaning that Malta's exports are becoming less price competitive relative to other EU members states. Furthermore, the World Bank Doing Business report, and the Global Competitiveness report point out to challenges notably in terms of the business environment and infrastructure. In terms of the business environment, the World Bank identified Malta's insolvency framework and the ease of registering a property are two main issues which may hinder ease of doing business. These issues warrant additional attention given their importance in facilitating and fostering a business-friendly environment.

CHAPTER 2: A MESO-LEVEL ANALYSIS OF PRODUCTIVITY

2. A MESO-LEVEL ANALYSIS OF PRODUCTIVITY

This section provides an overview of Malta's sectoral landscape, characteristics of key sectors as well as sectoral interlinkages, with the purpose of depicting clearly the performance of each sector highlighting any potential gaps as well as business opportunities.

2.1 Territorial Context

The Maltese Islands have a total area of 316 km² and are located in the centre of the Mediterranean Sea, approximately 100 km south of Sicily and 300 km east of Tunisia. The archipelago consists of three main islands: Malta, with an area of about 245 km² and 442,978 inhabitants; Gozo, with an area of 67km² and a population of 32,723 and Comino, which is inhabited by a very small farming community[8]. The entire coastline measures 173 km.

Malta is one of the most densely populated Member States within the European Union. The population density is further accentuated by two factors. The first is the large annual influx of tourists which exceeds the average of 2.3 million annually[9]. This renders the number of inbound tourists per year almost 5 times as much as the population size, thus exerting significant pressures on the island's environment, infrastructure and socio-economic set-ups. The second is that Malta has experienced a growing influx of migrants. The impact of migrants in proportional terms, given the country's small size and very high population density, is very high. The island region of Gozo, which is located at the northern part of the Republic of Malta is characterized by a number of inherent characteristics including smallness, double insularity and accessibility. Gozo is presently heavily dependent on the sea transport link with the mainland.

Although Malta is the smallest member state in the European Union, its economic track record has constantly been among the best in the EU with the attraction of Foreign Direct Investment (FDI) across all sectors of the economy. Malta`s strategic position within the Mediterranean has been particularly attractive to foreign investors that use the island as a stepping stone to trade with other European, African and Middle East countries. Nonetheless, Malta`s location is not the only factor driving such trading

[8] https://nso.gov.mt/en/News_Releases/View_by_Unit/Unit_02/Regional_and_Geospatial_Statistics/Documents/2018/News2018_200.pdf
[9] https://nso.gov.mt/en/News_Releases/View_by_Unit/Unit_C3/Tourism_Statistics/Documents/2019/News2019_017.pdf

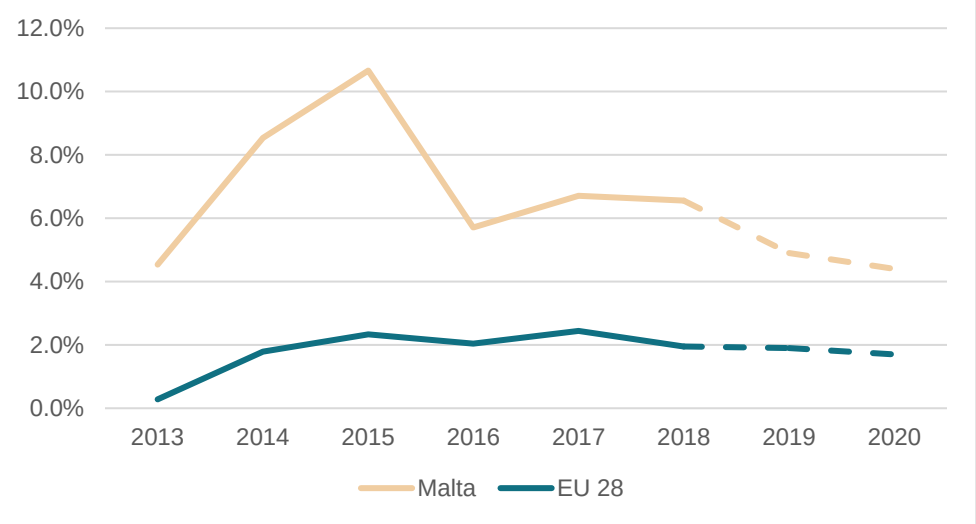
interest in the island of Malta. The island's low crime rate, Mediterranean climate, as well as its good educational and healthcare systems also make Malta an easy sell. Malta has a reputation for stability, predictability and security based on a robust EU-compliant regulatory framework. Also, the Maltese legislation and tax system have drawn even more attention of foreign investors who are willing to expand their businesses or start-up a new company in the island of Malta. There are various prominent companies which opted to invest in Malta particularly HSBC, Microsoft, Playmobil and Lufthansa Technik, among others.

2.2 Macroeconomic and Sectoral Development

The island of Malta, although small, has a well-diversified economic activity which is highly exposed to international market forces. Despite the small domestic market, Malta has maintained a strong pace of economic expansion and is expected to keep growing at a sustained pace, amid long-term sustainability challenges. Malta is experiencing an upsurge in its GDP along with near full employment, a fiscal surplus and a resilient services sector which keeps growing with the introduction of 'new economy' industries. As shown in Figure 2.1, in 2015 Malta experienced an upsurge of circa 11% from €7.8 million in 2014 to €8.6 million in 2015. Such growth was mainly driven by a strong tourism demand, the emergence of 'new economy' activities and the influx of foreign workers into the labour market[10]. Since then, the Maltese economy expanded more slowly, albeit at a higher rate than the EU average through balanced productivity and job creation, as illustrated in Figure 2.2 hereunder.

[10] https://www.maltachamber.org.mt/en/the-rise-and-rise-of-malta-s-economy-is-it-sustainable

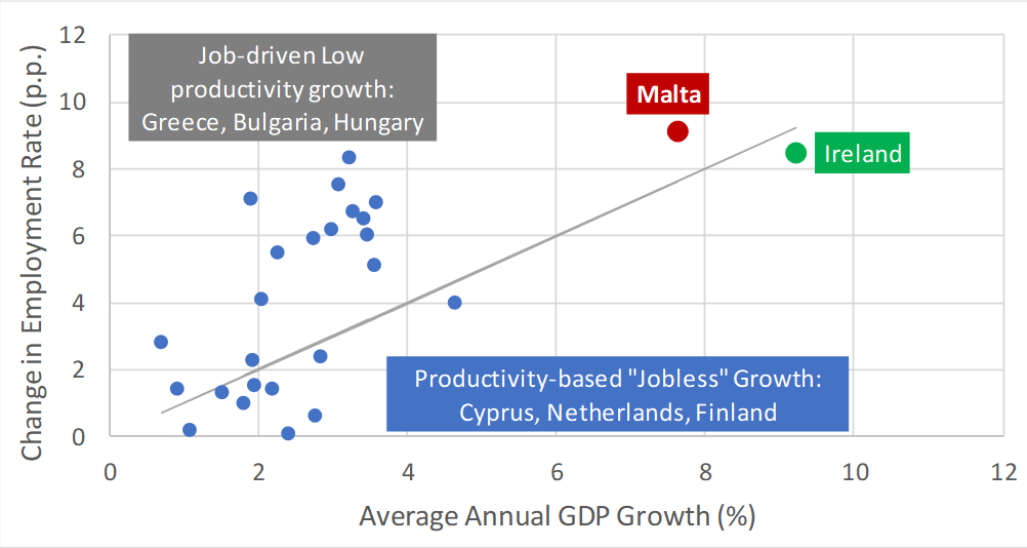
Figure 2.1: Growth in Real GDP



(Source: NSO News2019_038 & European Commission Economic Outlook)

Malta`s exceptional GDP growth is expected to persist in the medium term, although an orderly slowdown in sustained growth is expected post 2018 in line with the EU average. GDP growth in 2018 is estimated at 6.6%, moderating from the 6.7% growth recorded in 2017.

Figure 2.2: Employment and GDP Growth (5-Year Analysis)



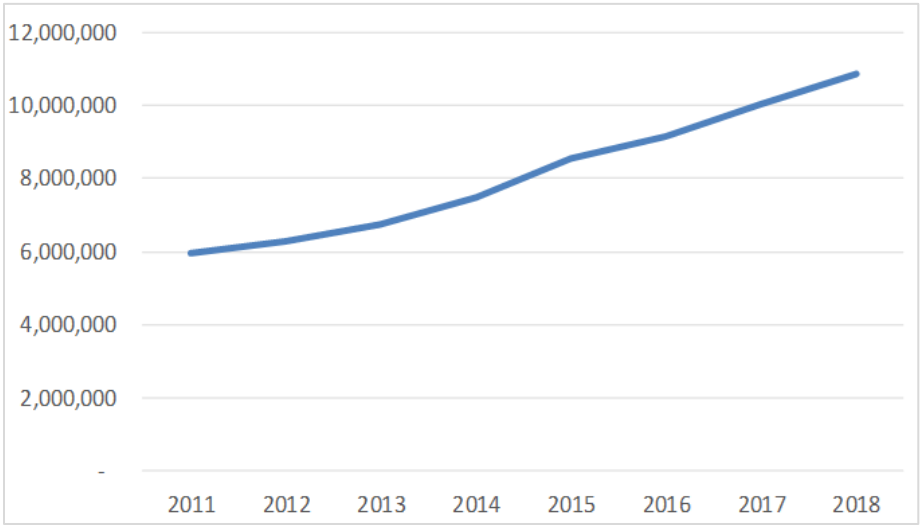
(Source: Eurostat)

As highlighted previously, Malta has experienced balanced productivity and job creation. A 5-year cross country analysis, illustrated in *Figure 2.2*, reveals that Malta and Ireland are closest to a path of strong sustainable employment growth. Jobless growth often reflects demographic constraints or skills shortages whilst low productivity growth often reflects insufficient overall economic competitiveness.

As illustrated in *Figure 2.3*, in comparison to the EU average of 3.7%, the Gross Value Added[11] of the Maltese economy grew by an average 9.1% p.a. between 2011 and 2018.

[11] Approximately salaries and profits.

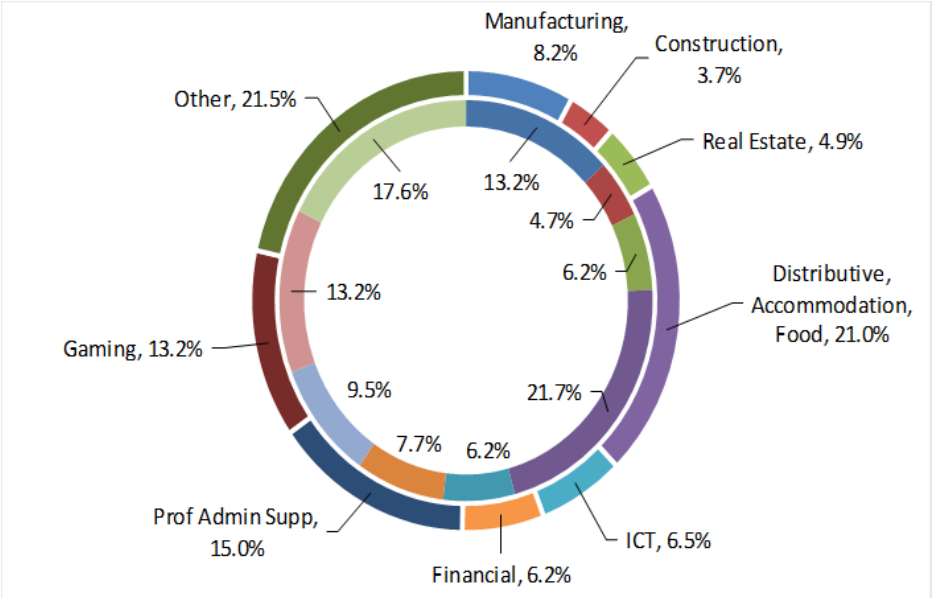
Figure 2.3: Economic Value Added



(Source: National Accounts NSO)

Figure 2.4 provides the composition of value added by economic activity for 2011 and 2018. Between the period 2011 and 2018, professional, administrative and support services experienced the largest growth in the GDP share during the period indicating that the Maltese economy is becoming more services oriented.

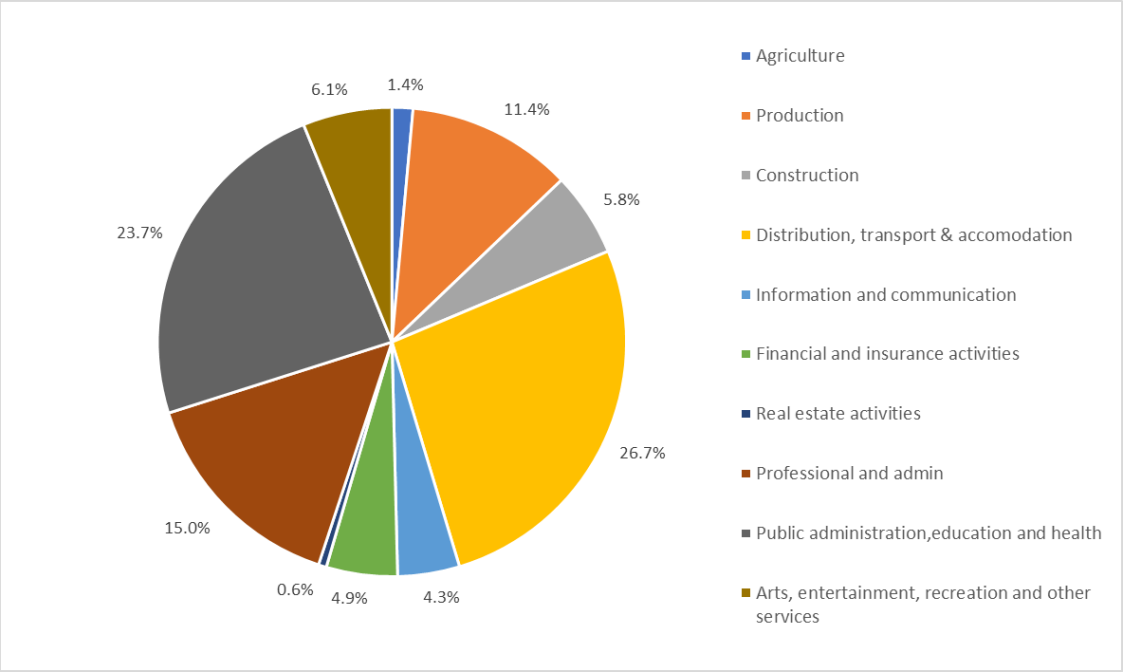
Figure 2.4: Value Added (2011 in comparison to 2018)



(Source: National Accounts NSO)

Figure 2.5 illustrates the employment composition in 2018 by economic activity. It indicates that around one half of the employment composition in Malta is attributable to the Wholesale and Retail sector followed by Public Administration. Professional, administrative and support activities have experienced the largest increase over the last five years, reaching 15% of total employment from 10% in 2013, in line with the increase in the share of GVA.

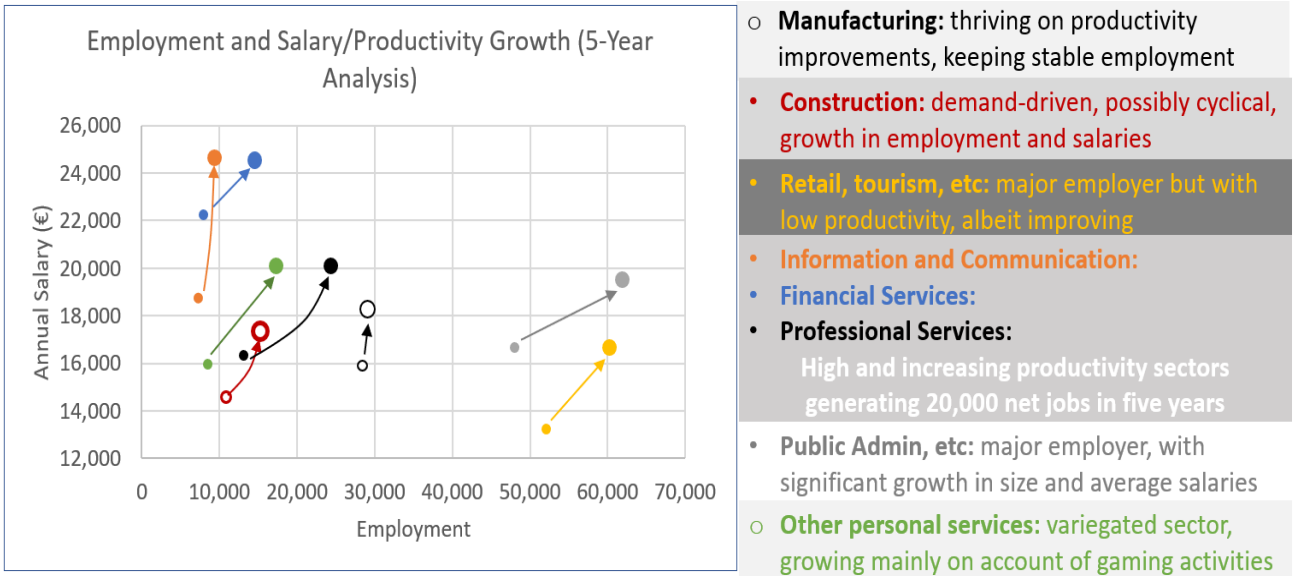
Figure 2.5: Employment composition in 2018



(Source: Eurostat)

Figure 2.6 illustrates that over the past five years growth has spread across all the main sectors of the economy, bringing with it increases in employment and average salaries, albeit with variations across different sectors. To this end, the sustained development of employment in Malta requires productivity growth in largest sectors, employment expansion in the more productive sectors as well as the management of future cyclical fluctuations in construction also through enhanced competitiveness in manufacturing. Furthermore, upgrading and innovation in traditional sectors such as wholesale and retail to bring them to new economy standards is warranted.

Figure 2.6: Employment and Salary/Productivity Growth



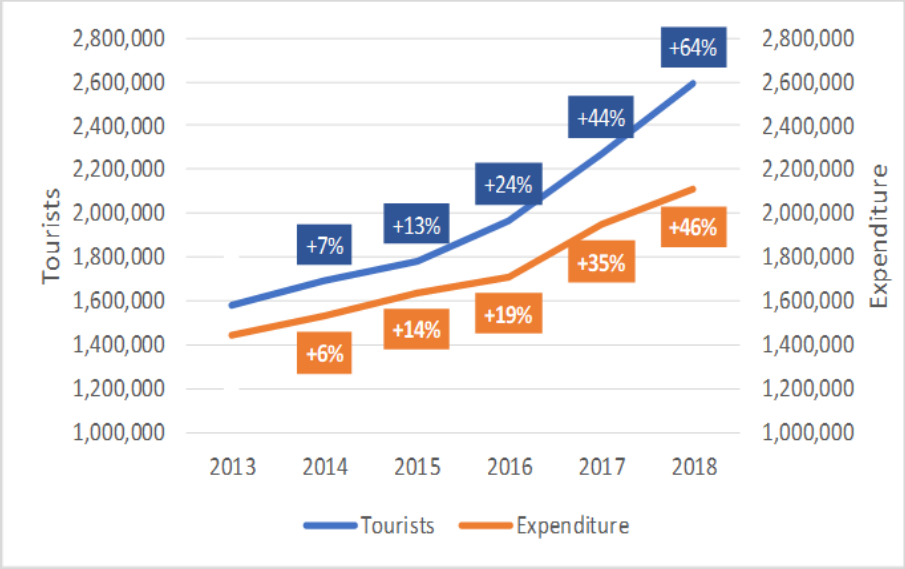
(Source: NSO Labour Force survey)

2.1.1 Demand Drivers

This section presents the main demand drivers for the Maltese economy within the context of investing in the quality of life and providing residential attractiveness as a unique selling proposition for Malta.

As depicted in *Figure 2.7*, tourism performance is on the increase both in terms of numbers as well as expenditure, creating widespread capillary multiplier effects. It is to be noted that as activity moves closer to full capacity, while the global economic scenario turns riskier, new higher value-added tourism activities need to be developed. At the same time there are number of challenges that need to be addressed. In particular, these include the quality of product and experience as well as the shift in accommodation patterns that is having a negative effect on the hotel industry especially since more hotel permits have been issued.

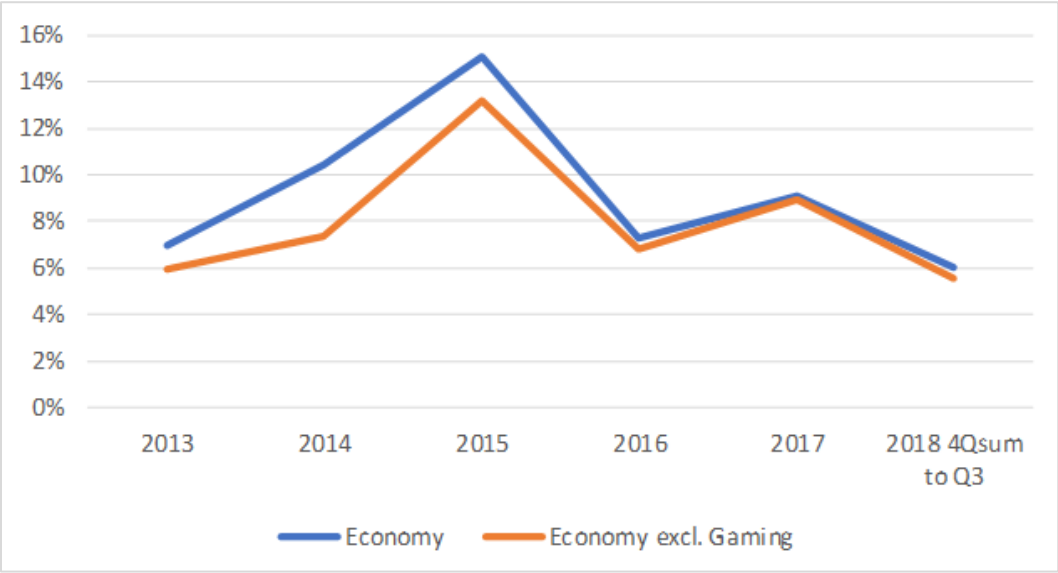
Figure 2.7: Tourism Performance



(Source: NSO Inbound Tourism 017/2019)

As for the Remote Gaming sector, the 12% share in total Gross Value Added poses a risk, as the sector faces expansion opportunities together with regulatory and resource constraints. Through employment (7,400FTEs) and other expenditures, the fundamental contribution of the sector is closer to 5% of the economy's GVA which is still substantial. It is however worth noting that the growth patterns of the economy over the past 5 years excluding the gaming sector would not have been fundamentally different, as illustrated in *Figure 2.8* below.

Figure 2.8: Growth in GVA (with/excluding gaming)

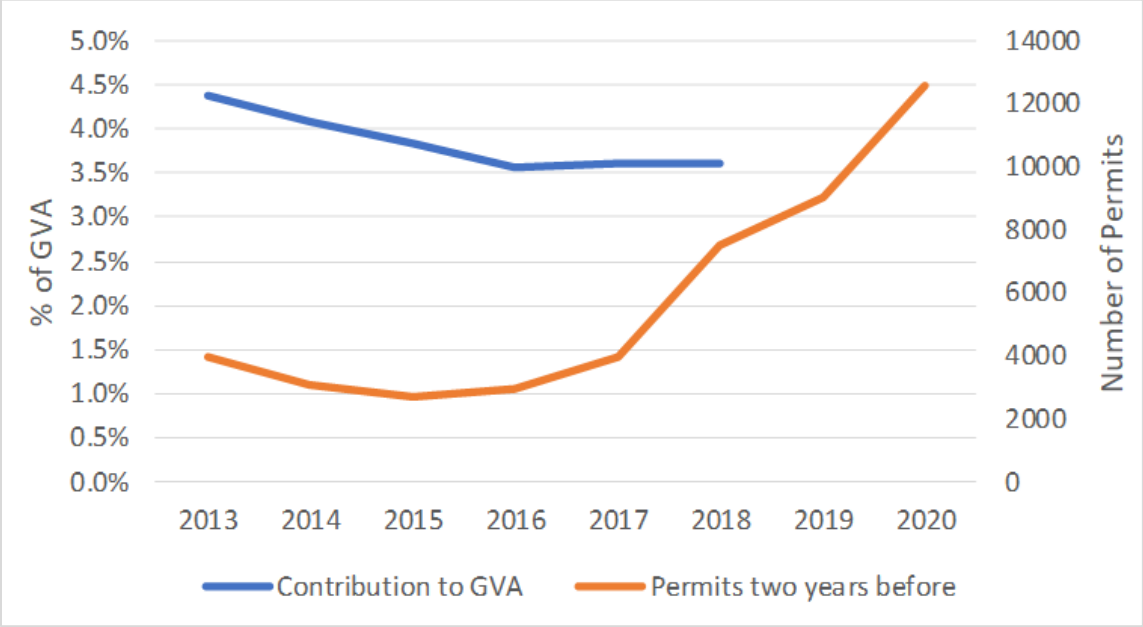


(Source: National Accounts)

To this end, given the substantial contribution of this sector, gaming needs to continue to restructure to meet challenges and opportunities whilst 'new economy' areas of activity with suitable risk-reward profiles need to be developed.

Construction has not been a major contributor to GDP growth. As highlighted in *Figure 2.9*, permits data indicate a significant potential growth in 2019 and 2020, but with a possible downturn thereafter. Construction sector activity is subject to resource constraints, not least in the availability of land. This sector poses obvious environmental risks.

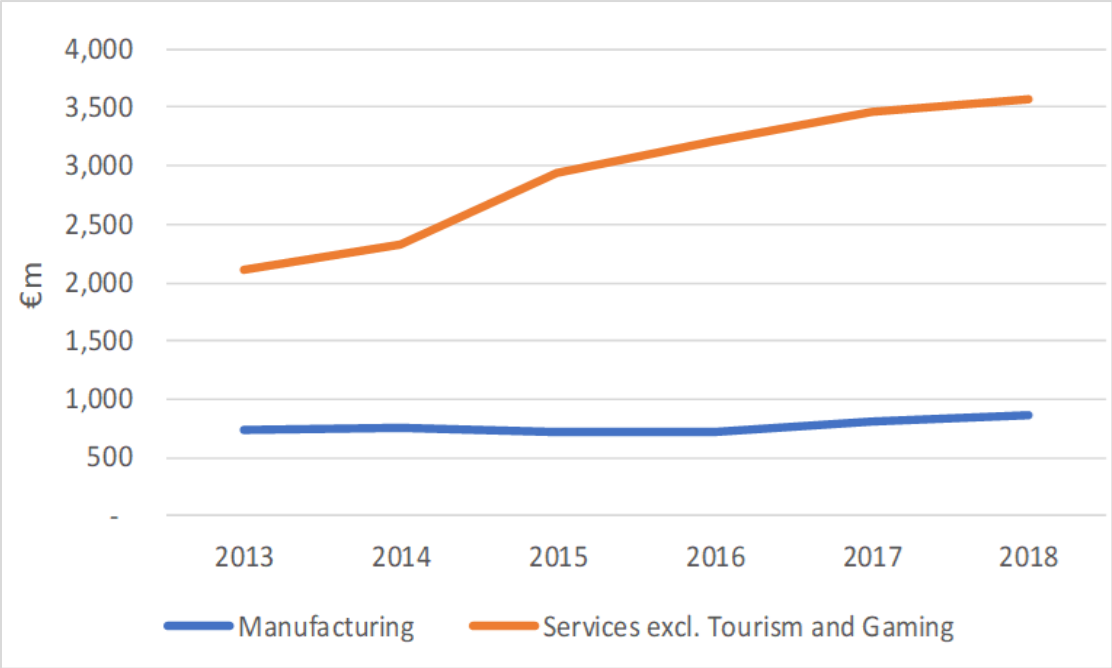
Figure 2.9: Construction Sector Activity



(Source: NSO/Planning)

As illustrated in *Figure 2.10*, following a period of stagnation, manufacturing staged a recovery since 2017, with employment increasing by around 600 in 2018. The value added of private sector services other than tourism and gaming has grown at an annual rate which exceeded that of the economy, indicating continued potential.

Figure 2.10: Value Added Generation



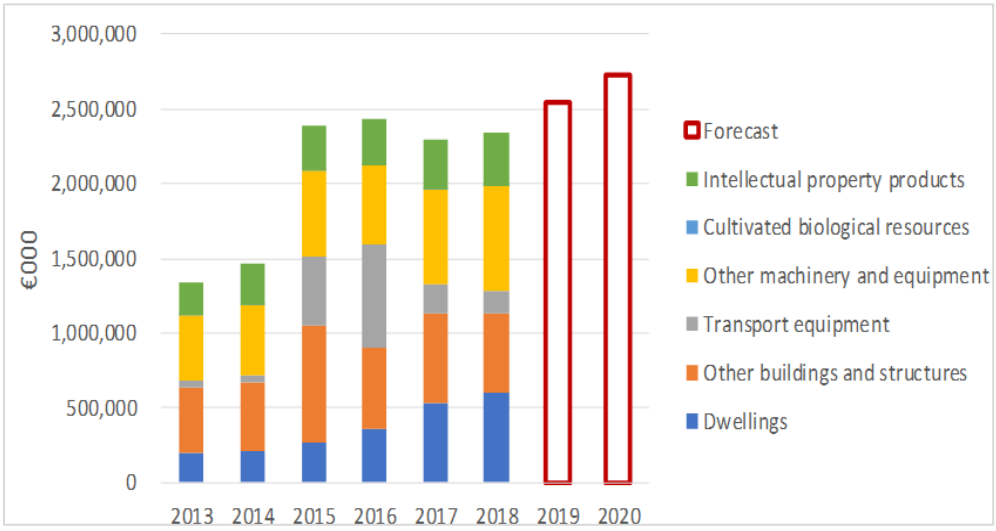
(Source: National Accounts)

2.1.2 Supply Side Capabilities

Productive capacity and residential spaces are being created at a strong pace, as illustrated in

Figure 2.11. It is worth noting that the pace of investment projects needs to be synchronised with demand potential to utilise them. To this end, a sustainable balance between investment and environmental assets needs to be ensured.

Figure 2.11: Total Gross Fixed Capital Formation



(Source: NSO News2019_038 & European Commission Economic Outlook)

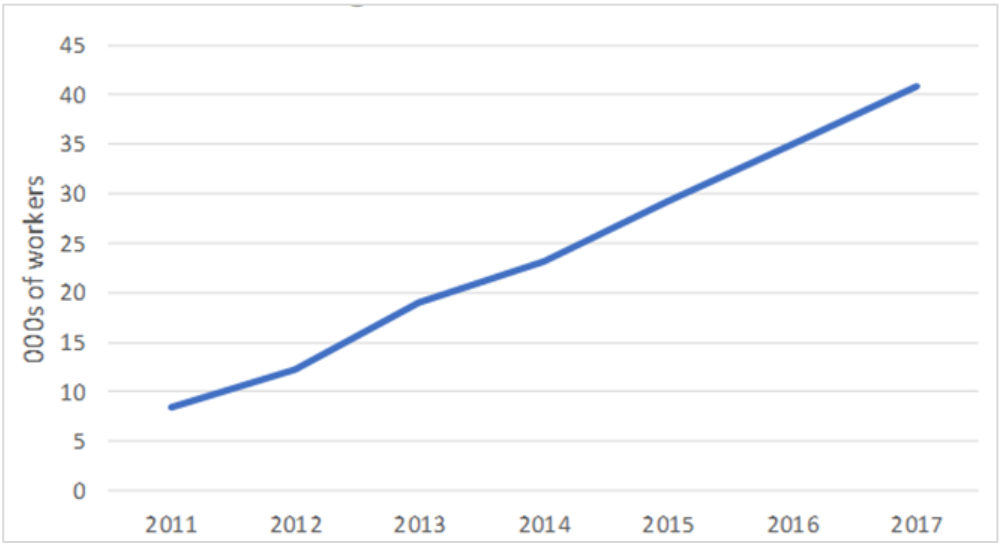
The quantity and quality of human resources is an ongoing challenge. As illustrated in *Figure 2.12,* labour market activity and employment rates in Malta have risen rapidly to converge and exceed the EU average. In spite of such increases as well as the substantial increase in immigrant workers which has been essential to support growth, as illustrated in

, labour availability is still falling short of market requirements in a number of sectors.

Figure 2.12: Employment and Activity rate

(Source: Eurostat)

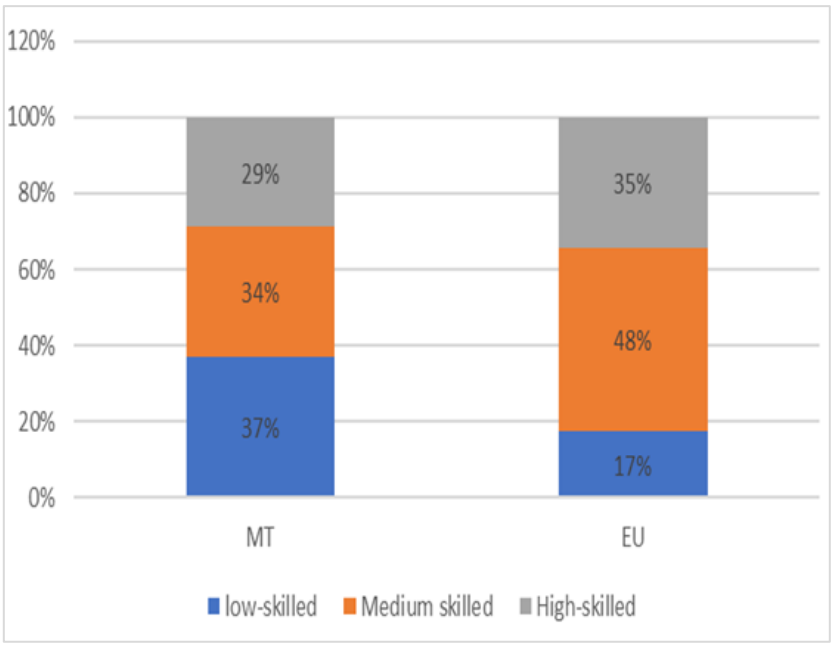
Figure 2.13: Immigrant workers in Malta



(Source: Eurostat)

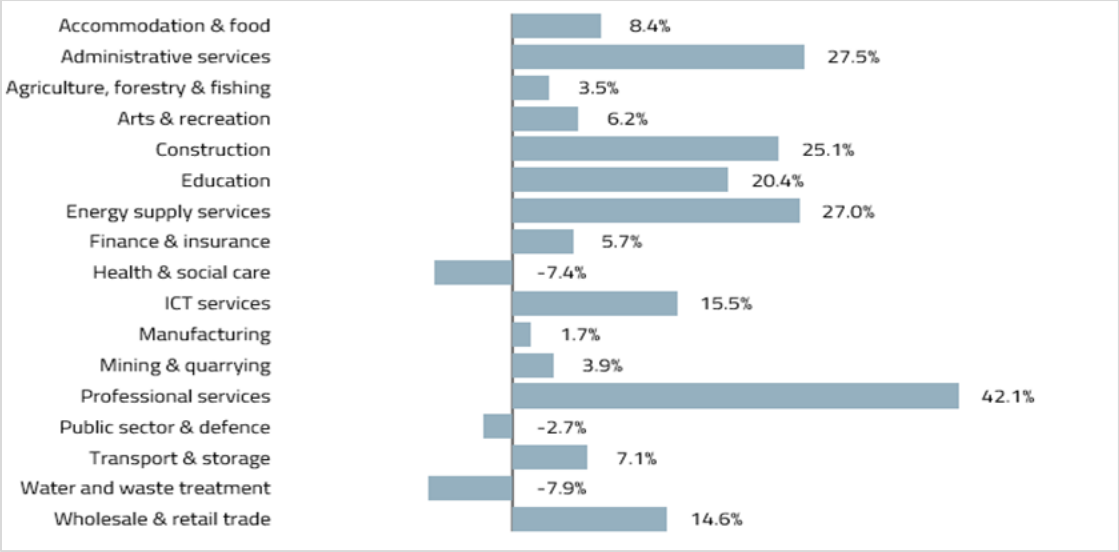
As shown in *Figure 2.14*, skills levels in the Maltese labour force remain unduly skewed towards the lower levels at the expense of medium level skills, in spite of future requirements, that are focused more on medium to high skills requirements, as illustrated by *Figure 2.15*.

Figure 2.14: Employment by skills level in 2018



(Source: Eurostat)

Figure 2.15: Future employment growth by sectors in Malta compared to EU in 2016-2030

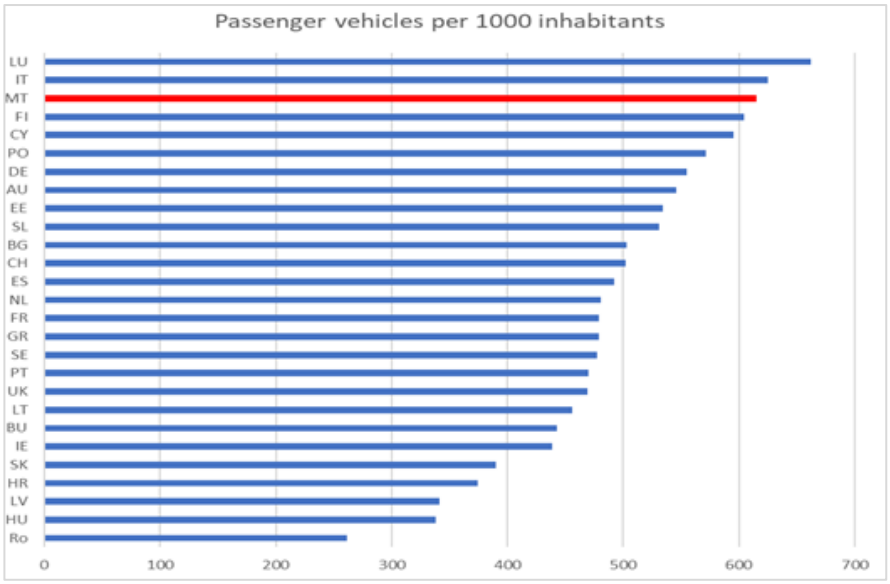


(Source: CEDEFOP)

In terms of environmental capital, Malta is the third country with the most vehicles per inhabitant as shown in *Figure 2.16*. The cost of congestion between 2010 and 2015 was estimated at 4% of GDP[12]. Cars occupy around 3% of built-up areas and 15% of road areas.

[12] Transport Malta (National Transport Strategy 2050 page 125) based on External Cost of Congestion in future years (European Commission, 2015)

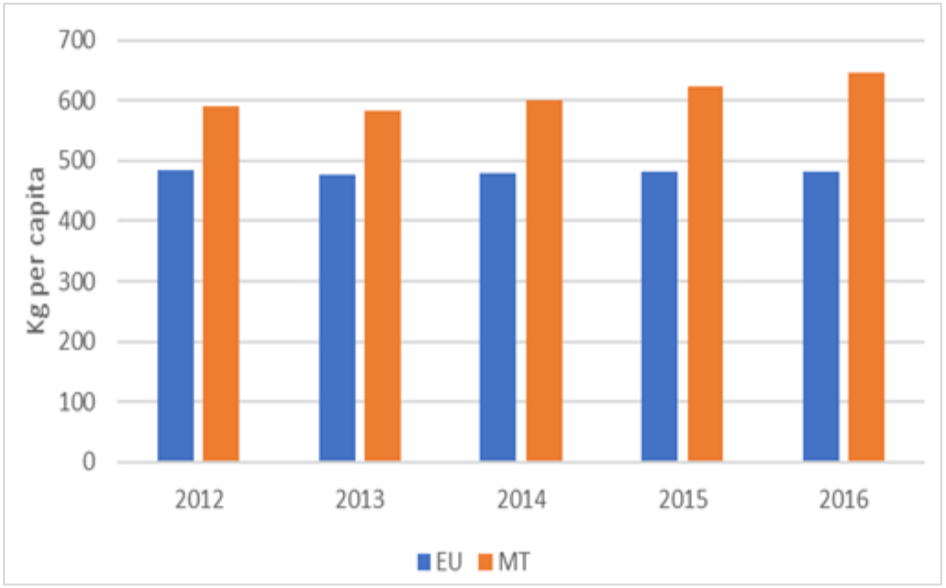
Figure 2.16: Passenger vehicles per 1000 inhabitants



(Source: Eurostat)

Per capita waste generation continues to increase, while it has fallen across the EU, as shown in*Figure 2.17*. Recycling behaviour continues to lag behind EU counterparts.

Figure 2.17: Waste generated per capita



(Source: Eurostat)

Broad based infrastructural investments towards a quality leap are called for. Malta's higher economic growth during the past years has brought about new challenges, particularly the need to invest and upgrade the existing infrastructure to support the higher level of economic activity and pave the way for further economic development. Malta has recently engaged in infrastructural improvement to be able to take on any challenges as competition rises whilst still being attractive for new investment. Various investment projects are being undertaken and others are in the pipeline in order to strengthen Malta`s economic base. These include investments on roads and other transportation facilities, connectivity, tourism and cultural amenities as well as other physical infrastructure particularly industrial spaces which have the potential to enable a better utilisation of resources and increase productivity.

2.2 Business Landscape

Malta`s economic expansion has led to several structural changes in the economy particularly the rise of several 'new economy' sectors which are thriving in Malta such as videogaming, distributed ledger technologies and artificial intelligence. Nonetheless, Malta`s reliance on SMEs has not been affected. Official statistics suggest that SMEs remained the main drivers for growth. Such SME`s are contributing to Malta`s resilience to economic shocks. Hence, it is highly important that such firms have good access to finance, human as well as physical capital.

The total number of registered business units has increased from 80,809 in 2014 to 103,458 in 2017 representing a 28% increase over a three-year period. The highest increase in births over the period under study were mainly in the professional scientific and technical activities followed by real estate activities and arts, entertainment and recreation sector. This is clearly a result of a greater interest in completing tertiary education, the boom in the property markets and the emergence of the gaming industry respectively. On the other hand, those sectors which were booming prior to 2014 experienced the largest increase in business unit deaths along the three-year period, particularly the financial and insurance services sector.

Business in Malta may be conducted in a variety of forms including sole ownership, partnership, both public and private limited liability companies, protected cell companies and SICAVs, amongst others. However, the majority of business units in Malta are limited liability companies. In 2017, these amounted to just under 51,500 enterprises accounting for 50% of the total business units. Around 32,899 of these enterprises operated within the business economy sector. Partnerships are common in the professional services sector while protected cell companies are common in the insurance sector.

The table below shows the distribution of firms in Malta according to their size for the past four years.

Table 2.1: Proportion of Enterprises by Size Class

	2014	2015	2016	2017
Micro	97.08%	97.08%	97.20%	97.25%
Small	2.28%	2.28%	2.18%	2.17%
Medium	0.53%	0.53%	0.50%	0.48%
Large	0.12%	0.12%	0.12%	0.11%

(Source: NSO News2018_068)

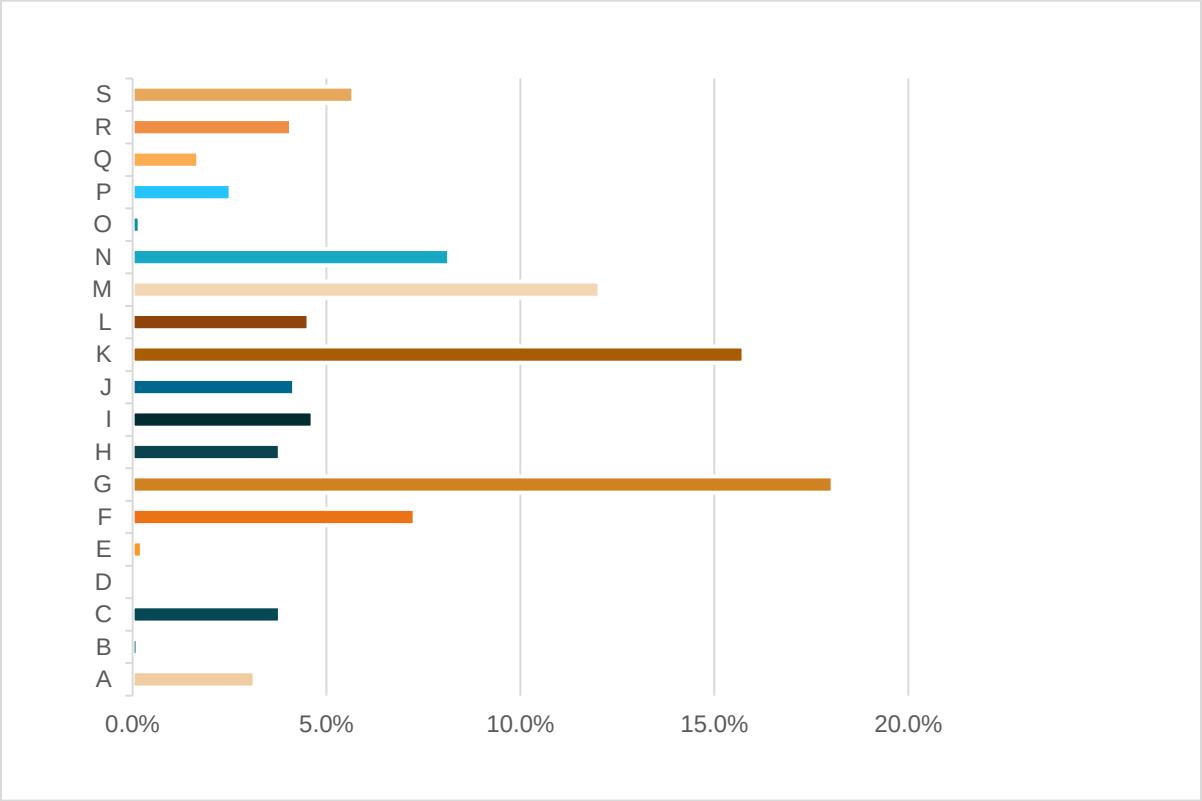
In line with the NSO metadata,[13] company size is classified according to the number of FTE employees. Firms with up to 10 FTE employees are classified as micro firms, those comprising of up to 49 workers are considered as small, those which have up to 249 employees classify as medium enterprises while those which have 250 or more employees are categorised as large firms. The table above shows that micro firms are quite dominant in the Maltese economy with their share increasing year after year. In fact, in 2017 around 97.25% were micro firms employing less than 10 persons each. Around 2.64% were small and medium enterprises while the largest firms in Malta accounted for only 0.11%.

Large firms operate predominantly within the public administration and support services activities (17%), which is followed by manufacturing and health and social work activities. On the other hand, SMEs are mainly found in the wholesale and retail sector (18%) which is followed by the financial and insurance sector.

[13] https://nso.gov.mt/metadata/classifications/Enterprise%20Size.pdf

Figure 2.18 shows the overall distribution of Maltese firms by sector. The majority of firms in Malta (18%) operate within the Wholesale and retail sector. This is followed by the financial insurance activities represented by sector K at 16% and the professional, scientific and technical activities which account for around 12% of Maltese firms. The overall distribution of Maltese firms across sectors follows that of the micro firms confirming their dominant economic activity.

Figure 2.18: Distribution of Maltese Firms by Sector



A: Agriculture, forestry and fishing;
B: Mining and quarrying;
C: Manufacturing;
D: Electricity, gas, steam and air conditioning supply;
E: Water supply, sewerage, waste management and remediation activities;
F: Construction;

G: Wholesale and retail trade; repair of motor vehicles and motorcycles;
H: Transportation and storage;
I: Accommodation and food service activities;
J: Information and communication;
K: Financial and insurance activities,
L: Real estate activities;
M: Professional, scientific and technical activities,
N: Administrative and support service activities,
O: Public administration and defence; compulsory social security;
P: Education;
Q: Human health and social work activities,
R: Arts, entertainment and recreation,
S: Other service activities
(Source: NSO News2018_068)

2.3 Contribution and Interdependence of Industries

The purpose of this section is to shed light on prevailing sector interlinkages. In fulfilling this purpose, this section relies heavily on information from supply and use and input-output tables. A quantitative comparative approach is adopted to compare and analyse trends and developments across sectors. In particular, it aims to quantify the relationship between key categories of sectors and to which extent this relates to productivity and growth in these industries, the latter of which will be the subject of *Section 2.4* in this chapter.

2.3.1 The inter-relatedness between sectors

The interconnectedness between sectors within an economy is considered to exacerbate the impact of positive and negative shocks. This implies that the positive growth of one sector propagates itself in other sectors. Similarly, the higher the sectoral interconnectedness, the higher the impact of an adverse sector-specific shock on the rest of the economy. These sectoral interlinkages are best captured through an analysis of the supply and use tables which provide a detailed picture of the supply of goods and services by domestic production and imports and the use of goods and services for intermediate consumption and final use. To this end, this sub-section puts forward key observations from an analysis of the supply and use tables for Malta which were published in 2016.

The Financial and Insurance Activities, the Production and the Arts, Entertainment and Recreation sectors make the highest use of intermediate goods and services.

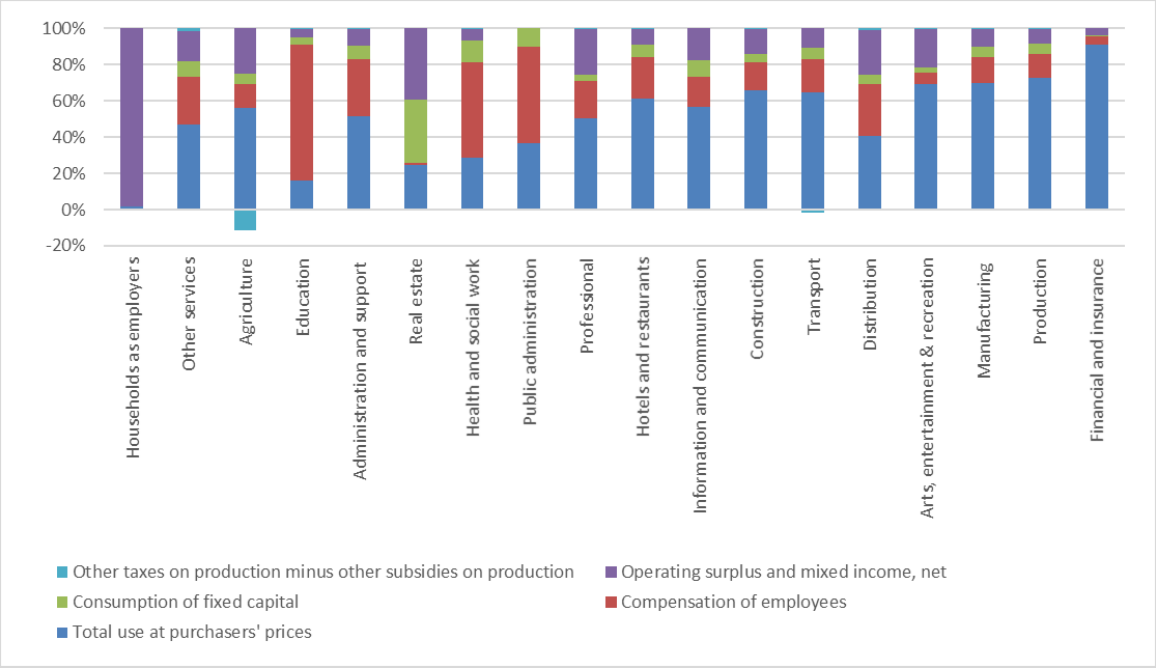


Figure 2.19 portrays the composition of inputs used by different economic sectors. The sectors are presented in an order reflecting their output size, such that the Households as Employers sector is associated with the smallest level of output whereas the Financial and Insurance sector is the largest sector in terms of output.

Figure 2.19: Input structure of each sector

(Source: NSO 2016)

Based on a consideration of the total use of goods and services at purchasers' prices[14], the Figure indicates that around 91% of the total output produced by the Financial and Insurance activities sector consists of goods and services purchased from other industries (as indicated by the darker blue shading in the last column in

[14] The purchasers' price is the price the purchaser actually pays for the product including any taxes less subsidies on products but excluding deductible taxes like deductible VAT (Source: NSO, 2016).

Figure 2.19).

While this represents a significant use of intermediate goods and services, it is to be noted that this use is concentrated in three main sectors, namely in the Financial and Insurance sector itself (48%), the Administration and Support sector (25%) and the Professional, Scientific and Technical Activities (23%). Other sectors which record a relatively high share of intermediate use of goods and services are the Production sector (including Manufacturing) (73%) and the Arts, Entertainment and Recreation (69%). Against this background, it can be observed that the largest sectors in terms of output are also those sectors which make the highest use of intermediate goods and services.

The use of intermediate goods and services by the Production sector is in its major part (85%) concentrated within the sector itself. Conversely, the Arts, Entertainment and Recreation sector consumers goods and services from a broader range of industries, with the key ones being the Professional, Scientific and Technical Activities sector (54%) and the Information and Communication sector (17%). This implies that more sectors are interdependent on and influenced by the Arts, Entertainment and Recreation sector (which includes Gaming and Gambling activities) compared to the Financial and Insurance and the Production sectors.

The Education, Public Administration and Health and Social Work sectors are more labour-intensive…

Apart from the direct materials or services from other sectors, there are other inputs which are used in the production of goods and provision of services. As indicated in

Figure 2.19, the input structure of the Education, Public Administration and Health and Social Work sectors appears to be more concentrated in the labour input. In fact, the compensation to employees represents 75%, 54% and 53% of the total output of each respective sector.

…while the capital-intensive industries are identified to be the Real Estate, the Health and Social Work and the Public Administration sectors.

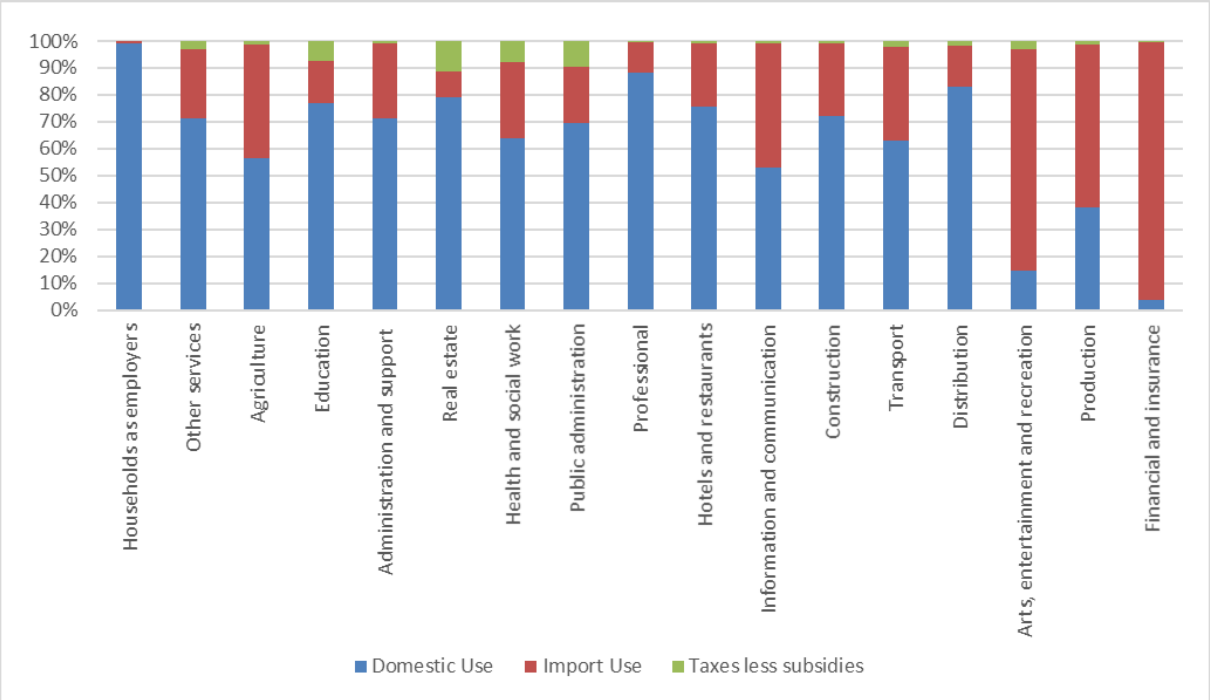
As indicated by the green-shaded bars in

Figure 2.19, the consumption of fixed capital represents around 35% of the total output of the Real Estate sector. Other sectors which also record a relatively high share of consumption of fixed capital are the Health and Social Work sector (12%) and the Public Administration sector (10%).

Although the Financial and Insurance Activities is the sector associated with the highest share of intermediate consumption of total output, it is to be noted that around 95% of the intermediate consumption consists of imported goods and services.

Figure 2.20 illustrates the composition of total intermediate consumption by each economic sector. The sectors are again ordered on the basis of their output size, with the smallest sector being the Households as Employers sector.

The Figure on the page overleaf indicates that the largest sectors (in terms of output) are the sectors



associated with the highest import intensity (as shown by the red shading in Figure 2.20). This implies that the linkages of these sectors with the local industry is limited. The Arts, Entertainment and Recreation sector is estimated to import around 82% of its total intermediate consumption whereas the Production sector is associated with an import intensity of 61%. Figure 2.20: Intermediate Consumption in terms of Domestic and Import Use (Source: NSO 2016)

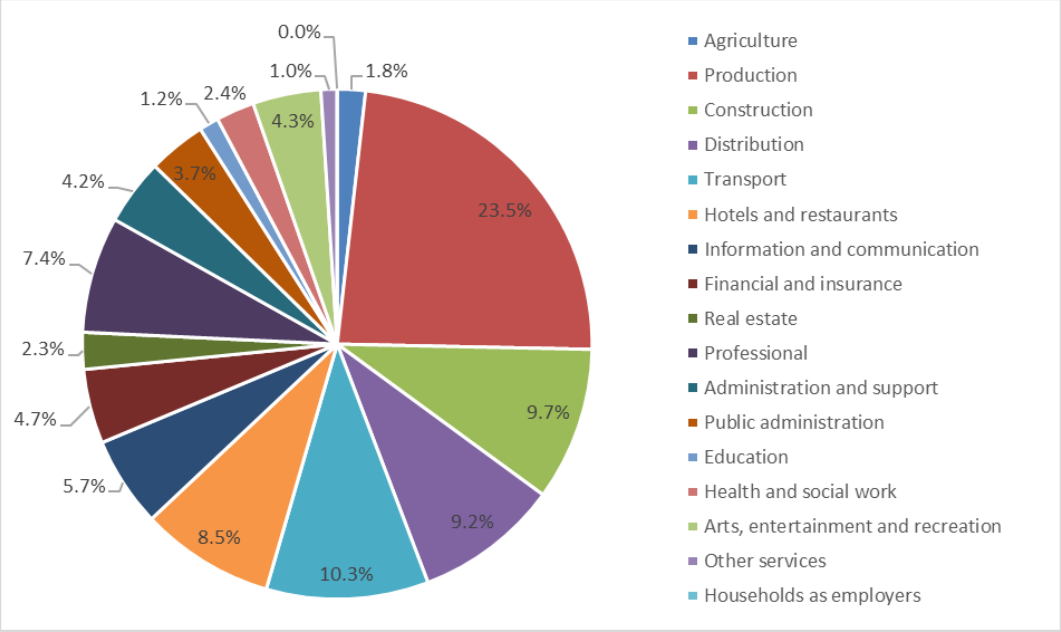
As a share of their own total intermediate consumption, the Households as Employers and the Professional, Scientific and Technical Activities sectors make the highest use of intermediate goods and services produced by the local industry.

The blue shading in Figure 2.20 represents the share of intermediate goods and services which are purchased from the local industry. The domestic use of intermediate goods and services by the Households as Employers and the Professional sectors is estimated to stand at 99% and 88% respectively. Other sectors which are associated with a relatively high share of locally produced goods and services are the Distribution (83%), the Real Estate (79%) and the Education (77%) sectors.

When taking into account the relative size of the sectors, it is observed that almost one quarter (23.5%) of the total domestic intermediate consumption stems from the Production sector.

This indicates that while the Households as Employers and the Professional sectors have most of their intermediate consumption concentrated in domestically produced goods and services, their consumption represents a relatively small share of the total intermediate consumption. Indeed, as depicted in Figure 2.21 on the page overleaf, the consumption of Households as employers represents around 0.01% of the total intermediate consumption while that of the Professional sector represents around 7.4%.

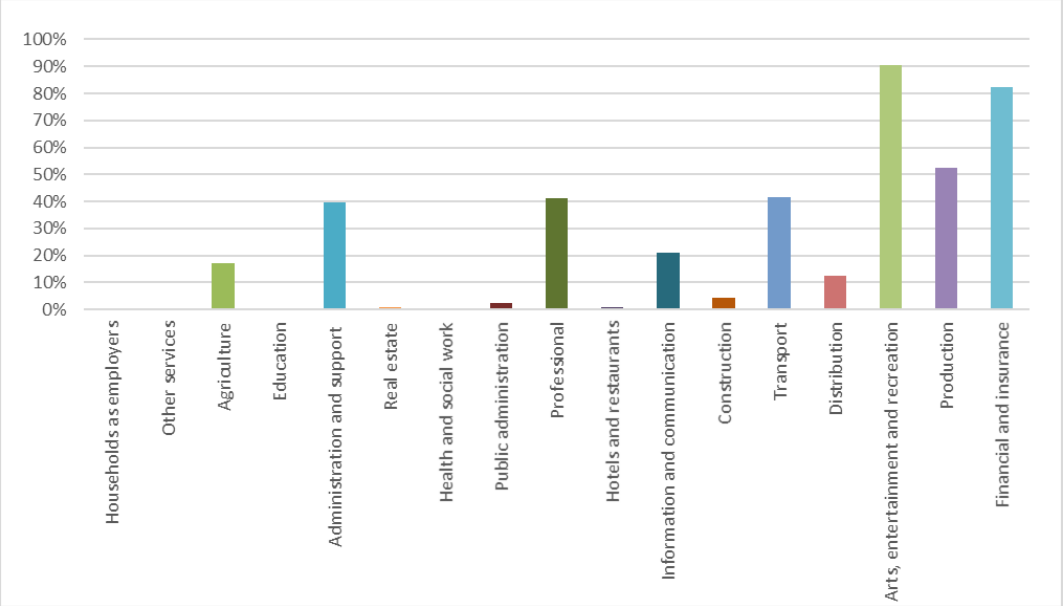
Figure 2.21: Composition of Domestic Intermediate Consumption



(Source: NSO 2016)

The highest exporting sectors are identified to be the largest sectors, that is the Arts, Entertainment and Recreation sector, the Financial and Insurance sector and the Production sector. Indeed, the Arts, Entertainment and Recreation sector is estimated to export around 90% of its total output whereas the Financial and Insurance sector exports around 82% of its total output, valued at basic prices.

Figure 2.22: Export to Output Ratio by sector



Source: Author's estimates based on data from NSO (2016)

2.4 Hypothetical Extraction Analysis (HEA)

In order to better understand the importance of different sectors, this section discusses the estimates of lost Gross Value Added (GVA), total labour income and total employment upon hypothetically extracting different sectors from the economy. This analysis is based on the Strassert (1968) Hypothetical Extraction Method which has been applied to the Maltese Economy by the Central Bank of Malta[15]. This approach assesses the relative importance of the sector taking into account both its linkages with the rest of the economy as well as its relative size. It involves the use of the input-output tables and is also known as the complete shutdown method. The analysis is based on three symmetric input-output tables, covering the time period from 2000 to 2010, thereby allowing for an assessment of the extent of change in the structure of the Maltese economy.

[15] Cassar (2017), Assessing Structural Change in the Maltese Economy via the Application of a Hypothetical Extraction Analysis.

This approach assumes that hypothetically, a sector j is extracted from the economic system, implying that it ceases to sell and purchase products or inputs from other sectors. This is assimilated by extracting the following elements:

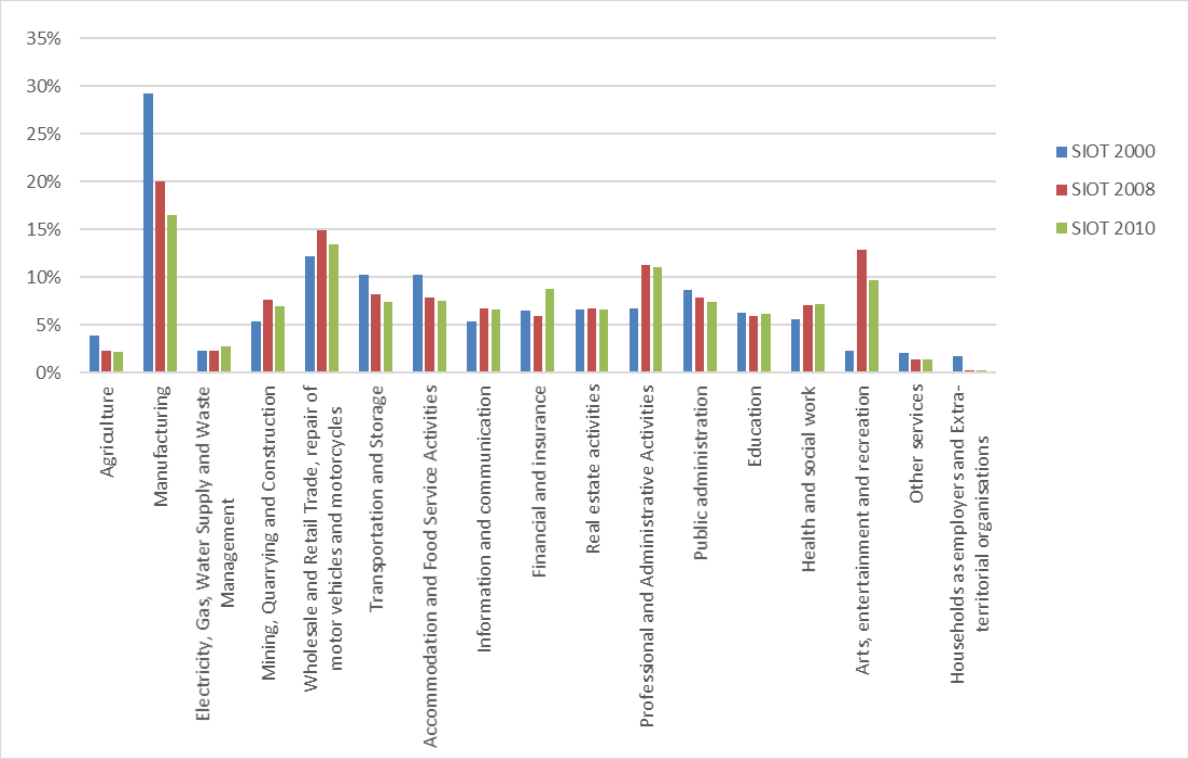
- the column of sector j's intermediary input purchases
- the row of sector j's intermediary input sales
- sector j's final demand sales

The input-output model is then run so as to estimate the effect on the other sectors of the economy caused by this hypothetical extraction. The total change in output across all sectors would reflect the extraction effect, the magnitude of which depends on the underlying inter-industry relations, the size of sector j itself as well as the size of the value-added/labour income/employment ratios for the sector and its supplying industries.

Figure 2.23 presents the results obtained from the Strassert (1968) Hypothetical Extraction Method in terms of the percentage loss in value added. The results are presented for the years 2000, 2008 and 2010. The key observations stemming from these results are as follows:

- The Manufacturing sector generates the highest loss in value added over the entire time period. Nevertheless, its relative importance in the Maltese economy appears to be on the decline, such that its extraction from the economy gave rise to a loss of 29.2% in GVA in 2000, to 20.0% in 2008 and to 16.6% in 2010.
- The Wholesale and Retail sector, repair of motor vehicles and motorcycles sector is another sector which is associated with a relatively high extraction effect in each of the years considered in the analysis. Its extraction from the economy is estimated to lead to a loss of around 13.4% of the total GVA, based on the SIOT for 2010.

Figure 2.23: Percentage Loss in Total Gross Value Added resulting from the Hypothetical Extraction of each sector



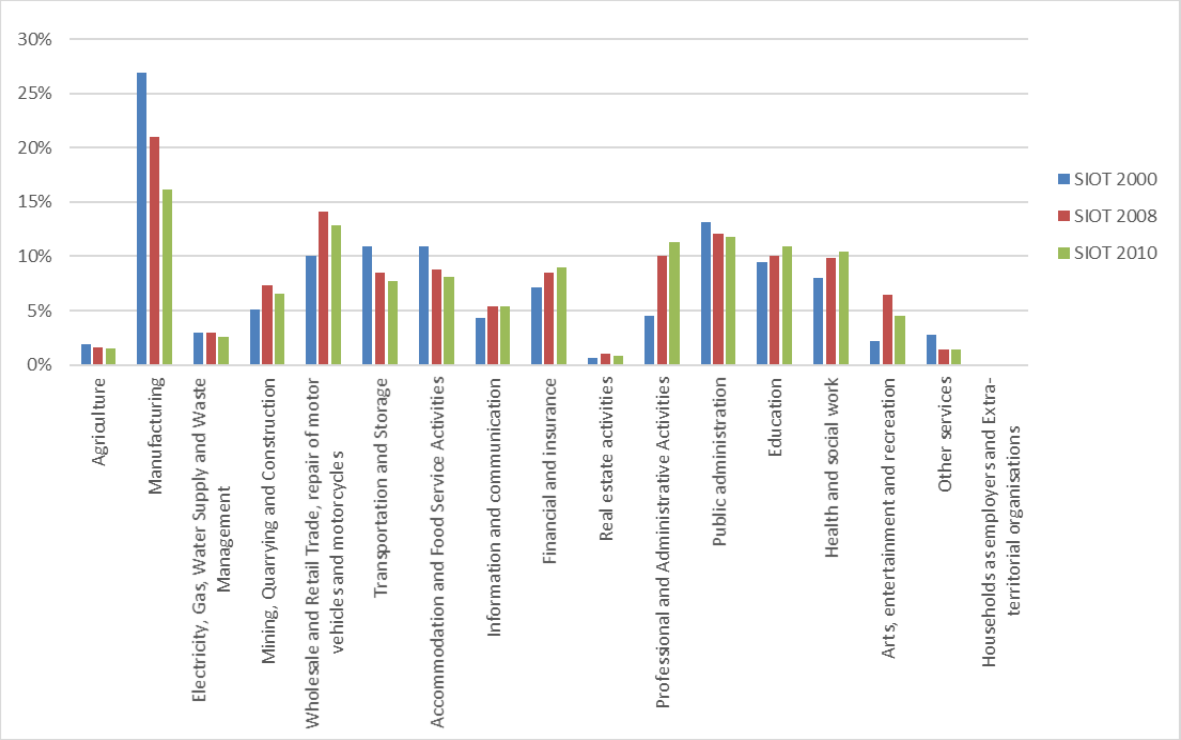
(Source: Cassar 2017)

- The Arts, Entertainment and Recreation sector and the Professional, Scientific and Technical Activities and the Administrative and Support Activities sector have recorded a notable increase in the extraction effect from 2000 to 2010. Indeed, the Arts, Entertainment and Recreation sector registered an increase in the percentage loss in Value Added equal to 7.4 percentage points whereas the Professional and Administration sector recorded an increase of 4.3 percentage points.
- Other sectors whose importance to the Maltese economy appears to have increased are Electricity, Gas, Water Supply and Waste Management sector, Mining, Quarrying and Construction sector, Information and Communication sector, Financial and Insurance sector and the Health and Social Work sector.
- Conversely, sectors such as the Transportation and Storage sector, the Accommodation and Food Service Activities sector and the Agriculture sector are considered have recorded a decline in their extraction effects.

The impact of extracting a sector from the Maltese economic system is also estimated in terms of the percentage loss in total labour income and total employment. These results are depicted in Figure *2.24* and Figure 2.25 below. The key findings from this analysis are as follows:

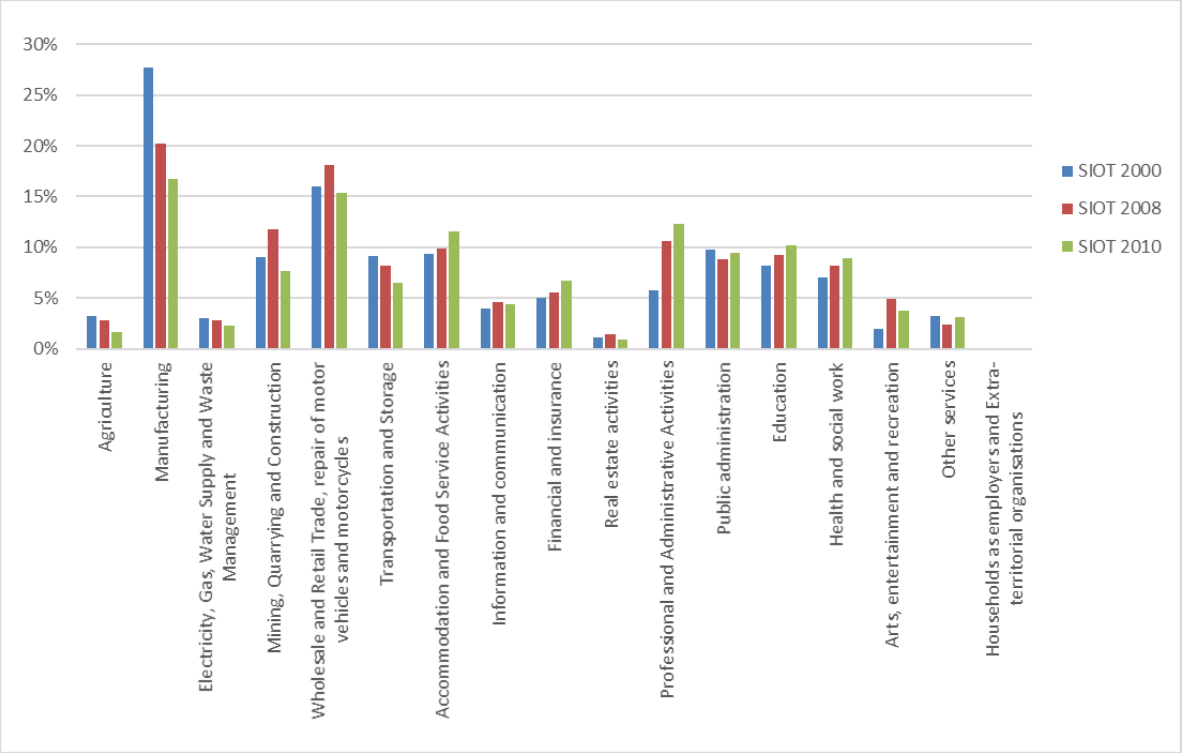
- The extraction effect of the Manufacturing sector, both in terms of labour income and employment, remains the highest across all time periods. Nonetheless, the significance of this sector to the structure of the Maltese economy appears to be in decline.
- If the Wholesale and Retail, repair of motor vehicles and motorcycles is hypothetically extracted from the economic system, the percentage loss in total labour income is estimated at 10.1% in 2000, increasing to 12.8% in 2010. As for the percentage loss in employment, this is estimated at 16% in 2000, which increased to 18.1% in 2008 and then declined to 15.4% in 2010. On the basis of these results, this sector records one of the highest extraction effects compared to other sectors.
- The highest increase in the percentage loss in total labour income and employment from 2000 to 2010 is recorded by the Professional and Administrative activities sector. The extraction effect in terms of labour income increased from 4.5% in 2000 to 11.3% in 2010 whereas the effect in terms of employment rose from 5.8% to 12.3%.

Figure 2.24: Percentage Loss in Total Labour Income resulting from the Hypothetical Extraction of each sector



Source: Cassar (2017)

Figure 2.25: Percentage Loss in Total Employment resulting from the Hypothetical Extraction of each sector



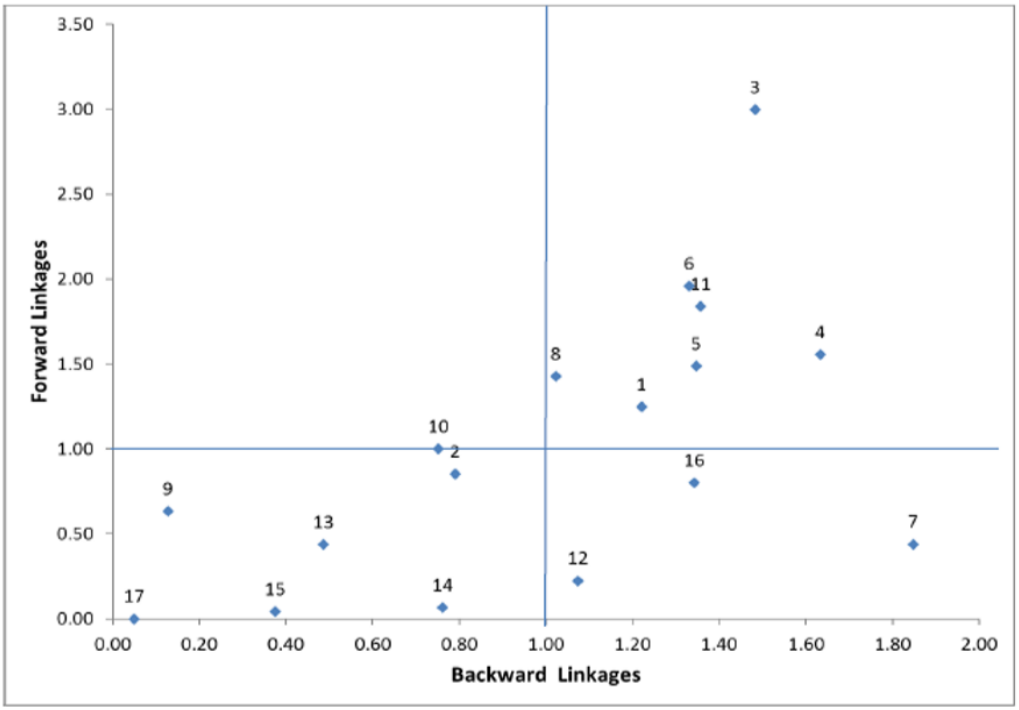
(Source: Cassar 2017)

The analysis put forward by the Cassar (2017) also makes use of a second hypothetical extraction method to infer backward and forward linkages between sectors. This is based on the Dietzenbacher and van der Linden non-complete hypothetical extraction method (1997) whereby the backward linkages are considered to reflect a sector's dependence on the inputs produced within the production system whereas the forward linkages reflect how dependant the sectors within the system are on the output produced by the one sector in consideration.

Against this background, the backward linkages are estimated by hypothetically extracting the inputs on which the sector is dependent upon and assuming that a sector's input requirements are now delivered from outside the system, e.g. imported, in such a way that the overall technical production process remains unaltered. Similarly, the forward linkages are estimated by assuming that the sector in question provides no intermediate deliveries within the system. Therefore, rather than being completely eliminated, the sector in consideration is assumed to deliver all of its output outside the system, e.g. exports and that the sector still continues to receive its input requirements from the other sectors within

the system[16]. Based on the SIOT for 2010, the backward and forward linkages are estimated and presented in Figure 2.26 on the page overleaf.

Figure 2.26: Linkages analysis based on the Non-Complete Hypothetical Extraction Method for the SIOT 2010[17]



(Source: Cassar 2017)

Key Sectors (K) are defined as those sectors which have both the corresponding normalized backward and forward linkage indicator greater than one (top right quadrant). The sectors with only strong backward linkages (B) are inside the bottom right quadrant, the sectors with only strong forward linkages (F) are

[16] Cassar (2017), Assessing Structural Change in the Maltese Economy via the Application of a Hypothetical Extraction Analysis.
[17] Where sectors are numerated as follows: Agriculture (1), Manufacturing (2), Electricity, Gas, Water Supply and Waste Management (3), Mining, Quarrying and Construction (4), Wholesale and Retail Trade, repair of motor vehicles and motorcycles (5), Transportation and Storage (6), Accommodation and Food Service Activities (7), Information and communication (8), Financial and insurance (9), Real estate activities (10), Professional and Administrative Activities (11), Public administration (12), Education (13), Health and Social Work (14), Arts, Entertainment and Recreation (15), Other Services (16), Households as Employers and Extra-Territorial Organisations (17).

inside the top left quadrant and the sectors with weak linkages (L) are inside the bottom left quadrant of each diagram.

The top right quadrant of Figure 2.26 indicates that there are seven key sectors in the economy, with the Electricity, Gas, Water supply and Waste Management sector recording the strongest backward and forward linkages. The other key sectors are identified to be the Mining, Quarrying and Construction sector, the Transportation and Storage sector, the Professional, Scientific and Technical activities and Administrative and support service activities sector, the Wholesale and retail trade & repair of motor vehicles and motorcycles sector, the Information and Communication services sector and the Agriculture, Forestry and Fishing sector. The only sector which is found to be have strong forward linkages is the Real estate activities sector whereas the Accommodation and Food Service activities, Other Services and Public Administration sectors are found to have only strong backward linkages. Six sectors are found to have weak linkages.

2.5 Sectoral Productivity

This section presents an assessment of productivity at the sectoral level[18] by exploring key research questions pertinent to this area of interest, namely:

1. Is employment concentrated in the most productive sectors in Malta?
2. Are productivity and employment growing in the highest productive sectors?
3. Are productivity and employment growing in the largest sectors?
4. Which are the leading and laggard sectors in terms of productivity and employment growth?
5. How do these compare with the same sectors in comparison and target countries?

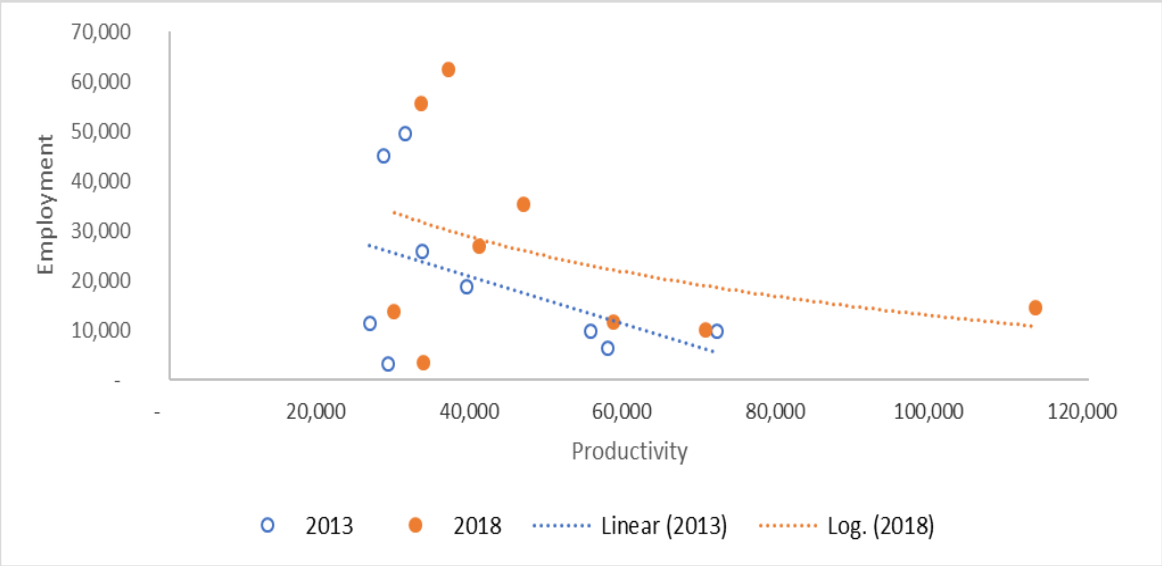
Figure 2.27

Figure 2.19 presents employment and productivity[19] for individual sectors for the periods 2013 and 2018. This analysis is undertaken to determine whether employment is concentrated in the most productive

[18] It is to be noted that the absence of sectoral price deflators renders an in-depth analysis of sectoral productivity particularly challenging at a time when it is being increasingly recognised that economy-wide measures of productivity need to be complemented by sectoral and, if available, firm-level developments (Central Bank quarterly review, 2008:3)
[19] Productivity is defined as Gross Value Added/Total employment.

sectors. The real estate sector is being excluded from the analysis since it skews results due to high rents and a lower employment level. It can be observed that employment is concentrated in low productive sectors which are Public Administration and Wholesale and retail.

Figure 2.27: Employment and Productivity by Sector



(Source: Eurostat 2019) based on National accounts and Labour Force survey

	2013			2018	
	Low Prod	**High Prod**		**Low Prod**	**High Prod**
Low emp	Agriculture, Construction, Professional	Information & Communication, Financial, Gaming	**Low emp**	Agriculture, Construction	Financial, Information & Communication, Gaming
High emp	Manufacturing, Public, Wholesale		**High emp**	Manufacturing, Professional, Public, Wholesale	

Manufacturing refers to Industry (except construction)

For both years, the most productive sector is Gaming and is associated with a relatively low employment level. Furthermore, the trend line has shifted outward from the blue to the orange line over the period under consideration, indicating that both employment and productivity have increased, particularly productivity.

As identified in the above table, the leading sectors in terms of productivity as at 2013 are identified to be Information and Communication, Financial sectors and Gaming. Based on an average employment of 19,929 persons and an average productivity of €40,981 for the Maltese economy in 2013, it is concluded that Information and Communication, Financial and the Gaming sectors have recorded above average

figures in terms of productivity. As for the Manufacturing[20], Public Administration and Wholesale and retail sectors, these are associated with high employment and low productivity. Conversely, laggard sectors included the Agriculture, Construction and Professional sector which appear to have registered low employment as well as productivity.

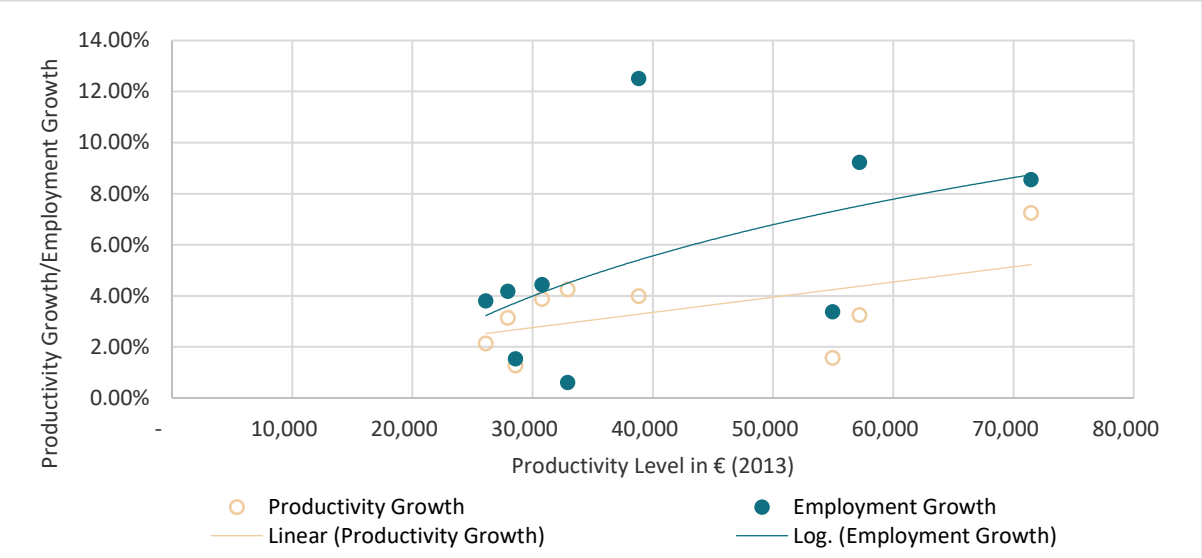
Based on average productivity and employment levels that reached 25,890 persons and €51,001 in 2018 respectively, the leading and laggard sectors both in terms of productivity and employment remain as they were in 2013, except for the Professional sector. This sector is no longer considered to be a laggard sector in employment as the employment level has reached 35,210 persons in 2018 as the Maltese economy is becoming more service oriented. As indicated in the table immediately below the Figure, it is to be noted that Agriculture and Construction remain as laggard sectors. Information and Communication, Financial and Gaming remain leading sectors in terms of productivity whilst the Manufacturing, Wholesale and Retail, Public Administration and Professional sectors have registered high employment levels in 2018.

[20] Throughout this analysis, the Manufacturing sector is reflecting the Industry (except Construction) sector.

Figure 2.28 presents the growth in employment and productivity for individual sectors for the period starting from 2013 to 2018. These growth rates are assessed in the context of the sectors' productivity level in 2013, thereby shedding light on whether employment and productivity have been growing in the most productive sectors.

Figure 2.28: Employment and Productivity Growth by Sector Productivity

(Source: Eurostat 2019)



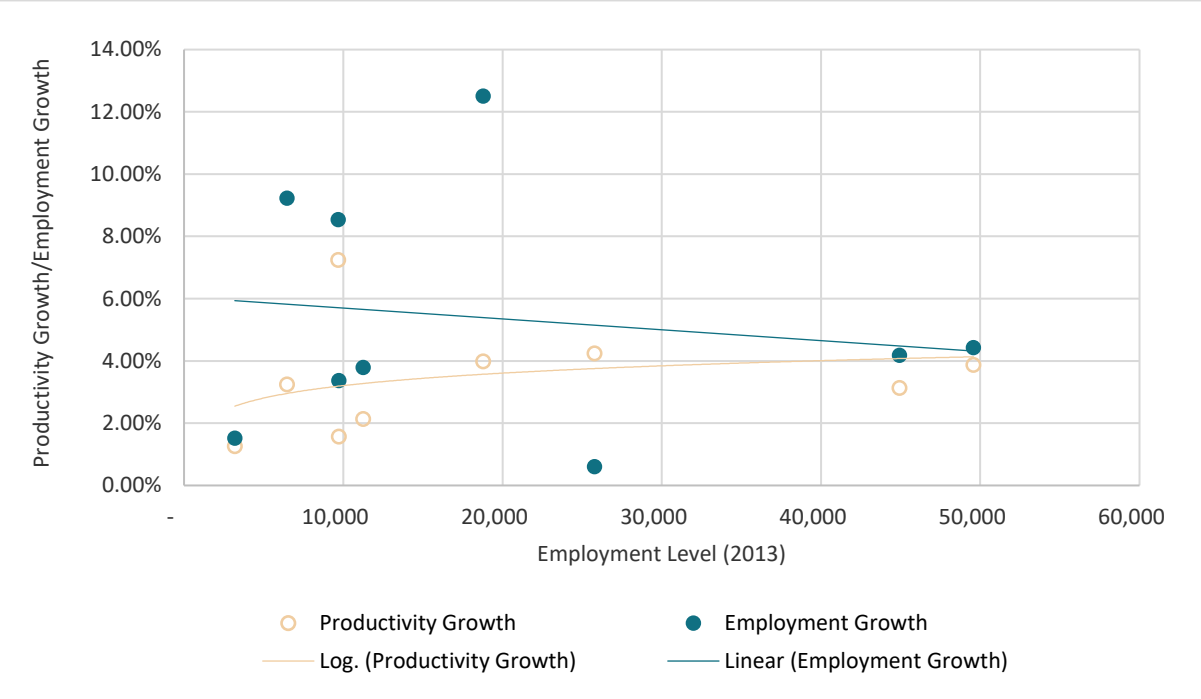
Based on this analysis, it can be observed that the highly productive sectors have tended to grow faster, particularly in terms of employment which is represented by the orange trendline. The leading sectors in terms of productivity as at 2013 are identified to be the Gaming, Information and Communication and Financial sectors. Based on an average employment growth of 5.35% and an average productivity growth of 3.41%, it is concluded that the Gaming sector has recorded above average growth rates in terms of both employment and productivity. Conversely, the Financial sector appears to have registered below average growth rates in terms of employment and productivity. As for the Information and Communication sector, this has recorded an employment growth which is above the economy average whilst the productivity growth rate which is below the average.

	Low Productivity	**High Productivity**		**Low Productivity**	**High Productivity**
Low Employment Growth	Agriculture, Manufacturing, Construction, Wholesale, Public	Financial	**Low Productivity Growth**	Agriculture, Construction, Public	Information & Communication, Financial
High Employment Growth	Professional	Information & Communication, Gaming	**High Productivity Growth**	Manufacturing, Wholesale, Professional	Gaming

Again, based on a consideration of the productivity level as at 2013, the laggard sectors are considered to be Agriculture, Manufacturing, Construction, Wholesale, Professional and Public Administration. Nevertheless, as indicated in the table immediately below the Figure, it is to be duly noted that the

Manufacturing, Wholesale and Professional sectors have registered above average growth rates in terms of productivity. Furthermore, the Professional sector is also identified as a sector which has recorded a high employment growth rate. Policy efforts appear to be mostly required with respect to sectors that are appearing to be inherently less productive, namely the Agriculture, Construction and Public sector. These sectors, together with the Manufacturing and Wholesale sectors, have also registered below average employment growth rates over the period 2013 to 2018. Figure *2.29* carries out a similar assessment to that presented in the previous figure yet considers the employment and productivity growth rates, this time, in the context of the size of each sector as measured by the employment level in 2013. Based on this analysis, one can establish whether employment and productivity are growing in the largest sectors.

Figure 2.29: Employment and Productivity Growth by Sector Size



(Source: Eurostat 2019)

Figure 2.29 indicates that there is some tendency for relatively large sectors (in terms of employment) to record higher productivity growth rates. Indeed, the blue trendline, representing productivity growth, is shown to be getting steeper as the size of

	Low Employment	High Employment		Low Employment	High Employment
Low Employment Growth	Agriculture, Construction, Financial	Manufacturing, Wholesale, Public	**Low Productivity Growth**	Agriculture, Construction, Information & Communication, Financial	Public
High Employment Growth	Information & Communication, Professional, Gaming		**High Productivity Growth**	Professional, Gaming	Manufacturing, Wholesale

the sector increases. Conversely, there appears to be a declining trend in employment growth as the sector gets larger.

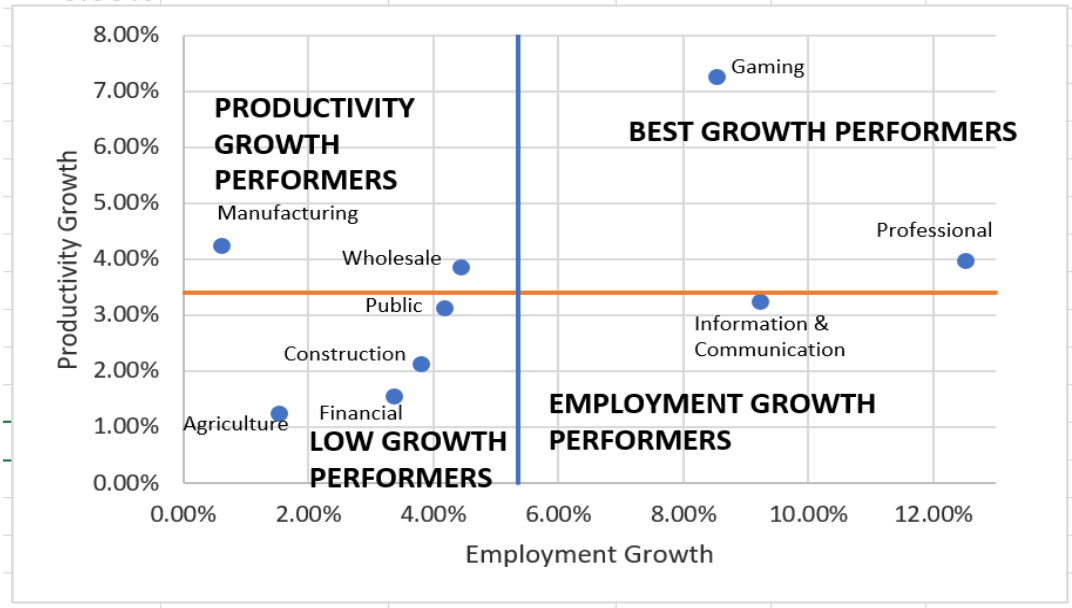
Based on the average employment level of the economy in 2013, the largest sectors in terms of employment are identified to be the Manufacturing, Wholesale and Public sector. Over the period 2013 to 2018, all of these three sectors have recorded below average employment growth rates. In view of an average productivity growth rate across all sectors which stood at 3.41%, the Public sector also appears to be lagging behind in terms of productivity growth. On the contrary, the Manufacturing and Wholesale sector have registered above average productivity growth rates.

The sectors which had a relatively low employment level in 2013 but which are registering above average employment growth are the Professional, Information and Communication and Gaming sectors. The Professional and Gaming sectors are also recording above average productivity growth rates, thereby implying that the productive potential of these sectors is increasing both in terms of quantity (higher number of employees) and quality (more productive employees).

The sectors which appear to have performed less well in terms of employment and productivity growth are the Agriculture, Construction and Financial sectors. Furthermore, it is interesting to note that the Information and Communication sector recorded a productivity growth rate which is marginally below the average productivity growth rate.

Figure 2.30 presents an analysis of productivity growth and employment growth. Sectors are classified in terms of productivity-employment quadrants. The average productivity and employment growth for the Maltese economy in 2018 stood at 3.41% and 5.35%, respectively. As highlighted in the below figure, the top right quadrant depicts Gaming and Professional services as best growth performers since they registered productivity and employment growth that exceeded the economy average figures.

Figure 2.30: Classifying sectors in productivity-employment quadrants

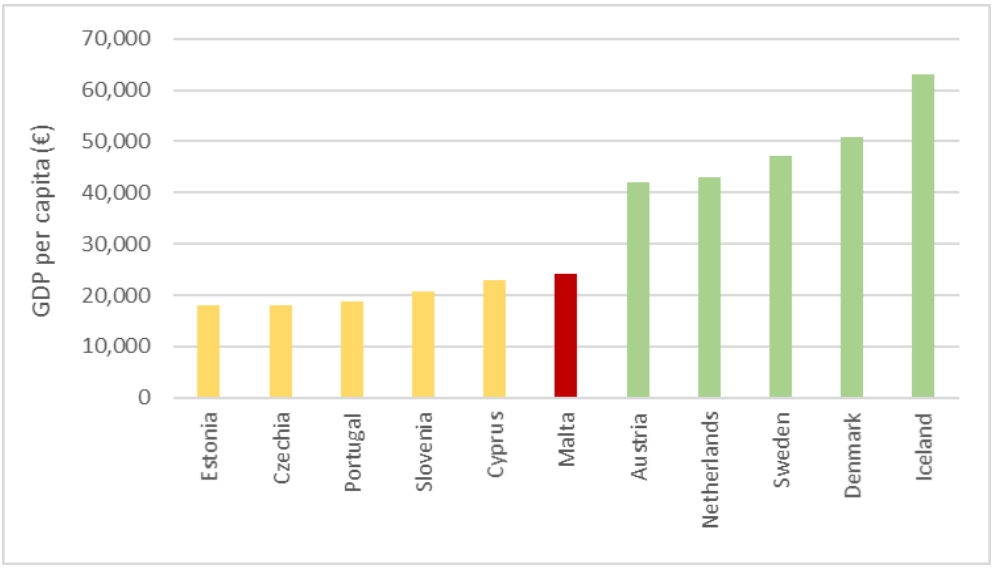


(Source: Eurostat 2019)

On the contrary, Agriculture, Financial Services, Construction and Public Administration are depicted on the bottom left corner indicating that they are low growth performers in terms of productivity and employment since they are less than the economy average. The Manufacturing and Wholesale and Retail sector are depicted on the top, left quadrant and are classified as Productivity growth performers whilst the Information and Communication sector is classified as an employment growth performer and is depicted on the bottom right quadrant.

The analysis presented in the Figure above is considered within the context of the sectors' performance within comparison and target countries. The countries in each group have been identified chiefly on the basis of the GDP per capita, as depicted in Figure *2.31*.

Figure 2.31: Identification of Comparison and Target countries



(Source: Eurostat 2019)

The comparison group is composed of Estonia, Czechia, Portugal, Slovenia and Cyprus. The average productivity growth and employment growth for each sector for all the countries within the comparison group is presented in Figure *2.32*.

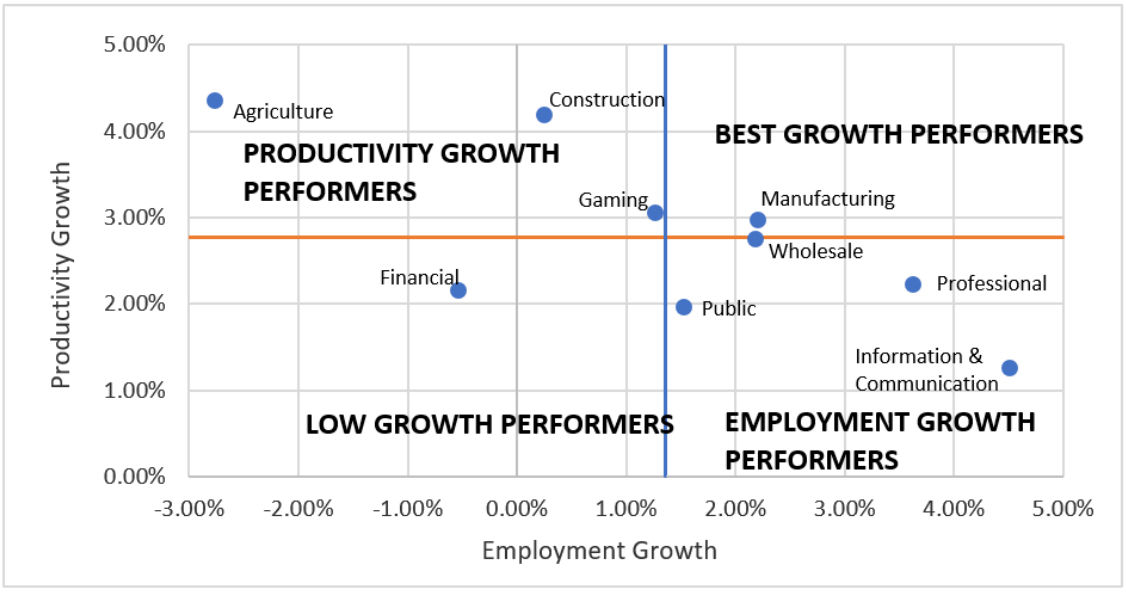


Figure 2.32: Sectors' Performance in Comparison Group

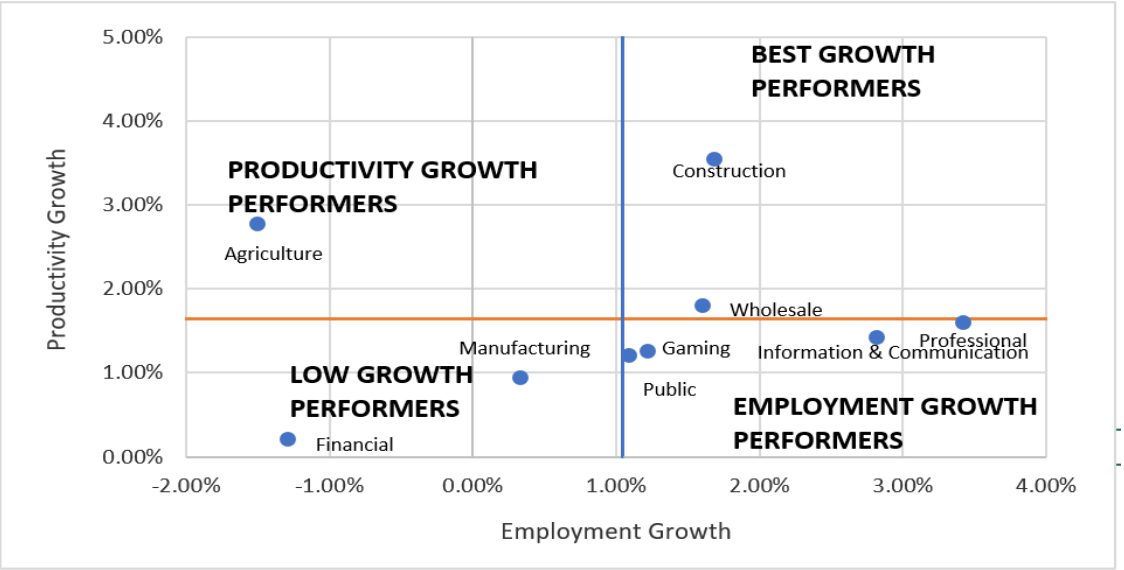
(Source: Eurostat 2019)

The key observations stemming from this analysis are the following:

- The Manufacturing sector is classified as the best growth performer since it is the leading sector both in terms of employment growth and productivity growth. In comparison, this sector is a good performer in terms of productivity growth in Malta but appears to be lagging behind when it comes to employment growth.
- The Gaming sector is a leading sector in terms of productivity growth, together with Agriculture and Construction. Nevertheless, these sectors have been recording below average employment growth rates. Furthermore, while the Gaming sector is identified as a productivity performer within the comparison group of countries, its average productivity growth rate for the period 2013 to 2018 stands at just above 3%, which is well below the 7.25% average productivity growth rate for the same sector in Malta.
- The Professional sector, identified as a best growth performer in Malta, is classified as an employment growth performer within the comparison group. Other employment growth performers are the Public sector, the Information and Communication and the Wholesale sector.
- The only sector which appears to be lagging behind in terms of both employment and productivity growth within the comparison group is the Financial sector. While this is also the case in Malta, the Financial sector in Malta is recording higher average growth rates in employment (3.37%). As for the average growth in productivity (1.57%), this is quite close to that recorded in the comparison group (2.16%).

The same approach was adopted to undertake a comparative analysis between Malta and a target group of countries, namely, Austria, Netherlands, Sweden, Denmark and Iceland. Figure *2.33* illustrates the average productivity and employment growth for each sector in the target group of countries.

Figure 2.33: Sectors' Performance in Target Group



(Source: Eurostat 2019)

The key findings from this analysis are the following:

- The Construction and Wholesale sectors are classified as the best growth performers. In contrast, the construction sector is classified as a low performer in Malta. As for the Wholesale sector, in Malta this is classified as a productivity performer, implying that it is recording above economy average productivity growth rates. Nonetheless, from Figure 2.30, it can be observed that the employment growth rate of this sector in Malta is only slightly below the economy average employment growth rate. Therefore, the performance of the Wholesale sector in Malta is almost in line with that observed in the target group of countries.
- The Professional sector is borderline between the quadrant of best growth performers and employment growth performers.
- The Gaming sector is a leading sector in terms of employment growth, together with the Professional, Public Administration and Information and Communication. As for the Gaming sector, this is identified as a best performer in Malta, recording employment and productivity growth rates which are higher than those recorded for the same sector in the target group of countries. In the case of Public Administration, this sector is considered to be a low growth performer on the two fronts in Malta. The situation is marginally better for the target group since it just surpassed the average employment growth to be classified as an employment growth performer. In the case of Information and Communication, its performance is very close to what has been observed for Malta.
- The Agriculture sector is classified as a productivity growth performers. In contrast, the Agriculture sector is identified as a low performer in Malta.
- The sectors which are clearly distinguished as low growth performers within the target group are the Financial and Manufacturing sector. The Manufacturing sector in Malta is performing better than the target group in terms of productivity growth rates whilst the Financial sector in Malta is also a low growth performer.

Table 2.2 recapitulates the discussion above by presenting the performance of each sector in Malta, in the comparison group of countries and the target group of countries.

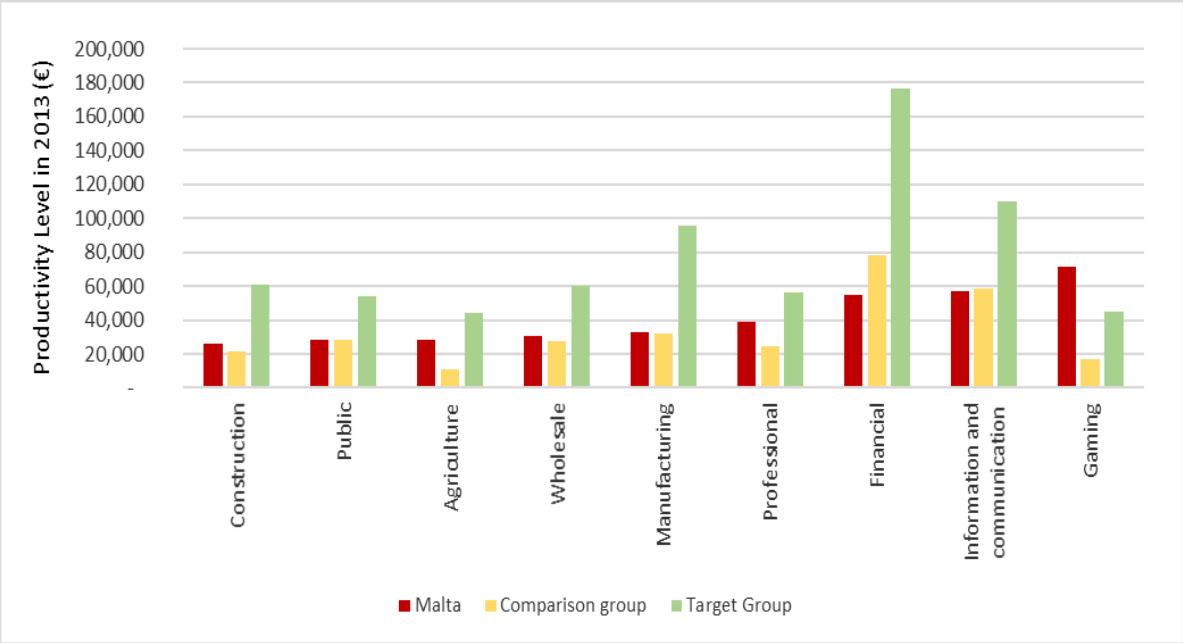
Table 2.2: Sectors' Growth Performance in Malta, Comparison countries and Target Countries

	Malta	Comparison Group	Target Group
Low Performers	Agriculture, Financial, Constructon, Public	Financial	Financial, Manufacturing
Employment Performers	Information & Communciaton	Public, Professional, Information & Communication & Wholesale	Gaming, Public, Information & Communciation & Public Administration
Productivity Performers	Maufacturing, Wholesale	Agriculture, Construction, Gaming	Agriculture
Best Performers	Gaming, Professional	Manufacturing	Construction & Wholesale

Furthermore, in order to better picture the performance of Malta vis-à-vis the comparison group and the target group, the following Figure presents an analysis of the productivity level in 2013 in Malta by sector for the comparison group of countries and the target group of countries.

As highlighted in the Figure and the table immediately following Figure 2.34, Malta performs better than the comparison group in Construction, Agriculture, Wholesale and retail and Manufacturing. Malta exceeds the target countries in the Gaming sector. On the contrary, Malta's performance needs to improve in Public Administration, Financial and Information and Communication since Malta fares worse than the comparison countries in these sectors. Malta also fares worse than the target countries in all sectors except for gaming.

Figure 2.34: Productivity by sector in Malta, Comparison and Target



Based on this analysis, it can be concluded that Malta must aim to increase productivity across all sectors aiming towards achievements obtained by target countries and surpassing comparison countries. This can be done by delving into new areas of economic activities whilst restricting the traditional sectors. In the case of the Gaming sector, diversification is very important since this presents an important opportunity for Malta to reap the benefits from the high productivity reaped from this sector by delving into new areas of activity such as videogaming and blockchain activities.

	Comparison Group	Target Group
Malta - more than	Construction, Agriculture, Wholesale, Manufacturing, Professional, Gaming	Gaming
Malta - less than	Public, Financial, Information & Communication	All sectors except for Gaming

2.6 Sectoral Resilience to Business Cycle Fluctuations

This section explores the impact of business cycle fluctuations on the performance of the sectors considered in this study. The objective of this section is to assess whether a drop in international or in domestic demand would be likely to impact on individual sectors and on the economy as a whole. The impact is studied in terms of the Gross Value Added (GVA).

The business cycle fluctuations are reflected by three key variables, namely:

- the growth rate in consumption, investment and government expenditure (domestic demand)
- the growth rate in the exports of goods (foreign demand)
- the growth rate in the exports of services (foreign demand)

In order to establish the average impact of changes in the business cycle on the different sectors, the growth rate in each sector's GVA was regressed against the above three variables. Data on each of these variables was sourced from the latest available National Accounts available on Eurostat. The annual growth rate for every variable is worked out using quarterly data. Furthermore, each of the explanatory variables was tested up to four lags. Hence, the following regression model, (referred to as the full regression), was developed:

$$\boldsymbol{y_{it} = a_0 + a_1 d_{t-1} + a_2 d_{t-2} + a_3 d_{t-3} + a_4 d_{t-4} + a_5 x^{g,s}_{t-1} + a_6 x^{g,s}_{t-2} + a_7 x^{g,s}_{t-3} + a_8 x^{g,s}_{t-4}}$$

where:

- *y* is the growth rate in each sector's Gross Value Added (GVA)
- *d* is the growth rate in domestic demand
- *x* is the growth rate in foreign demand (x^g: exports of goods and x^s: exports of services)
- *i* is the subscript representing each sector
- *t* is the subscript representing each time period
- $a_0, a_1, a_2, a_3, a_4, a_5, a_6, a_7$ and a_8 are the coefficients to be found through regression analysis

The full regression model was revised so as to consider only those variables which are deemed to be most relevant on the basis of economic judgement and statistical significance as indicated by the t-test statistic. In the case of low and insignificant coefficients, the growth rate in GVA does not depend on the business cycle. On the contrary strong and significant coefficients indicate that the growth rate in GVA depends on the business cycle.

The impact of changes in foreign demand is studied by considering the growth rate in the exports of services for service-oriented sectors and the growth rate in the exports of goods for the rest of the sectors.

In cases where the aggregation of the sector considered in this study implies that the sector is impacted by both the exports of goods and services, both these variables are regressed against the sectoral growth in GVA. Hence, the revised model is as follows:

$$y_{it} = a_0 + a_1 d_{t-x} + a_2 x_{t-x}^{g,s}$$

Using this approach, the objective of this section is to determine:

- whether the sector in question is impacted by fluctuations in the business cycle
- whether the sector appears to be mostly driven by domestic or foreign demand
- the magnitude of impact on the sector's GVA of changes in domestic and foreign demand

Based on the above methodological approach, the results for the total economy are as follows:

$$y_{it} = 0.06 + 0.21 d_{t-1} + 0.04 x_{t-1}^{s}$$

t-test		5.20	2.27	0.33
r^2	0.14			

The above results imply that, keeping everything else constant:

- a 1% increase in the growth rate of domestic demand in the previous time period increases the growth rate of the economy's GVA by 0.21% and
- a 1% increase in the growth rate of the exports of services in the previous time period increases the growth rate of the economy's GVA by 0.04%.

These results indicate that the Maltese economy appears to be more sensitive to changes in domestic demand. Indeed, the domestic demand variable is estimated to have a statistically significant impact on the economy's GVA growth. Conversely, the impact of foreign demand is considered to be rather weak on the basis of a statistically insignificant result. When testing the full regression, it could be concluded that the economy is more service-oriented since the exports of services was estimated to have a statistically significant impact whereas the impact of exports of goods was deemed to be incoherent (negative result) and statistically insignificant.

The results for each one of the nine sectors under consideration are as follows:

Agriculture

$$y_{it} = 0.01 + 1.13d_{t-2}$$

t-test	0.19	2.31	r^2	0.12

The above results imply that, keeping everything else constant:

- a 1% increase in the growth rate of domestic demand at time period *t-2* increases the growth rate of the agricultural sector's GVA by 1.13%

These results indicate that the Agriculture sector is influenced by changes in domestic demand. Indeed, the domestic demand variable is estimated to have a statistically significant impact on the GVA growth of the Agriculture sector. The impact of foreign demand is excluded on the basis of a statistically insignificant result when testing the full regression. In fact, it could be concluded that the agricultural sector is more domestically driven since the exports of goods were estimated to have a statistically insignificant impact whereas the impact of domestic demand was deemed to be statistically significant. Thus, negative shocks to domestic demand are expected to negatively impact the growth of this sector.

Manufacturing

$$y_{it} = 0.02 + 0.13x^{g}_{t-1}$$

t-test	1.34	1.96	
r^2	0.09		

The above results imply that, keeping everything else constant:

- a 1% increase in the growth rate of exports of goods in the previous time period increases the growth rate of the manufacturing sector's GVA by 0.13%.

These results indicate that the Manufacturing sector appears to be sensitive to changes in foreign demand, in particular exports of goods. Indeed, the exports of goods variable is estimated to have a statistically significant impact on the GVA growth of the Manufacturing sector. It is worth noting that the impact of domestic demand is excluded on the basis of a statistically insignificant result when testing the full regression. Thus, negative shocks to the foreign demand for goods are expected to negatively impact the growth of this sector.

Construction

$$y_{it} = 0.04 + 0.14d_{t-1}$$

t-test	3.30	0.95

r^2 0.02

The above results imply that, keeping everything else constant:

- a 1% increase in the growth rate of domestic demand in the previous time period increases the growth rate of the construction sector's GVA by 0.14%

These results indicate that the effect of domestic demand on the Construction sector is weak since the result is not significant. It is worth noting that the impact of foreign demand is excluded, on the basis of a statistically insignificant result when testing the full regression. Thus, these results imply that shocks to domestic demand are expected to have a weak effect on the growth of this sector.

Wholesale, transport, accommodation and food

$$y_{it} = \mathbf{0.04} + \mathbf{0.24}d_{t-1} + \mathbf{0.10}x^{g}_{t-1} + \mathbf{0.14}x^{s}_{t-1}$$

t-test 2.43 1.77 2.04 0.90

r^2 0.21

The above results imply that, keeping everything else constant:

- a 1% increase in the growth rate of domestic demand in the previous time period increases the growth rate of the wholesale sector's GVA by 0.24% and
- a 1% increase in the growth rate of exports of goods in the previous time period increases the growth rate of the wholesale sector's GVA by 0.10% and
- a 1% increase in the growth rate of exports of services in the previous time period increases the growth rate of the wholesale sector's GVA by 0.14%

These results indicate that the Wholesale, transport, accommodation and food sector appears to be mostly driven by foreign demand, in particular exports of goods, but also has ties with the domestic sector. Indeed, the exports of goods variable is estimated to have a statistically significant impact on the GVA growth of this sector. Based on the above results, the growth rate of this sector is considered to be impacted by shocks to the foreign demand for goods.

Information and Communication

$$y_{it} = \mathbf{0.05} + \mathbf{0.13}d_{t-4} + \mathbf{0.50}x^{s}_{t-1}$$

t-test 1.82 0.63 2.23

r^2 0.13

The above results imply that, keeping everything else constant:

- a 1% increase in the growth rate of domestic demand in the time period *t-4* increases the growth rate of the ICT sector's GVA by 0.13% and
- a 1% increase in the growth rate of exports of services in the previous time period increases the growth rate of the ICT sector's GVA by 0.5%

The Information and Communication sector appears to be service-oriented and is driven by foreign demand. Indeed, the exports of services variable is estimated to have a statistically significant impact on the GVA growth of the Information and Communication sector. As for the domestic demand variable, this is estimated to have a statistically insignificant impact on the GVA growth. Against this background, the sector is considered to be mostly foreign driven with shocks to the foreign demand for services having a statistically significant impact on the growth of this sector.

Financial and Insurance

$$\boldsymbol{y_{it} = 0.05 + 0.17 x^{s}_{t-4}}$$

t-test 1.85 0.96

r^2 0.02

The above results imply that, keeping everything else constant:

- a 1% increase in the growth rate of exports of services in the time period *t-4* increases the growth rate of the financial and insurance sector's GVA by 0.17%

The regression results imply that the Financial and Insurance sector is not impacted by shocks to domestic or foreign demand. Nevertheless, when testing the full regression model, the highest influence on this sector appears to be mostly stemming from the exports of services. The domestic demand variable has been excluded from the regression since it has a statistically insignificant impact on the GVA growth in the full regression. In conclusion, it appears that the financial and insurance sector is not significantly impacted by business cycle fluctuations, both when these arise from changes in domestic demand as well as when they arise from foreign demand volatilities.

Professional and Administrative

$$\boldsymbol{y_{it} = 0.12 + 0.25 x^{s}_{t-1}}$$

t-test 5.92 1.40

r^2 0.05

The above results imply that, keeping everything else constant:

- a 1% increase in the growth rate of exports of services in the previous time period increases the growth rate of the professional and administrative sector's GVA by 0.25%

The Professional and Administrative sector is not driven by either the domestic or the foreign sector. Nevertheless, on the basis of the regression results, the highest impact on the sector appears to be stemming from the foreign demand for services. This impact is however still considered to be statistically insignificant, as shown by the t-test results. The domestic demand variable has been excluded from the regression since it has a statistically insignificant impact on the GVA growth in the full regression. Overall, it can be concluded that the sector is not significantly influenced by shocks in the foreign or domestic sector.

Public Administration

$$\boldsymbol{y_{it} = 0.07 + 0.02 d_{t-1} - 0.04 x^{s}_{t-3}}$$

t-test	14.74	0.59	-1.36
r^2	0.05		

The above results imply that, keeping everything else constant:

- a 1% increase in the growth rate of domestic demand in the previous time period increases the growth rate of the Public Administration sector's GVA by 0.02%
- a 1% increase in the growth rate of exports of services at time period *t-3* decreases the growth rate of the economy's GVA by 0.04%

The key conclusion underpinning this sector is that it is neither dependent on local or foreign demand and is exogenous as expected, since t-test results indicate that both domestic demand and export of services variables are insignificant.

Gaming

$$y_{it} = 0.12 - 0.26\, d_{t-4} + 0.12 x^{s}_{t-1}$$

t-test	2.96	-0.77	0.32
r^2	0.02		

The above results imply that, keeping everything else constant:

- a 1% increase in the growth rate of domestic demand in the time period *t-4* decreases the growth rate of the economy's GVA by 0.26%
- a 1% increase in the growth rate of exports of services at in the previous period increases the growth rate of the economy's GVA by 0.12%

The Gaming sector is exogenous and is neither dependent on local nor on foreign demand, since t-test results indicate that both variables are insignificant. It is to be noted that even when domestic demand is removed, the result becomes even more insignificant.

Concluding Note

This regression analysis seeks to provide an indication of the dependence of each sector on business cycle fluctuations. Overall, the results imply that the sectors are not largely impacted by volatilities in the business cycle. Indeed, the r^2, which is a measure of the extent to which the explanatory variables explain changes in the dependent variable, is estimated to be rather weak. Against this background, the growth of individual sectors could be dependent on factors other than domestic and international demand alone.

The above analysis indicates that the sectors whose growth in GVA is dependent on domestic demand include Agriculture and to a smaller extent the Wholesale, transport, accommodation and food and the Construction sector. Indeed, the Agriculture, Wholesale, Transport and Construction sectors are considered to have the strongest backward and forward linkages with the economy, implying that such sectors are highly dependent on the inputs produced within the production system (backward linkages) and the sectors within the system are also dependent on the output produced by these sectors (forward linkages). The Accommodation sector is considered to have only strong backward linkages with the economy.

Furthermore, as illustrated in Figure 2.21, while the Agricultural sector represents a relatively low share of the total domestic intermediate consumption (1.8%), the Wholesale, Transport and Accommodation sector represents around 28% and the Construction sector represents 9.7% of the total domestic intermediate consumption. This exhibits that these sectors have significant ties with the domestic economy, hence making them relatively more vulnerable to changes in domestic demand.

Sectors that are service oriented and whose growth in GVA is dependent on the foreign sector include the Information and Communication. This could be explained by the fact that this sector is typically a supplier of export-oriented sectors such as the Gaming, Professional and Financial sectors. As a result, a drop in international demand is likely to impact the ICT sector through its dependence on these export-oriented sectors. Other sectors which are considered to be more sensitive to fluctuations in international demand,

in particular the exports of goods, include the Manufacturing sector as well as the Wholesale, transport, accommodation and food sector. This result is to be considered in the light of the relatively high extraction effects associated with these sectors. In this context, the sensitivity of such sectors to international demand fluctuations is deemed to translate into a potentially high impact on the overall Maltese economy, should there be a shock to foreign demand.

The Financial and Insurance, Professional and Administrative, Public Administration and the Gaming sectors result to be exogenous such that the growth in GVA of each respective sector appears to be neither dependent on local nor on foreign demand. Despite the fact that some of these sectors are associated with a high export ratio (in particular the Financial and Insurance sector and the Gaming sector), the key conclusion in this case is that being open does not imply that one is necessarily vulnerable. It could be that such sectors have adequate resilience mechanisms in place or that they have other competitiveness strengths.

In aggregate terms, the Maltese economy appears to be more sensitive to changes in domestic demand. This coincides with the observation that most of the individual sector are considered to have strong (backward and/or forward) linkages with the economy. The impact of foreign demand is considered to be rather weak, potentially indicating that despite being an open economy, Malta has succeeded in building the necessary resilience to counteract shocks stemming from the international sphere.

2.7 Key Conclusions and Policy Recommendations

2.7.1 Key Conclusions

The overall impression from the analysis in this chapter is that the Maltese economy is experiencing robust economic growth along with near full employment, a fiscal surplus and a resilient services sector which keeps growing with the introduction of 'new economy' industries.

From a meso-level perspective, the Hypothetical Extraction Analysis indicates that the extraction of the Manufacturing or the Wholesale and Retail sector would lead to a significant loss in value added, labour

income and employment in the Maltese economy[21]. Furthermore, the Arts, Entertainment and Recreation, the Professional, Scientific and Technical Activities and the Administrative and Support Activities sectors have registered a notable increase in the extraction effect in terms of GVA from 2000 to 2010[22]. In contrast, sectors such as Transportation and Storage, Accommodation and Food Service Activities and Agriculture are estimated to have recorded a decline in their extraction effects[23].

In addition, the analysis in this chapter highlights that there are seven key sectors in the economy which demonstrate the strongest backward and forward linkages. These include the Electricity, Gas, Water supply and Waste Management, the Construction, the Transportation, the Professional and Administrative, the Wholesale and Retail, the ICT and the Agriculture sectors.

While an in-depth analysis of sectoral productivity is difficult due to the absence of sectoral price deflators, this chapter presented a broad assessment of meso-level productivity by tracing developments in the Gross Value Added per employee for each sector. The following key conclusions were drawn:

1. Employment is mostly concentrated in low productive sectors.
2. High productive sectors have tended to grow faster in productivity and employment, in particular, in terms of employment.
3. There appears to be some tendency for relatively large sectors to record higher productivity growth rates. Conversely, there appears to be a declining trend in employment growth as the sector gets larger.
4. The Gaming and Professional sectors are estimated to have registered above economy average growth rates in both productivity and employment, thereby categorised as leading sectors in this regard. In contrast, within the target group of countries, these sectors are only leading sectors in terms of employment growth.
5. Sectors which are considered to be lagging behind in terms of employment and productivity growth are the Agriculture, Construction, Financial and Public sectors. When it comes to the Financial sector, this is also observed in the target group of countries. However, the Construction sector in this case is classified as a leading sector in terms of both productivity and employment growth. The other two sectors are also leading sectors, whereby the Public sector is considered to

[21] This implies that if this sector were to be completely shutdown from the Maltese economy, there would be a significant loss in value added.
[22] This indicates that this sector has become more important.
[23] This implies that the importance of this sector within the Maltese economy has diminished.

have an above economy-average performance in terms of productivity whereas the Agriculture sector is estimated to record above economy-average employment growth.

6. Similar to what is observed in the target group of countries, the ICT sector in Malta is considered to be a leading sector in terms of employment growth.
7. Finally, the Manufacturing and Wholesale sectors are rated as leading productivity growth sectors. When it comes to the Manufacturing sector, this starkly contrasts what is observed in the target group since this sector is rated as a laggard sector in terms of both employment and productivity. As for the Wholesale sector, this is classified as a leading sector in terms of employment and productivity growth within the target group of countries.

The last section of this chapter undertakes a regression analysis with the objective of assessing the degree of dependence of each sector on business cycle fluctuations. Overall, the results imply that the sectors are not largely impacted by volatilities in the business cycle. In aggregate terms, the Maltese economy appears to be more sensitive to changes in domestic demand. The impact of foreign demand is considered to be rather weak, implying that being an open economy does not make a country necessarily vulnerable.

From a sectoral perspective, the sectors whose growth appears to be more dependent on domestic demand include Agriculture and to a smaller extent the Wholesale, transport, accommodation and food and the Construction sector. Service-oriented sectors which are more impacted by international demand include the ICT sector. The Manufacturing and the Wholesale, transport, accommodation and food sectors are also influenced by fluctuations in international demand but given the nature of their sector, these are more impacted by volatilities in the exports of goods than those of services. The Financial and Insurance, Professional and Administrative, Public Administration and the Gaming sectors result to be exogenous such that the growth in GVA of each respective sector appears to be neither dependent on local nor on foreign demand.

2.7.2 Policy Recommendations

Informed by section 2.6.1 above, this part of the report discusses a selection of issues that are deemed to be critical for increasing productivity in relevant areas of the Maltese economy. This discussion leads to several policy recommendations which could boost productivity and hence competitiveness, within both high and low productive sectors. Based on the analysis carried out in this chapter, policy makers can explore the following questions:

- Should policy be in the direction of encouraging sectoral specialisation or strengthening sectoral interlinkages?

Sectoral specialisation can provide a comparative advantage to individual sectors, in that it creates higher opportunities for economies of scale. This implies that specialised skills can lead to higher productivity and competitiveness. Nevertheless, it is to be duly noted that specialisation can also give way to a degree of vulnerability, in that if something happens to a particular sector, the skills in that sector may not be easily transferable to another sector. Sectoral interlinkages can also give rise to a higher exposure to shocks since a negative shock to one sector would spread to other dependent sectors. For instance, the seven sectors which are recorded to have the strongest backward and forward linkages with the Maltese economy, referred to in Section 2.3.3, are likely to be more impacted by shocks experienced by other sectors in the economy. Against this background, it can be concluded that policy should be in the direction of promoting cooperation between sectors. This can be achieved through the creation of clusters which bring together enterprises from different but complementary sectors.

Recommendation 1: Support the creation of clusters that bring together enterprises from different sectors. This should contribute to higher economic resilience since it encourages cooperation and the sharing of knowledge, while still allowing for diversification and specialisation.

- Which are the sectors that need to be most targeted by policy makers?

In view of the observation that employment appears to be mostly concentrated in sectors which have a relatively low productivity level, such as the Public sector, the Manufacturing and Wholesale sector, higher policy efforts are required to boost employment in highly productive sectors. Indeed, the foregoing analysis indicates that the Maltese economy is on the right trajectory since the highly productive sectors, namely the Gaming and ICT sectors, have tended to grow faster in both productivity and employment, but in particular, in terms of employment. Against this background, this trend should be further encouraged by providing the right environment for enterprises in highly productive sectors to continue expanding and diversifying their operations.

Recommendation 2: Set up educational programmes to address the demand for new skills in highly productive sectors.

With respect to sectors which are associated with a high productivity level, such as the Gaming and Financial sector, the provision of effective regulatory environments would enable international activity to take place within a business and worker-friendly environment. Furthermore, the ongoing progress made on strengthening the anti-money laundering framework must be continued.

Recommendation 3: Intensify the efforts directed at strengthening the regulatory framework as well as anti-money laundering with respect to high productivity sectors exposed to international competition.

Low productivity sectors, such as the Wholesale sector which in this analysis also captures the retail, accommodation and food service activities, appear to be encountering difficulties when it comes to

attracting employees, thus recording low employment growth. Against this background, the policy maker is to assess the difficulties within these sectors and come up with the necessary policy measures, in particular those targeting human capital, which is key to productivity in services sectors. For instance, with respect to the tourism sector, the growth of tourism in the Maltese Islands needs to sustain parallel development in the employment field if Malta's overall competitiveness is to be sustained. This implies that consideration should also be given to aspects such as qualifications and continuous personal development to ensure an overall quality experience. Furthermore, the tourism sector should be broadened to include personal services sectors such as wholesale and retail which could bring new value added to the economy whilst bringing about improvements to the quality of product and experience.

Recommendation 4: Support human capital creation and improvement in low productivity services sectors exposed to international competition.

When it comes to sectors which have been identified as relatively low performers, such as the Agriculture and Construction, higher policy efforts are required. In addressing this issue, due regard should be given to sector-specific characteristics and challenges. For instance, the Agricultural sector in Malta faces challenges related to significant land fragmentation and an ageing workforce. Within the Construction sector, trends must continuously be monitored, taking into account the potential impact of new developments. In view of these challenges, policy should be in the direction of addressing excessive specialisation of in silos activity, which could offer limited interlinkages between sectors. For example, the development of the technological sector could be of benefit to such low productivity sectors to improve interlinkages and enhance the service provision.

Recommendation 5: Low productivity sectors should benefit from interlinkages with other sectors with the aid of technology.

On a more general note, further improvements to the foregoing analysis could be achieved by considering the recommendations below:

National Productivity Boards (NPB)

The EU Commission's recommendation on the establishment of National Competitiveness Boards within the Euro area highlights that the role of the boards is to track developments and inform the national debate in the field of productivity and competitiveness. In 2019, Malta's National Productivity Board was set up to contribute to improving national competitiveness and productivity performance.

Recommendation 6: The NPB is to engage with the European Commission, OECD and other international productivity bodies to exchange best practice. Furthermore, it is to continue analysing challenges to productivity and put forward policy measures which could address them.

Productivity Data

The availability of timely data on Malta's productivity performance is vital to inform future policy measures. Further steps are required to provide policymakers with a comprehensive picture of Malta's performance. Analysis of Malta's performance is currently limited by the absence of data on productivity performance at sectoral level.

Recommendation 7: Publish a more disaggregated sectoral productivity data, including at firm level, to assist policymakers in adequately understanding and benchmarking Malta's productivity performance against international competitors and driving informed policy decisions.

CHAPTER 3: THE ROLE OF HUMAN CAPITAL IN THE PRODUCTIVITY AND COMPETITIVENESS OF THE MALTESE ECONOMY

3 HUMAN CAPITAL

Within the context of more knowledge-based economies, the importance of human capital to both the individual and the countries' success is more significant than ever. This is particularly so in a small open economy such as Malta, which is particularly intensive in its availability and use of human capital relative to other physical resources. There are several definitions of human capital, with most of them highlighting the economic return to investing in human capital[24], such as the income earned from labour. Nonetheless, human capital investment delivers many other non-economic benefits such as improved health and greater social cohesion.

Human capital referred to in this chapter is in accordance to the definition put forward by the World Bank whereby it is defined as the "productive capacity embodied in individuals, with special focus on its contribution to economic production".

The overall objective of this chapter is to:

- outline the framework conditions underlying human capital in Malta;
- establish a human capital composite index for Malta;
- review implications on employment, unemployment, labour income and labour cost to identify strengths and weaknesses within the labour market;
- map relationships between human capital and growth;
- assess future developments and outline opportunities and threats which may affect human capital development; and
- put forward policy recommendations.

To this effect, *Section 3.1* provides an analysis of human capital development in Malta and selected countries on the basis of the World Bank Human Capital Index (HCI). This section also provides an overview of demographic developments and educational attainment. This analysis serves as a basis to establish a Human Capital Composite Index, which takes into consideration both volume and quality aspects of human capital. This is followed by a review of labour market developments. *Section 3.2* considers the human capital index compared to economic growth and development for Malta and other countries.

[24] For example, see Schultz (1961) who defines human capital as "acquired skills and knowledge".

Section 3.3 then adopts a forward-looking approach by considering potential future scenarios which may impact human capital development in Malta. This section serves to identify the opportunities and threats which are most likely to impact the future of the labour market in Malta. Finally, *Section 3.4* concludes this chapter by presenting a number of policy measures which could lead to further improvement in human capital.

3.1 Cross-Country Comparison of Human Capital Indicators

This section aims to set the context for the aanalysis of human capital development in Malta. A useful starting point is the World Bank Human Capital Index which is assessed for a group of comparison and target countries. As explained in *Chapter 2*, the countries in each of these groups is identified on the basis of GDP per capita, such that the comparison group represent those countries whose GDP per capita lies within the same range as that of Malta whereas the target group is composed of countries whose GDP per capita is considered to be a target level for Malta. The comparison group includes Estonia, Czechia, Portugal, Slovenia and Cyprus whereas the target group includes Austria, Netherlands, Sweden, Denmark and Iceland.

3.1.1 World Bank Human Capital Index

The World Bank Human Capital Index (HCI) represents an international metric to benchmark the key components of human capital across countries. It captures the amount of human capital that a child born today can expect to attain by age 18, given the risks of poor health and poor education that prevail in the country where the child lives (World Bank Group, 2018). The HCI is a forward-looking approach of measuring human capital, in that its focus lies on the human capital of the next generation rather than the human capital of the current workforce, the latter of which is largely the result of past policy choices. Indeed, it aims to provide an understanding of how improvements in health and education influence the productivity of the next generation of workers.

The HCI is designed to quantify the outcome of key human capital formation aspects in an individual's lifetime, for a child born today. For instance, in the context of the poorest countries in the world, the probability of a child surviving up to his/her fifth birthday is rather on the low side. Even if he/she does reach school age, human capital impediments are still significant since there is a further risk that he/she does not start school, let alone complete the full cycle of 14 years of school from pre-school to Grade 12 which is the norm in rich countries. In addition, the time spent at school may still not guarantee that the child has acquired the necessary level of schooling. Indeed, the time the child spends in school may translate unevenly into learning, depending on the quality of teachers and schools he/she experiences.

Finally, when he/she reaches age 18, the poor health and nutrition in childhood is likely to act as a constraint to his/her physical and cognitive abilities as an adult.

Based on these considerations, the HCI quantifies the key stages in this trajectory and their implications on the productivity of the next generation of workers by tracking developments in these three components:

1. Survival from birth to school age, measured using under-5 mortality rates.
2. Expected Years of Learning-Adjusted School, combining information on the quantity and quality of education. The quantity of education is measured as the expected number of years of school a child can expect to attain by age 18 given the prevailing pattern of enrolment rates across grades. The quality of education reflects ongoing work at the World Bank to harmonize test scores from major international student achievement testing programs. These are combined into a measure of learning-adjusted school years using the "learning-adjusted years of school" conversion metric proposed in the 2018 World Development Report.
3. Health. The overall health environment is captured by the adult survival rate[25], defined as the fraction of 15-year olds that survive until age 60.

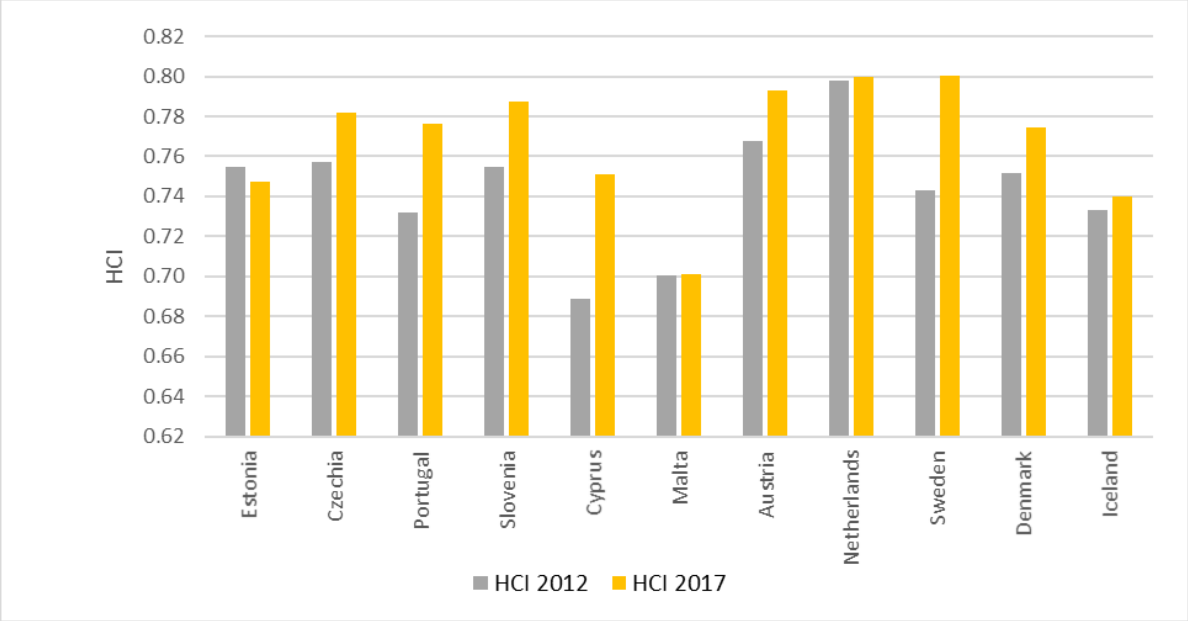
The HCI therefore measures the terms of the productivity of the next generation of workers, relative to the benchmark of complete education and full health. This gives the units of the index a natural interpretation: a value of X for a particular country means that the productivity as a future worker of a child born in a given year in that country is only a fraction X of what it could be under the benchmark of complete education and full health. This can be decomposed into the contributions of the three components of the HCI, each of which is also expressed in terms of productivity relative to the benchmark. Multiplied together they arrive at the overall HCI. Differences in the HCI between countries have large implications for the productivity of the next generation of workers.

On the basis of the above methodology, the HCI for Malta ranks at 39th place out of 157 countries in comparison to 20th place for the comparison countries and 16th place for the target countries. As illustrated in *Figure 3.1*, the HCI for Malta for a child born in 2013 will be 70 percent as productive when he/she grows up as the child could be if he/she enjoyed complete education and full health. The same HCI is recorded for a child born in 2017, indicating that no improvement was recorded over the 5-year

[25] This is the only component that is considered since the rate of stunting of children which is a proxy for pre-natal and infant health environment is not considered to be important for developed countries

period. For both years, the HCI for Malta is below the average of the comparison countries which stood at 0.74 and 0.77 in 2012 and 2017, respectively. As expected, the HCI for Malta is also below the average of the target countries which stood at 0.76 and 0.78 for both years, respectively. Furthermore, both comparison and target countries recorded improvements in the HCI over the 5-year period. On average, comparison and target countries experienced a growth in the index of 0.03 and 0.02 respectively.

Figure 3.1: World Bank HCI



(Source: World Bank)

As illustrated in *Table 3.1*, which decomposes the HCI across the three components for 2012 and 2017, 99 out of 100 children born in Malta survive up to the age of 5, in comparison to 100 out of 100 children, for both the comparison and target countries.

Table 3.1:

		2012					2017					
	Country	Survival: up to age 5	School: Expected Years	Test Scores	Health: Survival rate 15-60 years	HCI	Survival	School	Test Scores	School adjusted years	Health	HCI
Comparison Countries	Estonia	1.00	13.30	544	0.87	**0.75**	1.00	13.10	542	11.4	0.88	**0.75**
	Czechia	1.00	13.67	517	0.91	**0.76**	1.00	13.94	522	13.9	0.92	**0.78**
	Portugal	1.00	13.39	504	0.92	**0.73**	1.00	13.78	520	11.5	0.93	**0.78**
	Slovenia	1.00	13.51	516	0.92	**0.75**	1.00	13.64	532	11.6	0.93	**0.79**
	Cyprus	1.00	13.40	459	0.95	**0.69**	1.00	13.52	502	10.9	0.95	**0.75**
MALTA	Malta	0.99	13.33	474	0.94	**0.70**	0.99	13.28	474	10.1	0.95	**0.70**
Target Countries	Austria	1.00	13.67	517	0.93	**0.77**	1.00	13.89	525	11.7	0.94	**0.79**
	Netherlands	1.00	13.66	536	0.94	**0.80**	1.00	13.82	530	11.7	0.94	**0.80**
	Sweden	1.00	13.53	498	0.94	**0.74**	1.00	13.89	525	11.7	0.80	**0.80**
	Denmark	1.00	13.46	515	0.93	**0.75**	1.00	13.45	531	11.4	0.93	**0.77**
	Iceland	1.00	13.20	501	0.95	**0.73**	1.00	13.40	497	10.7	0.95	**0.74**

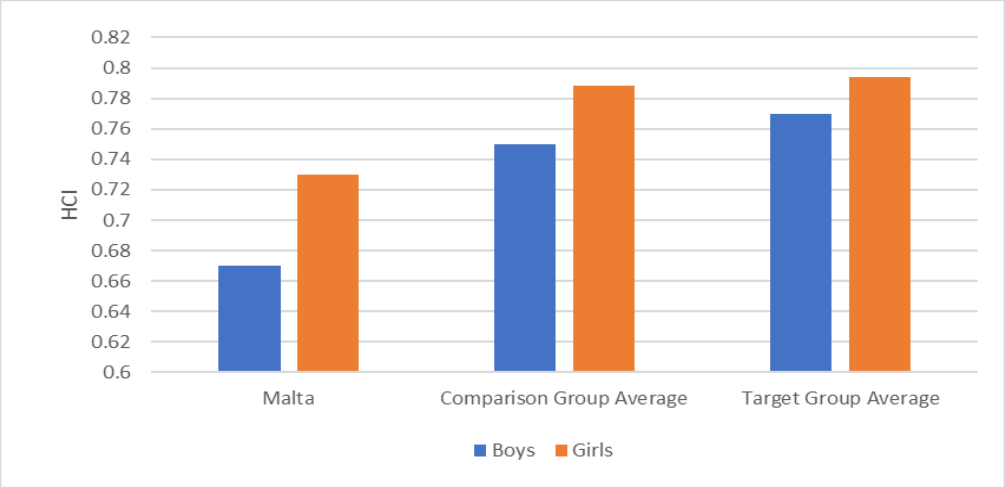
Decomposition of HCI

(Source: World Bank)

For the year 2017 for Malta, a child who starts school at age 4 can expect to complete 13.3 years of school by his/her 18th birthday, in comparison to 13.45 and 13.5 years for comparison and target countries, respectively. Even more importantly, students in Malta score 474 on harmonized test scores from Trends in International Maths and Science Study (TIMSS), Progress in International Reading Literacy Study (PIRLS) and Programme for International Student Assessment (PISA), in comparison to an average score of 524 for comparison countries and 522 for target countries.

Therefore, when factoring in what children actually learn, learning-adjusted years of school falls to 10.1 years from 13.3 years, indicating a learning gap of 3.2 years. The learning gap in Malta is higher than that for comparison and target countries. On average, the average learning-adjusted years of school for both comparison and target countries stood at 11.9 and 11.4 years, with learning gaps of 1.7 and 2.2 years, respectively. In terms of health, 95 percent of 15-year olds in Malta will survive until age 60, in comparison to 92 percent for comparison countries and 91 percent for target countries. This index is further assessed in terms of gender in *Figure 3.2* below.

Figure 3.2: HCI by Gender for 2017



(Source: World Bank)

An interesting point to note is that girls in general score a higher HCI than boys, albeit the gap between the two is registered at a higher level for Malta (0.73 for girls and 0.67 for boys) than for the average of the comparison (0.79 for girls and 0.75 for boys) and target countries (0.8 for girls and 0.77 for boys). The higher HCI for girls in Malta is mainly attributable to higher expected years at school (13.6 years for girls and 13 years for boys) as well as higher achievement in harmonized tests (483 for girls and 467 for boys).

Following the above analysis, it can be concluded that the lower HCI registered for Malta in comparison to the target group is mainly attributable to the second component which is the education aspect, particularly the learning-adjusted years of school which registers a learning gap which is significantly higher than that for the target and comparative countries. This is mainly attributable to a slightly lower figure for expected years at school which is decreased at a higher rate in comparison to the other countries due to lower achievement in harmonized tests, where significant gender differences exist, which imply that boys fair worse than girls. Overall, these findings shed light on deficiencies in human capital which would result in the future within the Maltese labour market causing skills shortages under the status quo scenario.

The World Bank HCI is considered a relevant indicator which measures human capital from the quality perspective implying the productivity of the next generation. The shortfall of this index is that the quality perspective is limited since it considers individuals up to the age of 18 years and it omits the consideration of adult participation in lifelong learning. Furthermore, it is limited since it does not consider the quantity of human capital. In view of these limitations, the upcoming sections delve deeper into three key aspects which are perceived to be more of an issue for Malta. These include demographic developments, educational attainment levels and labour market developments. These three human capital aspects are assessed in terms of several indicators for Malta as well as for the group of comparison and target countries.

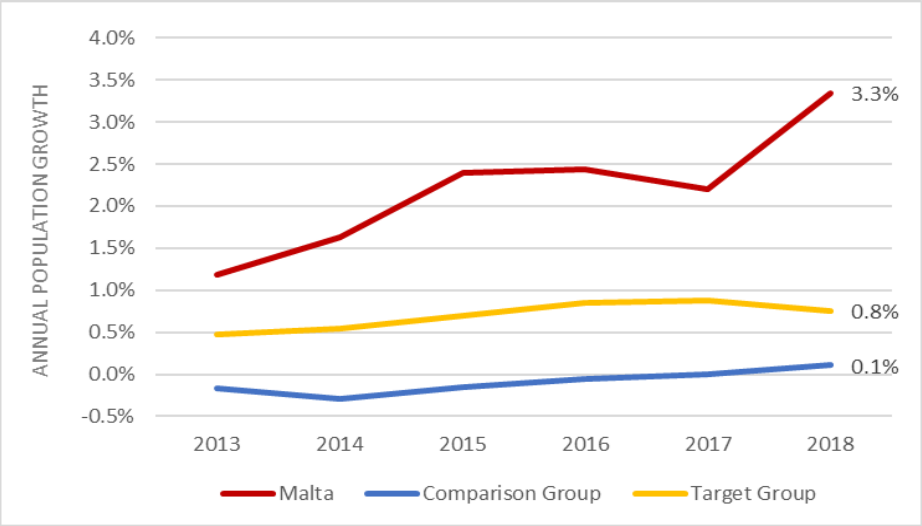
3.1.2 Demographic Developments

This section presents an overview of demographic developments with the aim of providing a context for the derivation of the human capital volume index. Within the context of a small island state like Malta, demographic developments often play a major role in the economic development of the country. Following Malta's Independence, such developments were characterised by emigration outflows, leading the population of Malta to fall by around 21,000 persons in the first decade after Independence (Grech, 2015). Over time, this situation changed significantly such that from a country with net emigration, Malta became a country of returning Maltese emigrants, to a stage where the population is growing due to an influx of people of different nationalities. In particular, following Malta's accession to the EU, the number of foreign persons has been continuously on the rise.

As at 1st January 2018, the population in Malta stood at around 475,000 persons[26]. Zooming in on the past five years, the rising population in Malta is evident, particularly when contrasted with population dynamics in the comparison and target group of countries. Indeed, Figure 3.3 indicates that the annual population growth in Malta has generally been on the rise, such that in 2018 it reached 3.3%. In contrast, the annual population growth in the comparison and target group of countries is less than 1% throughout the whole period considered, that is from 2013 to 2018.

Figure 3.3: Population Growth

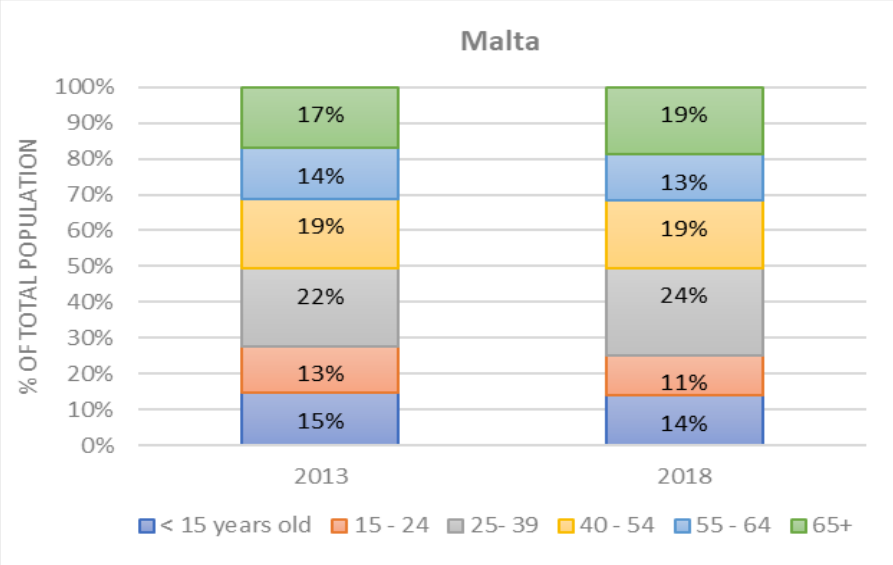
[26] In this report, annual population figures reflect the population level as at the start of the year. According to NSO figures, the population in Malta reached over 493,000 by the end of 2018. Eurostat is used throughout this analysis for cross-country comparison purposes.



(Source: Eurostat 2019)

Upon considering the composition of the Maltese population in terms of different age cohorts, which is illustrated in *Figure 3.4*, one notes that Malta has a significant share of its population within the 25-39 years old bracket. Indeed, this share increased to 24% in 2018, mostly attributed to the influx of migrants. Figure 3.5 indicates that the same age cohort represents a lower share on average within the comparison group and target group of countries, such that in 2018, it represented 20% and 19% in each respective group.

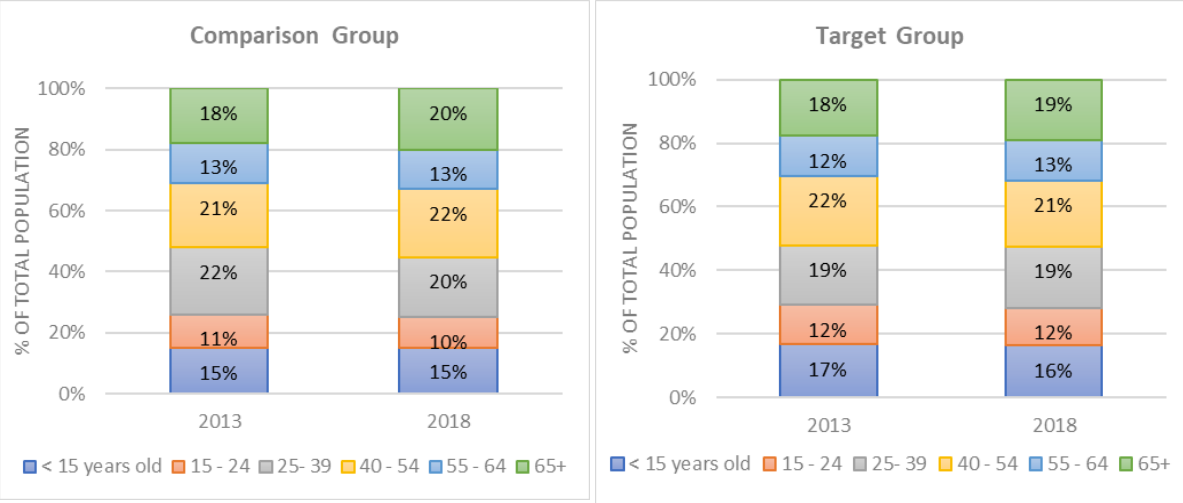
Figure 3.4: Age Structure of the Maltese Population



(Source: Eurostat 2019)

As depicted in the Figures below, Malta appears to have a higher share of its total population which falls within the working age population category. In fact, in 2018 the share of Maltese population aged between 15 to 64 years old stood at around 67%. In contrast, the share of this population cohort stood at around 65% for both the comparison and target group.

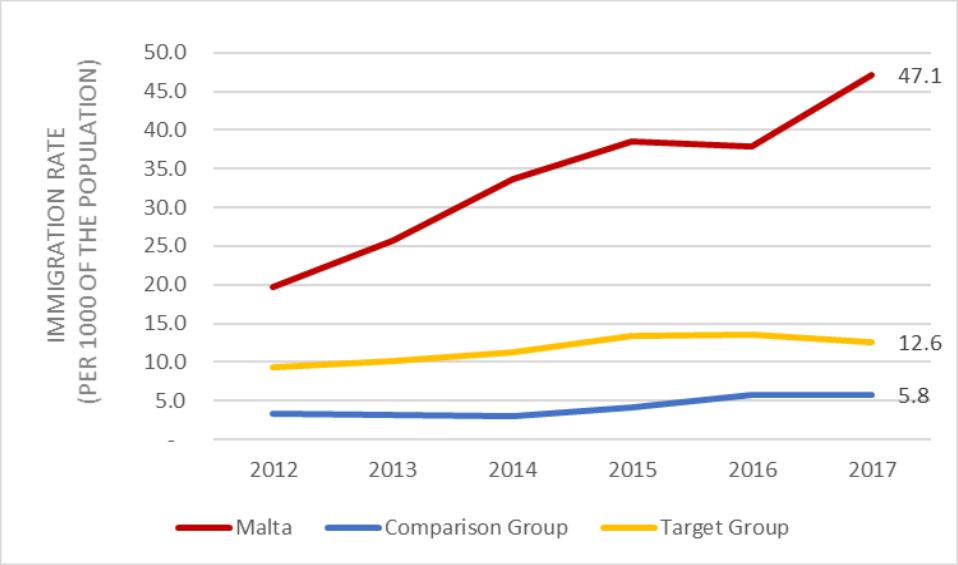
Figure 3.5: Age Structure of the Population within the Comparison and Target Group of Countries



(Source: Eurostat 2019)

A factor which has largely influenced demographic dynamics within the last few years has been the influx of foreign workers, with net migration reaching 17,102 persons in 2018[27]. This has been driven by the rapid expansion of the Maltese economy, which in turn has contributed to the generation of employment such that Malta is in a full employment situation. The inflow of migrant workers has served to mitigate the labour shortages that are associated with a full employment situation, thereby enabling further economic growth. *Figure 3.6* illustrates the immigration rate in terms of every thousand of the population. This clearly indicates that in comparison with the selected countries, Malta has been experiencing relatively high immigration rates. Indeed, the immigration rate soared up to 47.1 for every thousand of the Maltese population in 2017. Furthermore, the total number of foreign workers employed in Malta stood at over 50,000 by the end of 2018[28].

Figure 3.6: Immigration Rate



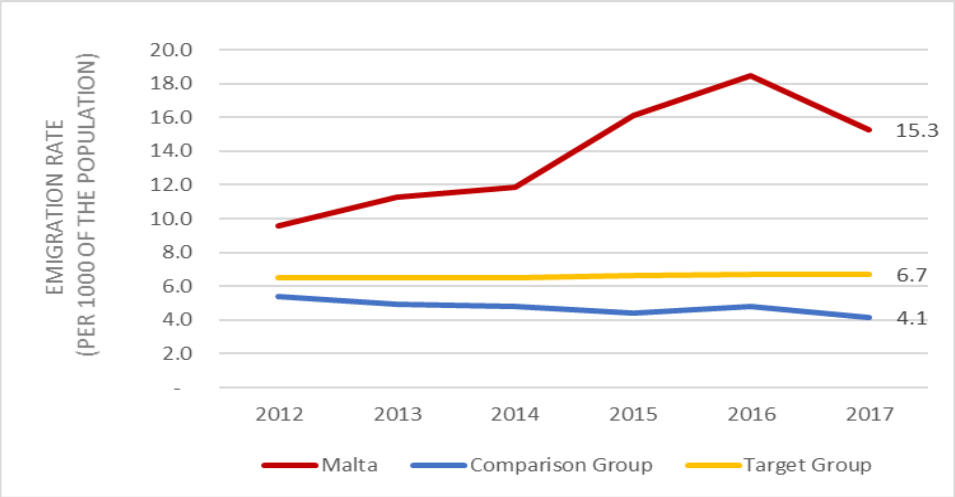
(Source: Eurostat 2019)

Nonetheless, the immigration rate is also to be considered in the light of the emigration flows registered over the same period. Figure 3.7 indicates that Malta also experienced relatively high emigration rates

[27] Source: NSO (2019), World Population Day News Release 108/2019
[28] Source: Jobsplus Data, available at: https://jobsplus.gov.mt/resources/publication-statistics-mt-mt-en-gb/labour-market-information/foreigners-data

when compared with countries in the comparison group and the target group. In fact, the emigration rate reached over 18 per thousand of the population in 2016 before falling to 15 per thousand of the population in 2017. This implies that Malta is experiencing a phenomenon of both relatively high migrant inflows as well as outflows.

Figure 3.7: Emigration Rate



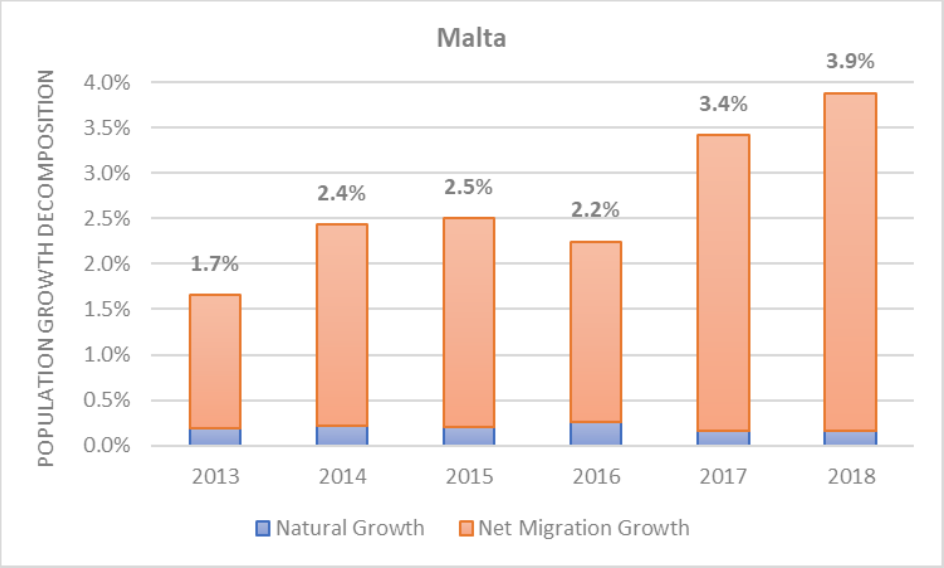
(Source: Eurostat 2019)

This points to a situation where the length of stay of migrant workers is rather short. Indeed, Borg (2019) shows that over the period 2002 to 2017, on average, 25% of those that were engaged exited the labour market within the same year, whereas 45% of foreign workers exited after a period of between one and two years. From one perspective, this may cast doubts on Malta's attractiveness to immigrants, in terms of potential difficulties in retaining foreign workers. Nevertheless, this is likely to be more due to the dynamic nature of the labour market, particularly when considered within the context of the millennial generation. In other words, this relatively low retainment of foreign workers may be due to such workers using Malta as a stepping-stone to advance their career prior to moving other countries. Furthermore, this may be attributed to foreign workers that appear to prefer project-based assignments. Against this background, Malta offers a dynamic labour market, in the sense that it is creating opportunities for a generation which is after flexible and task-oriented assignments.

Furthermore, this perspective is substantiated by the fact that it is net migration which has been fuelling population growth in Malta in recent years. This is illustrated in

Figure *3.8* and implies that Malta is still considered to be an attractive destination for workers seeking promising job opportunities.

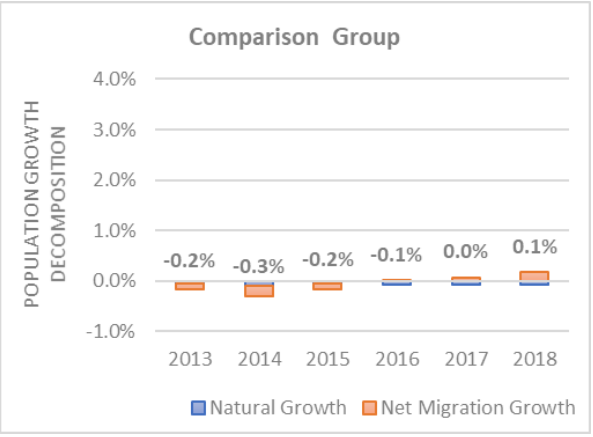
Figure 3.8: Decomposition of Population Growth for Malta

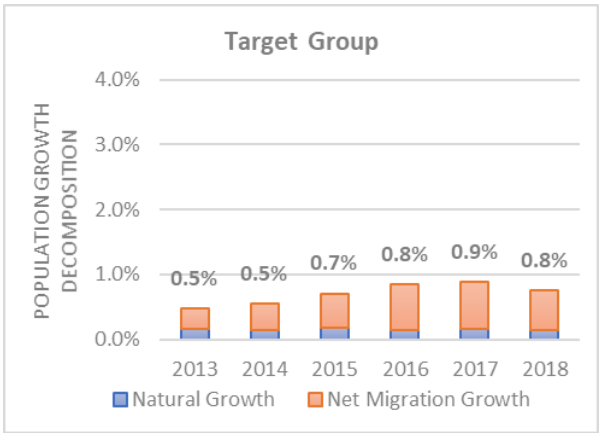


(Source: Eurostat 2019)

In contrast, net migration has been more subdued in the comparison and target countries. Figure 3.9 illustrates the decomposition of population growth in terms of natural growth and net immigration growth for the comparison and target group of countries. This indicates that in the comparison countries, population growth has been marginal and was also negative for some time. As for the target countries, population growth has also been mostly driven by net migration. However, the extent of growth in net immigration is much lower relative to Malta.

Figure 3.9: Decomposition of Population Growth for Malta





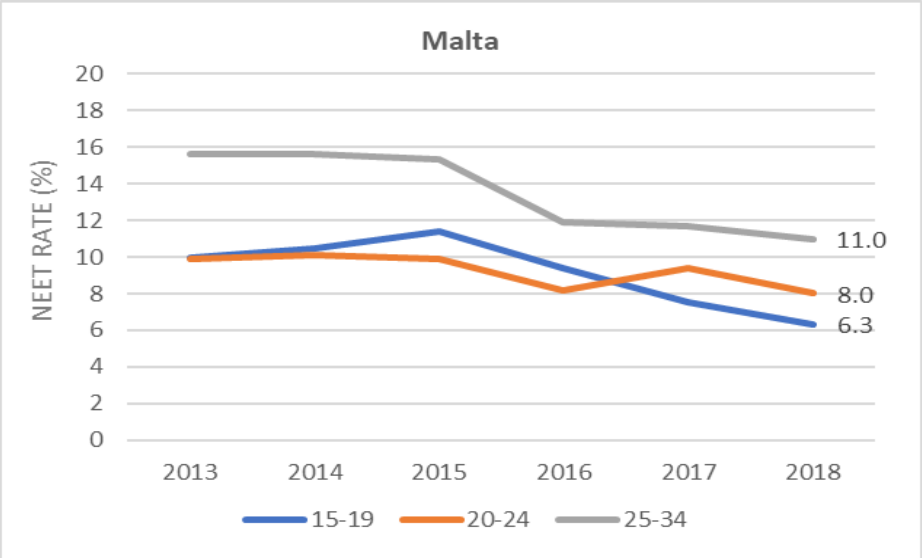
(Source: Eurostat 2019)

3.1.3 Educational Attainment

This section presents an overview of educational attainment developments with the aim of providing a context for the derivation of the human capital quality index. As highlighted in *Chapter 1* of this report, the evolution of skills is a key factor influencing the human capital and hence the productive potential of an economy. The early school leaving rate is an often-cited indicator when it comes to determining a country's performance in terms of educational attainment. As indicated in *Chapter 1*, at present, Malta still lags the EU28 average by 6.9 percentage points. In a similar vein, the following figures report the share of young people who are neither in employment nor in education and training (the NEET rate).

Figure 3.10 below implies that in 2018, around 11% of those falling within the 25-34 years old age cohort were neither in employment nor in education and training. In contrast, the same age cohort within the comparison group of countries is associated with an average NEET rate of 14.3% whereas within the target group of countries, this age group is associated with an average NEET rate of 9.3%.

Figure 3.10: The share of young people who are neither in employment nor in education and training (NEET)

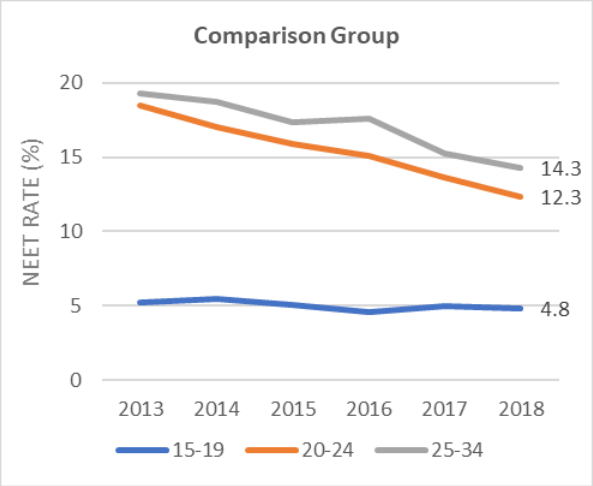


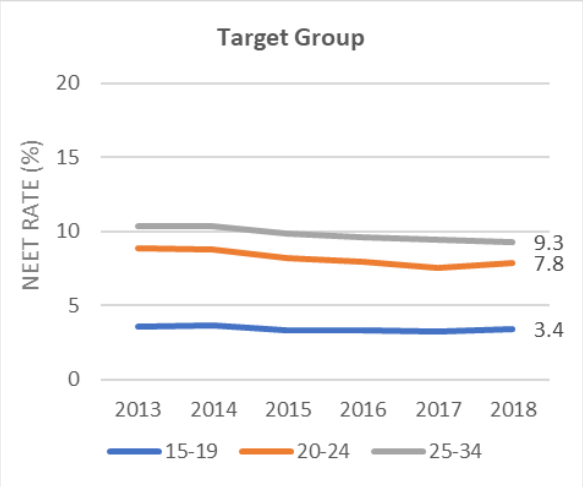
(Source: Eurostat 2019)

Similarly, the NEET rate for Malta (8%) for the age group of 20 to 24 years old is lower when compared to the average of the comparison group of countries (12.3%) and higher relative to the average of the target group of countries (7.8%). The highest challenge for Malta appears to be with respect to the younger age cohort, that is, for those aged between 15 to 19 years old.

Figure 3.10 indicates that the NEET rate for this age cohort stood at 6.3% in 2018, hence higher than the NEET rates for the same age cohort within the comparison and target group of countries.

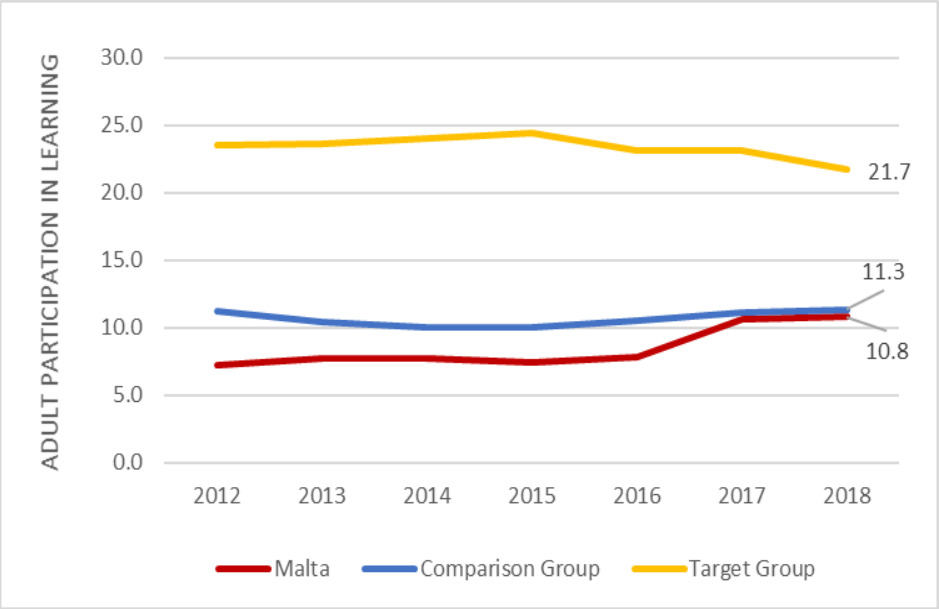
Figure 3.11: NEET Rate for the Comparison and Target Group of Countries (Source: Eurostat 2019)





Another aspect which influences the human capital level of a country is the extent of participation in education and training by the adult workforce. Against this background, Figure 3.12 depicts the trajectory of the rate of adult participation in learning, indicating that Malta has recorded improvement in lifelong learning in recent years, such that it converged to the comparison group. It is however still lagging behind the target countries considered in this study.

Figure 3.12: Adult Participation in Learning (Age cohort of 25-64 years)



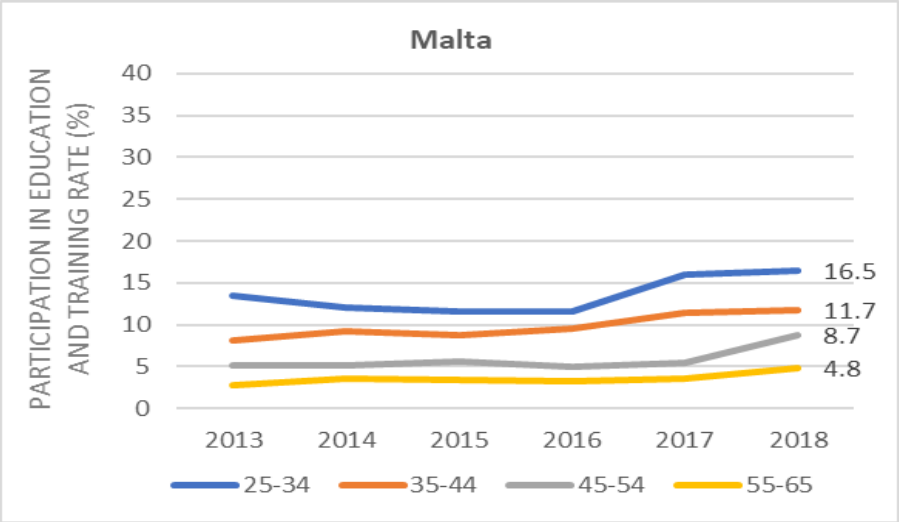
(Source: Eurostat 2019)

Indeed, the Figure above indicates that in 2018, the rate of adult participation in learning for Malta stood at 10.8%. In comparison, the average rate for the comparison countries is marginally higher at 11.3% and significantly higher within the target countries at 21.7%.

When considering adult participation in learning across different age cohorts, as done in

Figure 3.13, it can be observed that the highest participation is recorded in the 25-34 years age cohort. As the age group increases, the rate of participation falls. This phenomenon is shown to have been experienced every year over the period 2013 to 2018.

Figure 3.13: Participation in Education and Training for Malta by Age

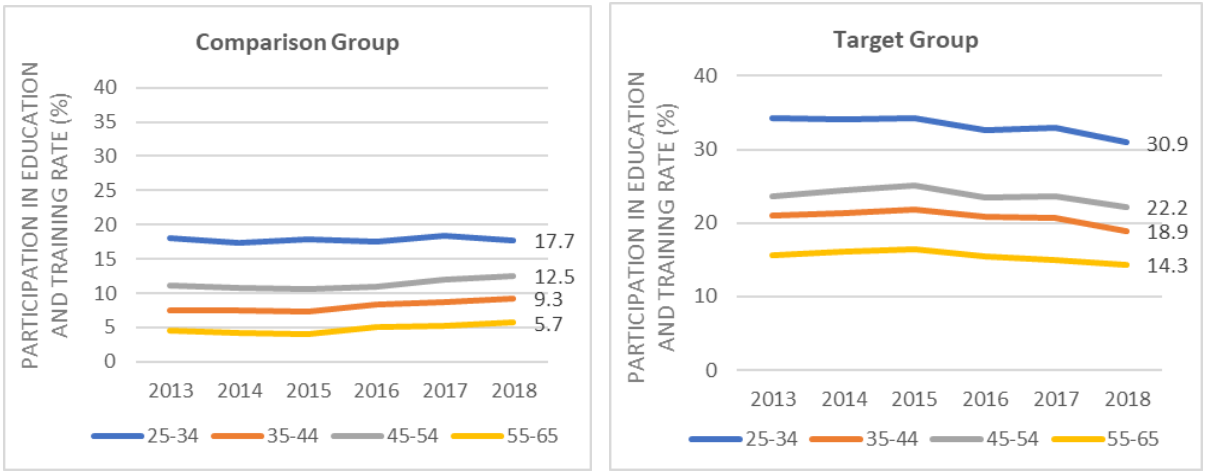


(Source: Eurostat 2019)

Overall, the participation in education and training appears to be higher on average within the comparison and target group of countries. The youngest age cohort, that is the 25-34 age group, exhibits significantly higher participation in the target group, such that the participation rate stood at around 31% in 2018.

Furthermore, in both the comparison and target group, the 45-54 age cohort is associated with a higher participation rate than the 35-44 age group, something which is not observed in Malta. On average, those aged between 55 and 65 years old and residing in the comparison and target countries, participate more in educational and training courses, relative to those residing in Malta.

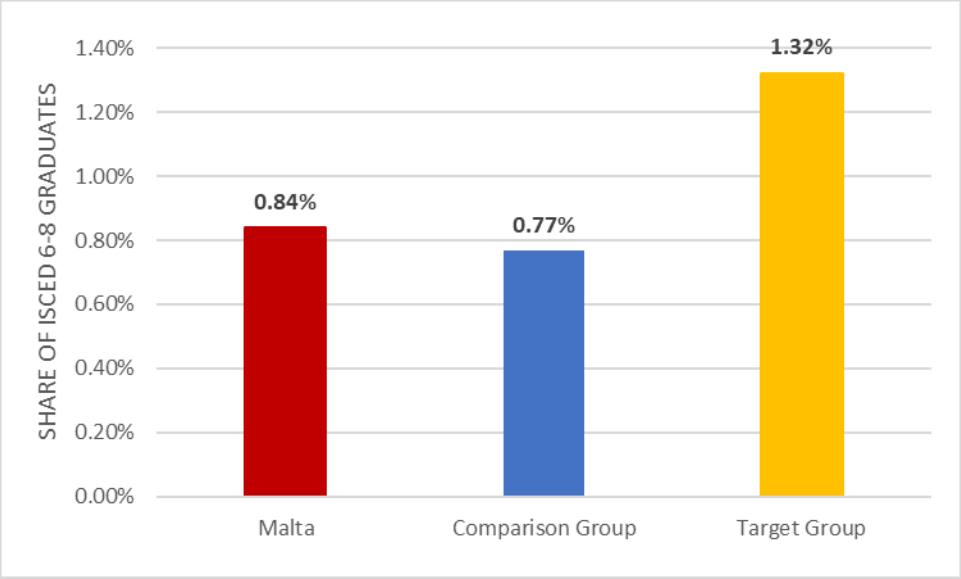
Figure 3.14: Participation in Education and Training by Age for the Comparison and Target Countries



(Source: Eurostat 2019)

A consideration of tertiary attainment in Malta and the selected countries implies that Malta compares well with the comparison group of countries, such that the graduates at ISCED levels 6 to 8 in 2018 represented 0.8% of the total population of the same year in both Malta and the comparison countries. Nonetheless, as indicated in Figure 3.15, the target countries are performing relatively better, with the number of graduates in 2018 representing around 1.3% of the population.

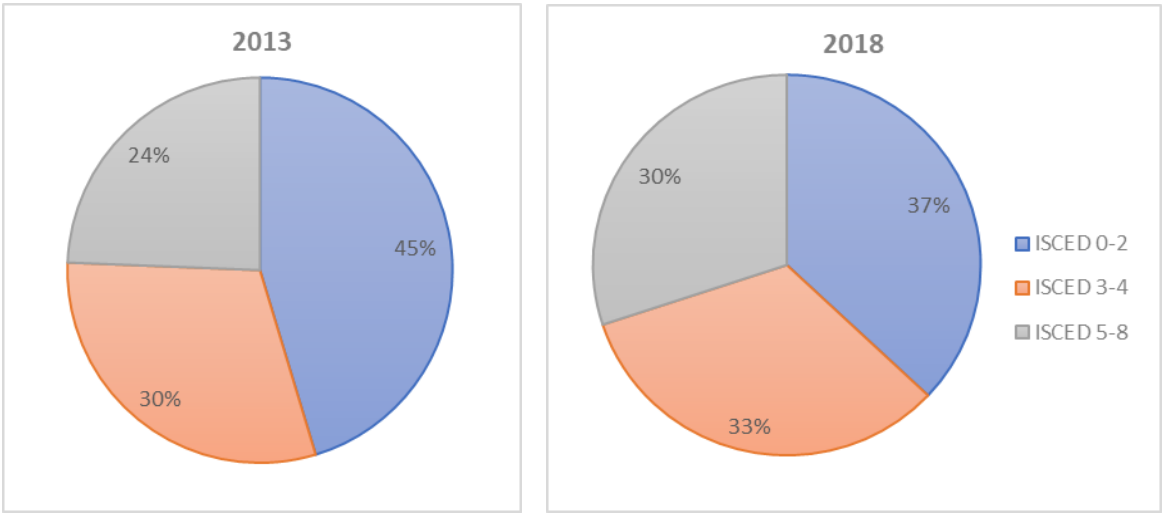
Figure 3.15: Graduates of ISCED 6-8 as a Share of the Population



(Source: Eurostat 2019)

Improvements in educational attainment in Malta are also observed in terms of the composition of the labour force population by ISCED levels. From 2013 to 2018, the share of the labour force population with an ISCED level ranging from 0 to 2 decreased by around 8 percentage points. This was paralleled by an increase in the share of the labour force population having an ISCED level from 3 to 4 and an ISCED level from 5 to 8.

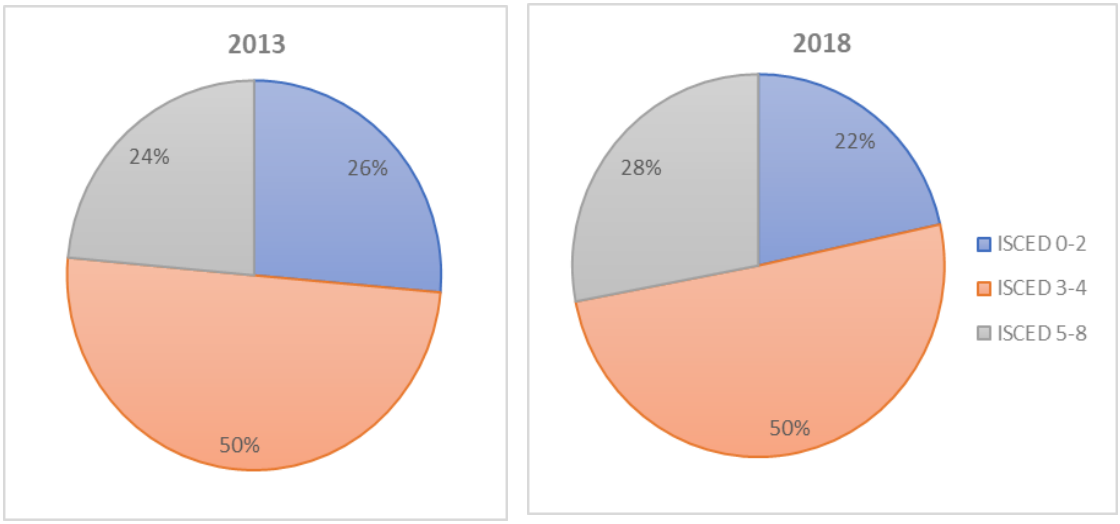
Figure 3.16: The Composition of the Labour Force Population by ISCED levels in Malta



(Source: Eurostat 2019)

Nonetheless, it is to be noted that Malta still appears to be lagging behind when compared to the countries within the comparison group and those within the target group. Indeed, in 2018, only 22% of the labour force population had an ISCED level of 0 to 2 within the comparison group of countries. As a result, the share of the population having a higher educational attainment level is relatively higher than that of Malta.

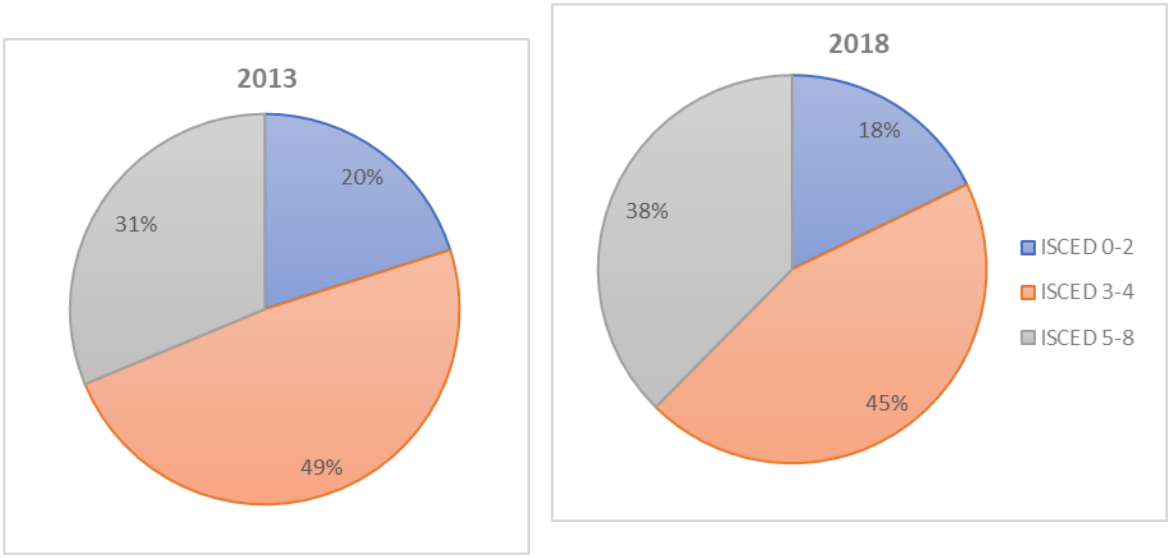
Figure 3.17: The Composition of the Labour Force Population by ISCED levels in the Comparison Group



(Source: Eurostat 2019)

Similarly, the share of the labour force population having an educational attainment level of ISCED 0-2 is lower than that of Malta within the target group of countries. The ISCED 5-8 category represents the highest share within the target countries, relative to both Malta and the comparison group.

Figure 3.18: The Composition of the Labour Force Population by ISCED levels in the Target Group



(Source: Eurostat 2019)

3.1.4 Human Capital Composite Index

Based on the above considerations, this section produces a Human Capital Composite Index which is further assessed in terms of a Human Capital Volume Index and a Human Capital Quality Index. The Human Capital Volume Index is composed of the following indicators[29], each of which will be discussed in further detail below:

1. Attractiveness to Immigration Index
2. Expected Population Growth
3. Female Participation Rate

[29] All data used to build this composite index is extracted from Eurostat to allow for cross-country comparison.

4. Duration of Working Life
5. Implicit Tax on Labour
6. Percentage of Employees working from home

These indicators are calculated for Malta and the group of comparison and target countries. The Attractiveness to Immigration Index and the Expected Population Growth are used to capture the dynamics related to the volume of human capital whereas the last three indicators are framework conditions which are necessary to enhance Malta's competitiveness in relation to other countries.

The Attractiveness to Immigration Index considers the total net migration for a 5-year period as a share of the average population for the same 5-year period. This index was obtained for two periods – one for the period 2007 to 2012 and another one for the period 2013 to 2018. As for the Expected Population Growth, the compound annual average growth rate for the 2012 to 2017 period and for the 2018 to 2030 period was calculated.

The indicators related to the Female Participation Rate, Duration of Working Life and the Percentage of Employees working from home are estimated as the average recorded during the period 2007 to 2012 and for 2013 to 2018. As for the Implicit Tax on Labour[30] indicator, this represents the average tax observed during the 2007 to 2012 period and 2013 to 2017 period.

presents each country's results for the indicators making up the Human Capital Volume Index. *Table 3.2* recapitulates this information by providing the average value for the countries within the comparison and target groups. The results for Malta and its performance relative to the selected countries will be discussed in further detail at the end of this section.

[30] This is defined as the sum of all Direct and Indirect Taxes and Employees' and Employers' Social Security Contribution divided by the Compensation of Employees. This could be seen as a summary measure that approximates an average effective tax burden on labour.

	Attractiveness to Immigration Index		Expected Population Growth		Female Participation Rate		Duration of working life		Implicit Tax Rate on Labour		Percentage of Employees working from home	
	2007-2012	2013-2018	2012-2017	2018-2030	2007-2012	2013-2018	2007-2012	2013-2018	2007-2012	2013-2017	2007-2012	2013-2018
Malta	3.0%	14.7%	1.6%	1.8%	39.7%	54.4%	30.2	34.2	21.6	22.8	5.9%	6.3%
Estonia	-1.4%	1.0%	-0.1%	0.0%	64.1%	68.6%	35.8	37.6	35.0	34.2	9.7%	15.2%
Czechia	2.1%	1.2%	0.1%	0.1%	57.2%	63.5%	33.9	35.4	39.2	39.5	7.1%	8.5%
Portugal	-0.1%	-0.7%	-0.4%	-0.2%	60.9%	62.1%	36.9	37.2	25.0	29.2	7.2%	14.3%
Slovenia	2.3%	0.9%	0.1%	0.0%	62.4%	62.7%	33.9	34.7	35.3	35.6	13.5%	18.3%
Cyprus	10.3%	-1.4%	-0.1%	1.0%	62.0%	59.9%	36.6	36.4	22.7	24.9	1.4%	2.7%
Austria	2.0%	4.5%	0.7%	0.5%	65.3%	67.6%	36.0	37.0	41.8	42.2	21.2%	21.9%
Netherlands	0.9%	2.1%	0.3%	0.3%	68.3%	70.1%	38.8	40.0	31.8	32.4	10.8%	29.5%
Sweden	3.4%	5.4%	0.9%	1.0%	71.1%	74.3%	40.1	41.4	39.8	39.4	22.8%	30.3%
Denmark	1.9%	2.9%	0.5%	0.5%	71.9%	71.1%	39.6	39.5	34.4	34.0	32.8%	31.3%
Iceland	-0.7%	7.0%	1.0%	0.9%	77.9%	81.9%	44.8	46.5				

Table3.2:Decomposition of the Human Capital Volume Index

(Source: Authors' estimates based on Eurostat 2019)

Table 3.2: Summary Table – Malta in relation to Comparison and Target Groups

	2007-2012	2012-2017	2007-2012	2007-2012	2007-2012	2007-2012
Country	**Indicators**					
	Attractiveness to Immigration	Average Expected Population Growth	Female Participation	Duration of Working Life (years)	Implicit Tax on Labour	Percentage of employees working from home
Comparison Group	2.6%	-0.1%	61.3%	35.43	31.5%	7.8%
Malta	3.0%	1.6%	39.7%	30.23	21.6%	5.9%
Target Group	1.5%	0.7%	70.9%	39.85	37.0%	21.9%
	2013-2018	**2018-2030**	**2013-2018**	**2013-2018**	**2013-2017**	**2013-2018**
Country	**Indicators**					
	Attractiveness to Immigration	Average Expected Population Growth	Female Participation	Duration of Working Life (years)	Implicit Tax on Labour	Percentage of employees working from home
Comparison Group	0.2%	0.2%	63.4%	36.27	32.7%	11.8%
Malta	14.7%	1.8%	54.4%	34.17	22.8%	6.3%
Target Group	4.4%	0.6%	73.0%	40.86	37.0%	28.2%

(Source: Authors' estimates based on Eurostat 2019)

Each of these indicators presented above were standardised, with the detailed results presented in Annex I. The first four indicators were standardised against the minimum of the class[31] such that a value of 0 was assigned to the country with the poorest performance. Conversely, the country with the best performance was assigned a value of 1. This method of standardisation is justified since the higher the value of these indicators, the higher the volume of human capital. A country with the highest attractiveness to immigration, expected population growth, female participation and working life duration contributes to higher volume of workers.

In contrast, the indicator related to the implicit tax on labour was standardised in a manner whereby a value of 1 was attributed to the country with the lowest tax on labour. The lower the tax on labour the higher the incentive to work, thereby contributing positively to the volume of human capital. To this end, a value of 0 was assigned to the country with the highest tax on labour.

Finally, the Percentage of Employees working from home indicator was standardised against a minimum of zero[32] such that the country with the least favourable work-life balance was attributed with the lowest standardised value which is above the absolute minimum of 0. This is justified by the fact that while the country with the lowest performance could have attained better results, it is still not considered as having the worst performance that could ever be achieved. In contrast, a value of 1 was assigned to the country with the most favourable work-life balance.

In deriving the composite human capital volume index, weights were assigned equally to each indicator and multiplied by the standardised values to obtain the results depicted in

Table 3.3. The results indicate that during the 2007 to 2012 period, Malta was faring better than the comparison countries but was still lagging behind the target countries. Over the following 5-year period, Malta registered notable improvement with the human capital volume index reaching to 0.52, converging to the target countries' average of 0.54.

[31] This implies that each country result was compared against the minimum result for the same indicator such that the worst performing country ends up with a numerator of 0 in the standardisation formula.
[32] This implies that each country result was compared against the absolute minimum of zero such that the worst performing country ends up with a numerator that is greater than zero in the standardisation formula.

Table 3.3: Human Capital Volume Index

	2007-2012	2013-2018		2007-2012	2013-2018
Malta	0.425	0.521	Malta	0.425	0.521
Estonia	0.296	0.316	Average of Comparison Group	0.359	0.268
Czechia	0.266	0.181			
Portugal	0.362	0.274			
Slovenia	0.353	0.250			
Cyprus	0.520	0.317			
Austria	0.422	0.347	Average of Target Group	0.540	0.540
Netherlands	0.452	0.490			
Sweden	0.554	0.575			
Denmark	0.595	0.515			
Iceland	0.679	0.774			

(Source: Authors' estimates based on Eurostat 2019)

A similar approach was adopted to derive a Human Capital Quality Index, such that this consists of a set of indicators, this time focused on education and training. The following indicators[33] were used and discussed in further detail below:

1. Adult Participation in Learning
2. World Bank Human Capital Index

These indicators are calculated for Malta and the group of comparison and target countries. The Adult Participation in Learning is estimated as the average rate recorded during the period 2007 to 2012 and for 2013 to 2018. As for the World Bank HCI, the values as at 2012 and 2017 were considered.

Table 3.4

presents each country's results for the indicators making up the Human Capital Quality Index. *Table 3.5* recapitulates this information by providing the average value for the countries within the comparison and target groups. The results for Malta and its performance relative to the selected countries will be discussed in further detail at the end of this chapter.

Table 3.4: Decomposition of the Human Capital Quality Index

[33] All data used to build this composite index is extracted from Eurostat to allow for cross-country comparison.

	Adult Participation in Learning		World Bank Human Capital Index	
	2007-2012	2013-2018	2012-2017	2018-2030
Malta	6.4%	8.7%	0.70	0.70
Estonia	10.5%	14.9%	0.75	0.75
Czechia	8.6%	9.2%	0.76	0.78
Portugal	7.3%	9.8%	0.73	0.78
Slovenia	15.1%	11.9%	0.75	0.79
Cyprus	8.2%	7.1%	0.69	0.75
Austria	13.6%	14.8%	0.77	0.79
Netherlands	17.0%	18.7%	0.80	0.80
Sweden	23.5%	29.4%	0.74	0.80
Denmark	31.2%	28.8%	0.75	0.77
Iceland	26.2%	25.1%	0.73	0.74

Source: Authors' Estimates based on Eurostat (2019)

Table 3.5: Summary Table – Malta in relation to Comparison and Target Groups

	2007-2012	2007-2012
Country	Indicators	
	Adult Participation in Learning	World Bank Human Capital Index
Comparison Group	9.9%	0.74
Malta	6.4%	0.70
Target Group	22.3%	0.76
	2013-2018	2013-2018
Country	Indicators	
	Adult Participation in Learning	World Bank Human Capital Index
Comparison Group	10.6%	0.77
Malta	8.7%	0.70
Target Group	23.3%	0.78

Source: Authors' estimates based on Eurostat (2019)

Each of these indicators presented above were standardised, with the detailed results presented in Annex I. Both indicators were standardised against a minimum of zero[34] such that the country with the lowest

[34] This implies that each country result was compared against the absolute minimum of zero such that the worst performing country ends up with a numerator that is greater than zero in the standardisation formula.

adult participation in lifelong learning was assigned the lowest standardised value which is above the absolute minimum of zero. In contrast, a value of 1 was assigned to the country with the highest participation in lifelong learning. The same method was applied to the standardisation of the World Bank HCI.

In deriving the composite human capital quality index, weights were assigned on the basis of hours of learning associated with adult participation versus years in school considered within the World Bank HCI. These weights were multiplied by the standardised values to obtain the results depicted in *Table 3.6*. The results indicate that during the 2007 to 2012 period, Malta was faring worse than both the comparison and target countries. Over the following 5-year period, Malta registered marginal improvement with the human capital quality index reaching to 0.74 in comparison to better performance recorded in the comparison and target countries, which reached 0.82 and 0.93, respectively.

Table 3.6: Human Capital Quality Index

	2007-2012	2013-2018		2007-2012	2013-2018
Malta	0.717	0.737	Malta	0.717	0.737
Estonia	0.800	0.831			
Czechia	0.788	0.818	Average of		
Portugal	0.754	0.817	Comparison	0.779	0.817
Slovenia	0.835	0.845	Group		
Cyprus	0.720	0.771			
Austria	0.836	0.874			
Netherlands	0.891	0.912	Average of		
Sweden	0.889	1.000	Target Group	0.895	0.933
Denmark	0.956	0.970			
Iceland	0.900	0.908			

Source: Authors' estimates based on Eurostat (2019)

Based on the results of the human capital volume and quality indices, the total composite index was derived by taking the average of the two sub-indices. *Table 3.7* and *The target group recorded a marginal improvement in the composite index, reaching 0.737 between 2013 to 2018. This is due to an increase in the human capital quality index. When considering the total composite index, Malta appears to be converging to the average target group of countries. Nevertheless, the increase in the volume index for Malta surpassed that for the quality index.*

Table *3.8* below illustrate the composite index for the two periods 2007 to 2012 and 2013 to 2018 for Malta and the selected countries. The composite index for Malta registered an improvement over the period under consideration, reaching an average 0.629 during 2013-2018. In contrast, the human capital composite index of the comparison group deteriorated to 0.542. This is attributed to a decline in the volume index. Thus, Malta fares better than the comparison countries since it experienced a significant increase in the volume index due to the influx of foreign workers.

Table 3.7: Total Human Capital Composite Index for the period 2007-2012

Country	Volume Index	Quality Index	Human Capital Composite Index	
Malta	0.425	0.717	**0.571**	
Estonia	0.296	0.800	0.548	Comparison Group Average - **0.569**
Czechia	0.266	0.788	0.527	
Portugal	0.362	0.754	0.558	
Slovenia	0.353	0.835	0.594	
Cyprus	0.520	0.720	0.620	
Austria	0.422	0.836	0.629	Target Group Average - **0.717**
Netherlands	0.452	0.891	0.672	
Sweden	0.554	0.889	0.722	
Denmark	0.595	0.956	0.775	
Iceland	0.679	0.900	0.790	

The target group recorded a marginal improvement in the composite index, reaching 0.737 between 2013 to 2018. This is due to an increase in the human capital quality index. When considering the total composite index, Malta appears to be converging to the average target group of countries. Nevertheless, the increase in the volume index for Malta surpassed that for the quality index.

Table 3.8: Total Human Capital Composite Index for the period 2013-2018

Country	Volume Index	Quality Index	Human Capital Composite Index	
Malta	0.521	0.737	**0.629**	
Estonia	0.316	0.831	0.574	Comparison Group Average - **0.542**
Czechia	0.181	0.818	0.499	
Portugal	0.274	0.817	0.546	
Slovenia	0.250	0.845	0.548	
Cyprus	0.317	0.771	0.544	
Austria	0.347	0.874	0.611	Target Group Average - **0.737**
Netherlands	0.490	0.912	0.701	
Sweden	0.575	1.000	0.787	
Denmark	0.515	0.970	0.743	
Iceland	0.774	0.908	0.841	

Table 3.9 presents Malta's performance vis-à-vis the comparison and target countries across time. When considering the progress over time, Malta appears to have registered an improvement with respect to most of the indicators. Furthermore, Malta's progress is considered to have exceeded that registered within the selected countries when it comes to the attractiveness to immigration, female participation, duration of working life and adult participation in learning.

In contrast, when considering Malta's progress in the percentage of employees working from home and in the World Bank Human Capital Index, it can be noted that Malta's improvement was less than that registered within both the comparison and target countries. As for the average expected population growth, Malta is considered to have progressed well relative to the target countries, but its progress was less than that observed within the comparison group of countries.

Finally, while Malta's implicit tax on labour remains one of the lowest in Europe (European Commission, 2019), it appears to have registered a marginal increase over the two periods under consideration. This observed increase is to be considered in light of the fact that the "implicit tax rate on labour represents the ratio of the revenue from labour taxation to the total compensation of employees" (European Commission, 2018). It could therefore have to an extent reflected the progressivity inherent in the system of taxation of labour income, as well as the inflow of higher paid immigrant workers.

Table 3.9: Summary Table for Malta

Indicators	2007-2012	2013-2018	Change	Progress over time	Progress relative to Comparison Group	Progress relative to Target Group
Attractiveness to Immigration	2.95%	14.74%	11.8pp	Yes	Yes	Yes
Average Expected Population Growth	1.64%	1.76%	0.1pp	Yes	No	Yes
Female Participation	39.67%	54.38%	14.7pp	Yes	Yes	Yes
Duration of Working Life (years)	30.23	34.17	3.9yrs	Yes	Yes	Yes
Implicit Tax on Labour	21.56%	22.80%	1.2pp	No	Neutral	No
Percentage of employees working from home	5.92%	6.32%	0.4pp	Yes	No	No
Adult Participation in Learning	6.40%	8.67%	2.3pp	Yes	Yes	Yes
World Bank Human Capital Index	70.04%	70.14%	.1pp	Yes	No	No

The same increase is also observed within the comparison countries, hence Malta's progress relative to the comparison group is listed as neutral. In contrast, the increase in the implicit tax on labour was less in the target countries. As a result, Malta is considered to have not registered any progress relative to the target group.

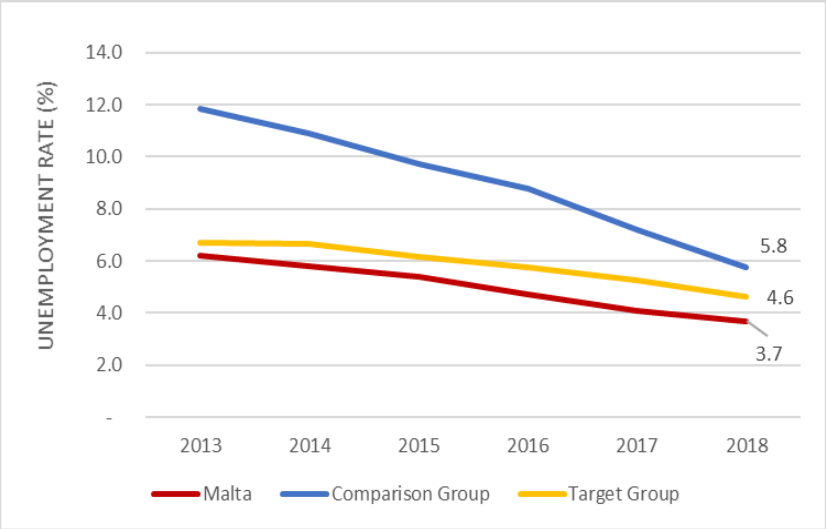
In view of these results, the next section delves into an explanation and discussion of labour market developments, with specific focus on the headline indicators such as participation rates, employment growth and productivity growth.

3.1.5 Developments in Employment, Unemployment, Labour Income and Labour Cost

Within the context of strong and sustained growth, the labour market in Malta continues to perform well. Indeed, as indicated in *Chapter 1*, this is largely witnessed by an unemployment rate for Malta which has been consistently below that of the EU average over the past decade. *Figure 3.19* indicates that the

unemployment rate for Malta stood at 3.7% in 2018. In contrast, higher unemployment has been recorded in both the comparison and target group of countries over the entire period under consideration.

Figure 3.19: Unemployment Rate

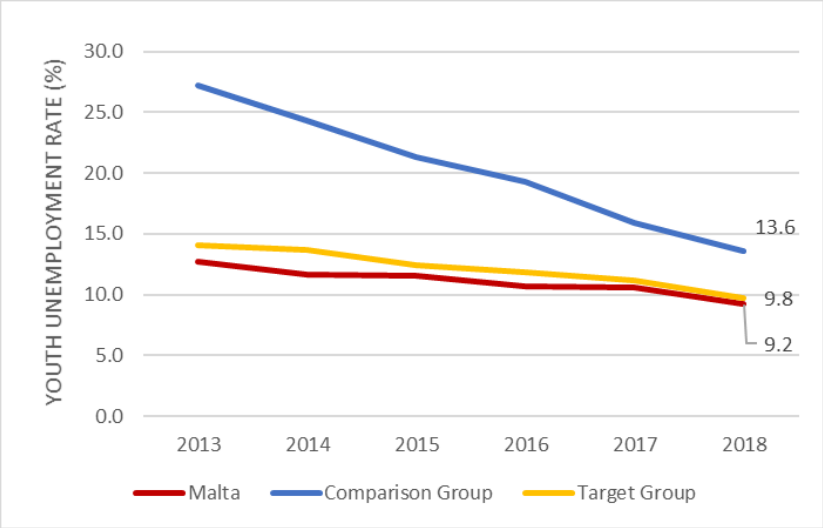


(Source: Eurostat 2019)

The declining unemployment reflects the growing demand for labour as well as measures which have been targeted at facilitating the transition from inactivity to employment by improving the employability of specific target groups. Such measures include the Youth Guarantee Scheme, the Tapering of Benefits Scheme and the Mature Workers' Scheme (Ellul, 2018).

Error! Not a valid bookmark self-reference. looks at the youth unemployment rate, clearly indicating that over the past five years, the youth unemployment rate for Malta has been consistently below that experienced in the target and comparison countries.

Figure 3.20: Youth Unemployment (Less than 25 years old)



(Source: Eurostat 2019)

While an overall positive performance is recorded with respect to employment growth in Malta, such that the employment rate in Malta is above the EU average, inactivity is comparatively high, the gender gap is still large and the employment rate of people with disabilities and older workers is low.

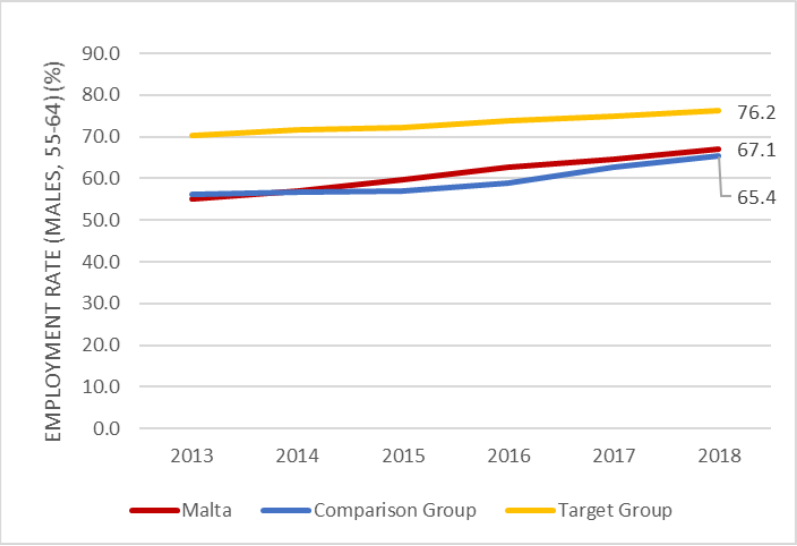
As indicated in *Chapter 1*, both male and female participation in the labour market have been on the rise. Nonetheless, the female participation rate is still below the EU average by around 5.2 percentage points. This however is also to be seen within a context whereby Malta is recording notable improvement in this regard. In fact, *Table 3.9* indicates that Malta has registered progress both relative to the comparison and target countries when it comes to female participation. This is largely attributed to the availability of free formal childcare which has facilitated the employment of younger women.

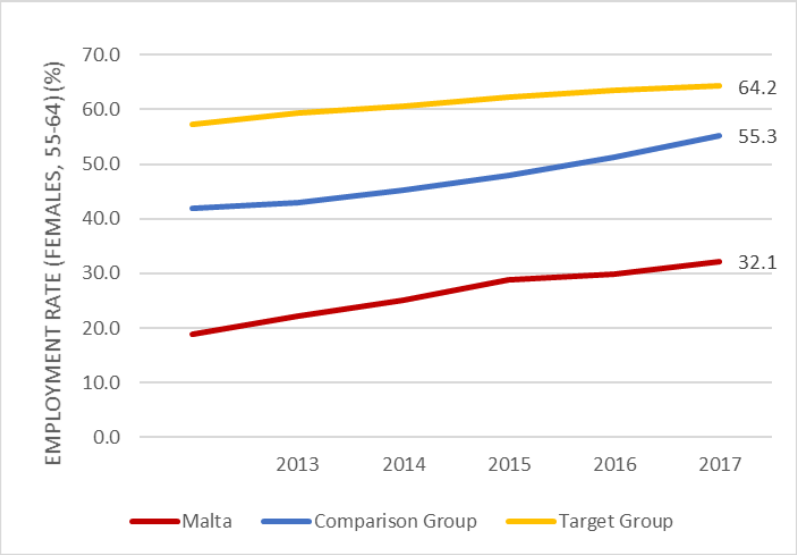
Again, the employment rate of older workers is expected to improve further in view of the progress recorded in the duration of working life. As indicated in *Table 3.9,* the duration of working life in Malta increased by almost 4 years in the past five years (2013-2018) as compared to the previous five years (2007-2012). This increase in the duration of working life exceeded the growth in working years registered in the comparison and target countries.

Figure 3.21 indicates that the largest potential for improvement lies amongst the older age cohorts whereby the employment rate for women aged between 55-64 stood at 32.1% in 2018. This starkly contrasts the employment rate recorded amongst the same age cohort of women within the comparison and target countries. Indeed, the low employment rate of older workers in Malta is considered to be driven by the very low employment rate of older women in Malta.

Again, the employment rate of older workers is expected to improve further in view of the progress recorded in the duration of working life. As indicated in *Table 3.9*, the duration of working life in Malta increased by almost 4 years in the past five years (2013-2018) as compared to the previous five years (2007-2012). This increase in the duration of working life exceeded the growth in working years registered in the comparison and target countries.

Figure 3.21: Employment Rates of Older Workers by Gender





(Source: Eurostat 2019)

The significant growth in employment in Malta has also given rise to new challenges related to labour and skill shortages. Indeed, the share of employers reporting labour shortages has continued to increase across sectors (European Commission, 2019), hence increasing the reliance on foreign workers. The number of employed foreign nationals in Malta and Gozo at the end of 2018 amounted to 55,280 persons, increasing drastically from the 4,000 persons in 2002 (Jobsplus, 2018). This surge in the influx of foreign workers has also been observed through the Human Capital Volume Index, whereby the attractiveness to immigration index experienced a growth of over 11 percentage points from the 2007 to 2012 period to the 2013 to 2018 period.

While all sectors are experiencing an increase in foreign employment, the highest share of foreign employment is found within the professional and administration, the wholesale and retail trade, transportation and storage, the arts, entertainment and recreation and the accommodation and food services sector (Jobsplus, 2018). Foreigners are mainly employed as clerks and support workers, sales workers as well as managerial occupations, implying that such workers occupy both low and high skilled jobs. This reflects a situation in the Maltese labour market whereby shortages are experienced in terms of both the supply of workers as well as the skills available.

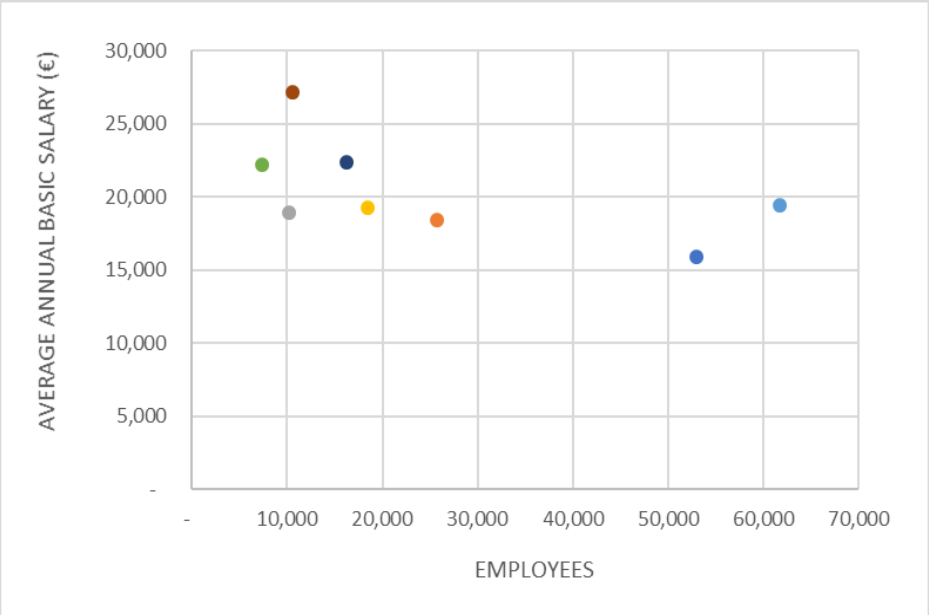
These shortages are reflected in the fact that around 36% of all vacancies are considered as hard to fill across all sectors (Jobsplus, National Commission for Further and Higher Education and Malta Enterprise, 2016). The sector which experiences the most hard-to-fill vacancies when compared to the number of vacancies was the mining and quarrying, manufacturing, electricity, gas steam and air conditioning supply, water supply, sewerage, waste management followed by the financial and insurance activities sector. On

the other hand, the sectors which have the least share of hard-to-fill vacancies were public administration and defence, compulsory social security, education, human health and social work activities and the arts, entertainment and recreation, repair of household goods and other services sectors.

The labour shortages experienced by different sectors may be partially explained by the wages offered in each respective sector. For instance, *Figure 3.22* identifies the manufacturing, mining and quarrying and other industry as being one of the two lowest paying sectors. This could explain the difficulties encountered by this sector to fill certain vacancies. Notwithstanding, industries such as the financial and insurance sector which are shown to be paying above average salaries, still appear to be facing skills shortages and hard to fill vacancies.

Figure 3.22 also points towards a situation whereby relatively low-paying sectors, such as wholesale, transportation and accommodation, employ a notable share of the workers in Malta. In contrast, the highest-paying sectors, such as the financial and insurance and the information and communication sectors, are associated with a relatively low employment level.

Figure 3.22: Average Annual Basic Salary and Employment Level (2018)



(Source: NSO 2018)

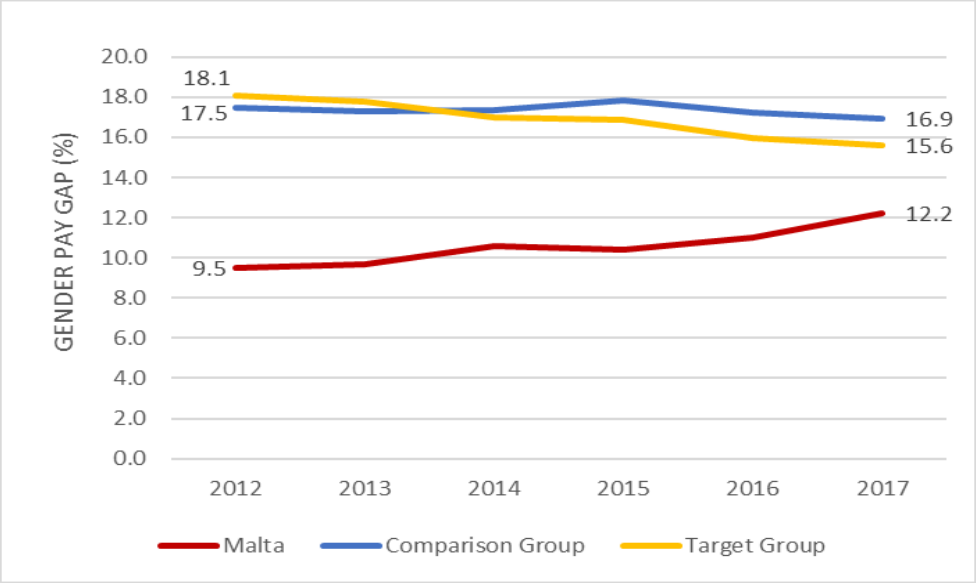
This observation points towards an element of weakness in the Maltese labour market, in that a notable share of the workers in Malta are engaged in low-paying jobs. In the absence of adequate measures targeting training and upskilling, such workers could fall into in-work poverty[35]. Indeed, while in 2017, Malta was recorded to have the fifth-lowest risk of in-work poverty of all EU28 countries (at 5.9%), between 2012 and 2017 there was still an overall increase of 13.5% persons who were at risk of in-work poverty in Malta (Borg, 2019). Within the context of a booming economy, this increase in the in-work poverty merits higher policy attention.

The tightening labour market is expected to result in increased wage pressures over time. Nevertheless, wage growth has been contained by rising labour supply resulting from inflows of foreign workers and higher participation of women in the labour market. Overall, nominal wage growth in recent years has been broadly in line with macroeconomic developments (European Commission, 2019).

When it comes to the gender pay gap[36], as a percentage of men's average gross hourly earnings, it can be observed that this is widening in Malta. Indeed, *Figure 3.23* indicates that the gender pay gap increased from 9.5% in 2012 to 12.2% by 2017. In contrast, although the gender pay gap is, on average, higher in the comparison and target countries, it appears to be narrowing over time.

Figure 3.23: Gender pay gap (% of average gross hourly earnings of men)

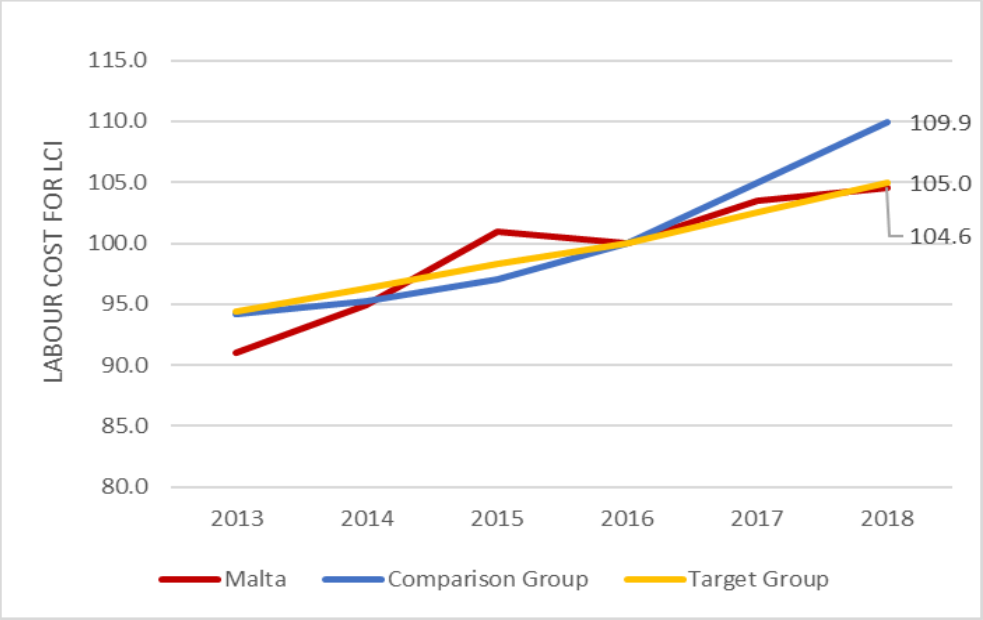
[35] A person is considered to be at risk of in-work poverty if they are in employment or self- employment for more than half of the year and live in a household that is at risk of poverty.
[36] The indicator is unadjusted, that is, it gives an overall picture of gender inequalities in terms of pay and measures a concept which is broader than the concept of equal pay for equal work.



(Source: Eurostat 2019)

Turning to labour costs, Figure 3.24 indicates that these appear to be on an upward trend in Malta. Relative to the selected countries, it can be observed that the labour costs in Malta are in line with the average labour costs in the target group but less than the comparison group, indicating that Malta is still considered to be competitive in this regard. Labour costs primarily reflect developments in wages and salaries whereby wage growth is considered to have been quite subdued relative to the state of development of the economy.

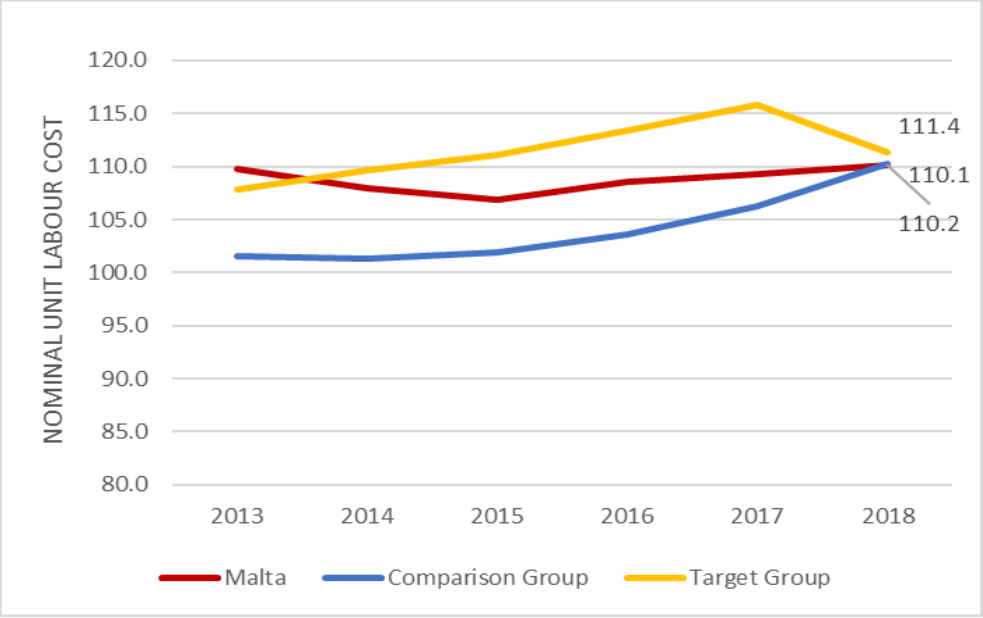
Figure 3.24: Labour Cost Index



(Source: Eurostat 2019)

Error! Not a valid bookmark self-reference. indicates that the nominal unit labour costs for Malta appear to be quite stable as opposed to those in the target and comparison countries whose labour costs appear to be on an upward trend (with the exception of 2017 in the target group). Indeed, in contrast to the real unit labour costs observed in *Chapter 1*, the trajectory of nominal unit labour cost point towards relatively stable labour costs for Malta, implying that wages and salaries are moving in line with productivity.

Figure 3.25: Nominal Unit Labour Costs (based on persons)



(Source: Eurostat 2019)

In conclusion, developments in the labour market are reflecting a market of growing opportunities. Employment growth has been robust, providing opportunities for both local and foreign workers. Nonetheless, areas which merit more attention by policymakers, and which will be discussed in further detail in the concluding section of this chapter are the following:

- Quality of the workforce: This involves a focus not only on job creation but also on the creation of opportunities for people who are already gainfully occupied to improve their position in the labour market, hence allowing them to improve their income level and reduce the risk of in-work poverty.
- Future sustainable development of the Labour Market: In ensuring that the current positive performance registered in the labour market is sustainable, overall social integration of foreign workers in the labour market should be targeted. Furthermore, measures which further promote a work-life balance could contribute to making the best use of the human capital available.

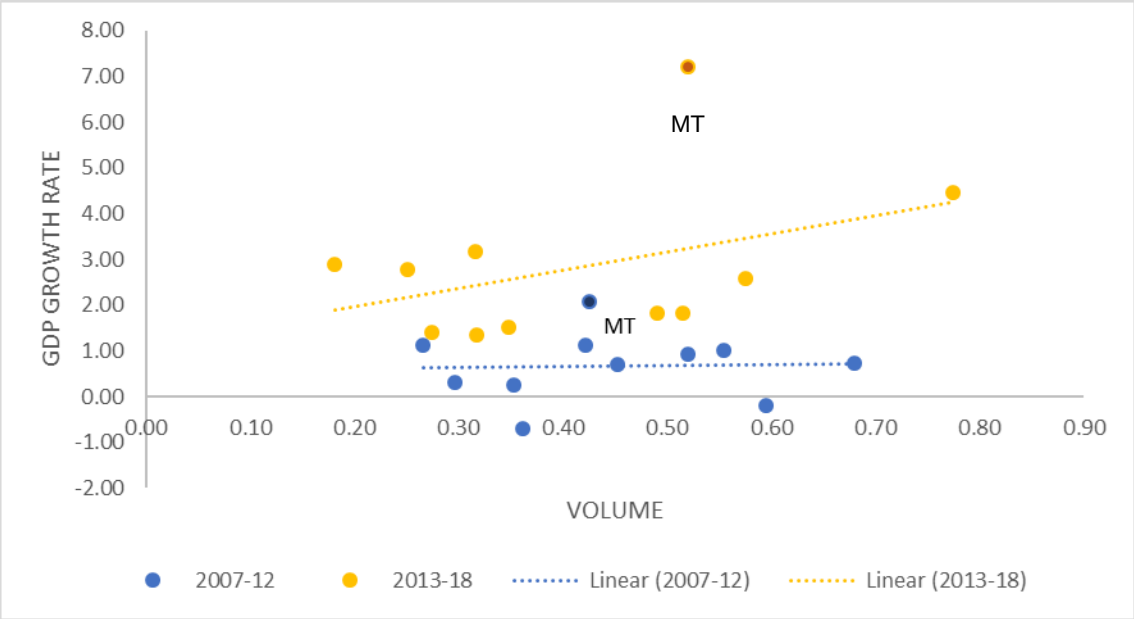
3.2 The Relationship Between Human Capital and Growth

This section presents an analysis of the relationship between human capital, growth and economic development for Malta and the comparison and target countries. The relationship between the volume of human capital and GDP growth is analysed first followed by the quality of human capital indicator and its relationship to GDP per capita.

Figure 3.26 presents a scatter with the average values of the Human Capital volume index and the corresponding GDP growth rate for two periods, namely 2017-2012 and 2013-2018, for Malta[37] and each of the comparison and target countries. Average values for GDP growth are being considered to smoothen out exogenous factors that may be present in the data as well as to obtain a medium-term trend.

[37] The points for Malta for the first and second periods are marked in a darker shade of blue and orange, respectively.

Figure 3.26: Human Capital Volume Index and Economic Growth



(Source: Authors' estimates based on Eurostat and World Bank data)

As illustrated by the two trend lines presented in the Figure, the relationship between the Volume of human capital and GDP growth is neutral in the first period, with the relationship changing to a positive one between the two variables, for the second period under consideration. This sheds light on the fact that volume is required to sustain GDP growth, though not in a recessionary period where the volume of human capital did not really help to increase growth.

It can be noted that he volume of human capital is helping to sustain a higher level of growth that is currently being experienced[38], provided that Aggregate Demand is strong. During the recessionary period, the effect of the volume of human capital on growth was neutral, since Aggregate Demand was relatively weak in the wake of the international recession.

In the case of Malta, during the recessionary period, the economy was not adversely affected as that of other countries as it emerged from this experience as a stable, diversified economy which still attracted foreign workers. Despite this, Malta still suffered from vulnerabilities due to the dependence on the international business both in manufacturing and tourism, which had an impact on aggregate demand,

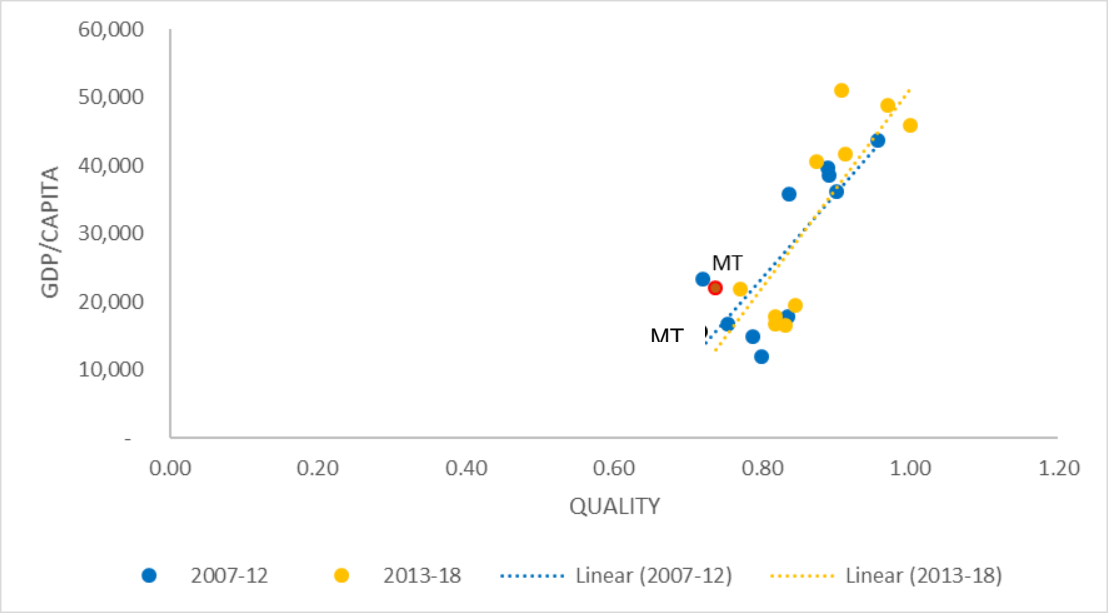
[38] The average GDP growth rate has risen from the first to the second period for all countries, especially for Malta. The average growth rate for the comparative and target countries increased from 0.38 and 0.68 to 2.3% and 2.4%, respectively, over the period under consideration. For Malta, the growth rate has steadily risen from 2% to 7%.

albeit to a relatively smaller extent. Therefore, it can be noted that during the first period under consideration, the volume of human capital did not really help economic growth. This is in stark contrast to the second period which experienced much stronger growth rates coupled an increase in the volume of human capital. To this end, it can be noted that the volume of human capital is serving to sustain the growth spurt that is currently being experienced, as long as aggregate demand remains strong.

Figure 3.27 presents the average values of the Human Capital quality index and the corresponding GDP per capita for two periods, namely 2007-2012 and 2013-2018, for Malta[39] and each of the comparison and target countries. Average values for GDP per capita are being considered to smoothen out exogenous factors that may be present in the data and obtain a medium-term trend. As illustrated by the two trend lines presented in the Figure, the relationship between the quality of human capital and GDP per capita is strongly positive in both periods. This sheds light on the fact that quality of human capital is required to sustain a higher per capita GDP level within the sample of countries belonging to a common economic grouping and hence, are subject to convergence factors. To this end, quality improvements are essential to sustain higher per capita GDP levels in the selected countries in the longer term, leading to sustainable growth.

[39] The points for Malta for the first and second periods are marked in a darker shade of blue and orange, respectively.

Figure 3.27: Human Capital Quality Index and GDP per capita



(Source: Authors' estimates based on Eurostat and World Bank data)

In the case of Malta, quality improvements had a positive impact on GDP per capita within the context of a convergence scenario, following EU accession, irrespective of the performance of the economy. This reflects the importance of quality improvements in human capital for Malta to sustain higher per capita GDP levels in the longer term especially within a context where the rate of growth may slow down and where significant inequality gaps between sectors and occupations that may exacerbate in-work poverty.

In conclusion, this section has highlighted that the quantity of human capital is sufficient to sustain GDP growth during periods of high demand indicating potential for growth of a short-term nature as was the case in Malta post 2013. Deficiencies in human capital of a quality nature are detrimental to sustainable growth. In particular, Malta must invest in the quality of human capital so as to further converge to target EU countries as well as reap the benefits obtained from long term growth.

3.3 Future Scenarios

This section presents a forward-looking approach and identifies the opportunities and threats which are expected to affect the labour market in Malta, based on the 2018 Ageing Report for Malta[40] and the Cedefop Skills Forecasts[41], building on the analysis presented in the previous sections. The strengths and weaknesses of the Maltese labour market were presented through the Human Capital composite index, which in relation to the selected group of countries, elicited the quantity of human capital as a strength due to the high influx of migrants and the increase in the labour market participation rate. The quality of human capital has been identified as a weakness due to the lack of education attainment and skills which are existent within certain pockets of the population.

The demographic projections presented in the Ageing Report indicate that total population in Malta is projected to rise from 437,658 in 2016 to around 521,000 in 2070. While the share of very young people (aged 0-14 years) in the total population is projected to hover around the 15% share, the share of the people aged 65+ is projected to increase from 19% to 30%.The working-age population (aged 20-64 years) as a proportion of the total population is expected to fall from 61% in 2016 to 46% by 2070. Over the same period, annual net migration is also expected to decline from 0.8% to 0.2% of the population. The projected drop in net migration as well as the fall in the working age population indicate a potential threat to human capital as an insufficient supply of human capital may result both in terms of volumes as well as quality, which can be more accentuated within certain sectors. For example, sectors with the highest recruitment of foreigners such as Information and Communication, Construction and Financial and Insurance activities are expected to be hit worse than sectors that are not so dependent on the recruitment of foreigners such as Public Administration.

On the other hand, opportunities for human capital both in terms of quantity and quality emanate from an increase in the labour force participation rate and the employment rate. Rapa (2019) estimates labour market participation rates over the medium-term, taking into account gender, age, period and cohort

[40] https://ec.europa.eu/info/sites/info/files/economy-finance/ip079_en.pdf
[41] https://www.cedefop.europa.eu/en/publications-and-resources/country-reports/malta-skills-forecasts-2025

effects[42]. Results emanating from this study indicate that Malta's working age population is expected to reach 342,941 by 2030, implying an average annual increase of 0.7%. Furthermore, the overall participation rate is expected to reach 80.4% in 2030, from 72.2% in 2017. Malta's overall participation rate is expected to exceed the euro area average (projected at 74.4% in 2030) due to both an expected growth in the female participation rate, as well as an overall male participation rate which is expected to remain above the euro area average (Rapa, 2019).

Turning to the projections presented in the Ageing Report, the indications point towards a participation rate for the 15-64 age bracket which is projected to reach a peak in 2070 at 80% from 69% in 2016. Meanwhile, the employment rate for workers aged 15-64 is projected to increase from 66% in 2016, reaching 74% in 2030 and stabilizing thereafter. These increases are largely attributable to the increase in the female and older workers labour force participation and employment rates. Furthermore, the projected increase in life expectancy at birth and at age 65 by around 6.5 and 4 years respectively, over the period under consideration, indicate a higher potential for persons to extend their working lives.

The increase in pension age is also expected to have an impact on the working age population and hence potential output. The pension age in Malta started to rise in 2012, rising gradually from 61 for men and 60 for women to 65 for both genders, with the final rise scheduled for 2026 (Grech, 2016). Grech (2016) argues that the increase in pension age could have a significant impact on Malta's economy. Indeed, in the absence of such changes in pension age, Malta's working age population was projected to decline by 3.3% over the next decade. This trend is expected to be reversed when taking into account the rise in pension age to 65, such that the working age population increases by 2.3%. Grech (2016) explains that by the time pension age will have reached 65, the potential working age population will be 24,171 more than if the pension age had remained at 61 for men and 60 for women. Against this background, these legislated increases in the pension age coupled with incentives to postpone retirement are expected to impact the effective exit age. Indeed, according to the Ageing Report, this is projected to reach 63.3 years in 2070 from 62 years in 2016.

It can be noted that an increase in the female participation rate is considered to contribute to improve the quality of human capital especially since females register higher rates of education attainment, as

[42] For an explanation of each of these effects, refer to Rapa (2019), "A cohort approach to project the labour participation rate in Malta", page 9.

presented in Section 3.1 of this report. Older workers that would have gained years of experience throughout their working lives are expected to alleviate the problem of skills shortages due to deficiencies in human capital.

According to the Cedefop's Skill Supply and Demand Forecasts up to 2025, future employment growth in Malta, up to 2025, will be concentrated in business services, and the distribution and transport sectors, while, in the primary and manufacturing sectors employment will continue to fall. In Malta, most job opportunities, around 26%, will be for professionals (high level occupations in science, engineering, healthcare, business and teaching), followed by service and sales workers with 20%. Most job opportunities in Malta will require high-level qualifications followed by medium-level qualifications.

Cedefop forecasts that by 2025, the share of the labour force with high-level qualifications should rise to 39.2% compared to 28.4% in 2013 and 21.3% in 2005. People with medium-level qualifications in 2025 will account for 34.4 % of the labour force, compared to 25.6% in 2013. The share with low-level or no qualifications is forecast to fall from 46% in 2013 to 29.4% in 2025. According to Cedefop's forecasts, by 2020, in Malta, around 48% of 30 to 34-year olds will have high level qualifications, above the EU's educational attainment benchmark of 40% by 2020. It must be noted that as demand for higher level skills are increasing, older less-qualified people are leaving the labour market whilst younger more highly-educated people, including migrants, are entering the labour market.

As presented in Section 3.1, since Malta fared worse and registered only a marginal improvement with respect to the human capital quality index in comparison to the other countries, the increasing demand for medium to high qualifications may pose a threat. Furthermore, as outlined in Chapter 1 and earlier on in this chapter, in Malta, in 2018, around 17.5% of young people left the education and training system with low-level qualifications, substantially higher than EU average of 10.6%. To this end, Malta needs to do more to further lower the rate of early school leavers and the share of persons within the labour force with low-level qualifications. This is especially important since the inequality gap between the highly skilled and the lower skilled persons, especially those of the younger generation, continues to grow.

3.4 Key Conclusions and Policy Recommendations

Conclusions

This chapter aimed to provide a broad view of human capital development in Malta, by studying the trajectory of several indicators in the context of comparison and target countries. The departure point of this analysis involved an assessment of the World Bank's Human Capital Index (HCI) whereby the HCI for

Malta for a child born in 2013 is estimated to be 70% as productive when he/she grows up as the child could be if he/she enjoyed complete education and full health. The same HCI is recorded for a child born in 2017, indicating that no improvement was recorded over the 5-year period.

This chapter recognises the limitations of the World Bank's HCI, in terms of focusing only on the quality aspect of human capital. For this reason, a broader approach is adopted such that developments in both the volume and quality of human capital are considered. In assessing the volume aspect of human capital, this chapter looks into demographic developments in Malta. The key conclusions in this regard are the following:

- Annual population growth in Malta has generally been on the rise, such that in 2018 it reached 3.3%. In contrast, the annual population growth in the comparison and target group of countries is less than 1% throughout the whole period considered, that is from 2013 to 2018.

- Net migration has reached 17,102 persons in 2018, largely influencing population dynamics in Malta. The inflow of migrant workers has served to mitigate the labour shortages that are associated with a full employment situation, thereby enabling further economic growth.

- Malta also experienced relatively high emigration rates when compared with countries in the comparison group and the target group, implying that Malta is experiencing a phenomenon of both relatively high migrant inflows as well as outflows.

- The length of stay of migrant workers is rather short, possibly casting doubts on Malta's attractiveness to immigrants. Nevertheless, the relatively low retainment of foreign workers may be explained by the fact that Malta offers a dynamic labour market, in the sense that it is creating opportunities for a generation which is after flexible and task-oriented assignments.

This chapter then turns to investigating the quality of human capital by considering developments in educational attainment. This analysis points towards the following conclusions:

- When it comes to share of share of young people who are neither in employment nor in education and training (NEET), the highest challenge for Malta appears to be with respect to the younger age cohort (15 to 19 years old). Indeed, the NEET rate for this age cohort stood at 6.3% in 2018, hence higher than those within the comparison and target group of countries.

- Malta has recorded improvement in lifelong learning in recent years, such that it converged to the comparison group. It is however still lagging behind the target countries.

- Malta compares well with the comparison countries when it comes to tertiary attainment. Indeed, the graduates at ISCED levels 6 to 8 in 2018 represent 0.8% of the total population in both Malta and the comparison countries. Nonetheless, the target countries are performing relatively better, with the number of graduates in 2018 representing around 1.3% of the population.

- From 2013 to 2018, the share of the labour force population with an ISCED level ranging from 0 to 2 decreased by around 8 percentage points. Nevertheless, Malta still appears to be lagging behind when compared to the countries within the comparison and target groups.

In the context of these observations, this chapter derives and presents a Human Capital Composite Index which is further decomposed in a Human Capital Volume Index and a Human Capital Quality Index. The Human Capital Volume Index considers the Attractiveness to Immigration Index, the Expected Population Growth, the Female Participation Rate, the Duration of Working Life, the Implicit Tax on Labour and the Percentage of Employees working from home. As for the Human Capital Quality Index, this includes the Adult Participation in Learning and the World Bank Human Capital Index. These indices were derived for two periods, namely for 2007 to 2012 and 2013 to 2018. The indicator related to the average expected growth in the population was studied for the period 2012 to 2017 in the first period and for 2018 to 2030 for the second period.

Upon consideration of Malta's performance in these indices, the following conclusions are drawn:

- Over the period under consideration, Malta registered an improvement with respect to all indicators, except for the Implicit Tax on Labour.

- Malta's progress is considered to have exceeded that registered within the selected countries when it comes to the attractiveness to immigration, female participation, duration of working life and adult participation in learning.

- In contrast, the selected countries' performance was better than that of Malta in terms of the percentage of employees working from home and in the World Bank Human Capital Index.

- As for the average expected population growth, Malta progressed well relative to the target countries but its progress was less than that observed in the comparison countries.

- Finally, Malta's performance was very similar to that observed in the comparison countries when it comes to the implicit tax on labour. In contrast, the target countries' average performance was better since the increase in the implicit tax on labour was less than that of Malta.

In view of the above, the main strength within human capital in Malta lies within the volume aspect whereas further efforts are required with respect to improving the quality aspect, in particular within priority categories of the population which register low educational achievement.

Based on the above considerations, the chapter than delves into the developments in employment, unemployment, labour income and labour costs. A clear observation emanating from this section is that employment growth has been robust, providing opportunities for both local and foreign workers. Nonetheless, higher policy efforts may be required with respect to improving the quality of the workforce whereby more opportunities are created for employees to improve their position in the labour market. Furthermore, another area requiring more attention is the future sustainable development of the labour market in terms of higher social integration particularly for migrant workers as well as work-life balance measures.

In studying the relationship between human capital and economic development, this chapter also concludes that while the volume of human capital is sufficient to sustain GDP growth during periods of high demand, deficiencies in the quality of human capital may pose a threat to sustainable growth. In particular, Malta must invest in the quality of human capital so as to further converge to target EU countries as well as reap the benefits obtained from sustainable long-term growth.

A consideration of future scenarios points towards a projected drop in net migration. This could be a potential threat to human capital since an insufficient supply of human capital may compromise the notable economic growth recorded over the past years. On the other hand, opportunities for human capital both in terms of quantity and quality emanate from an increase in the labour force participation rate and the employment rate, especially the female category which tends to have a higher level of education attainment.

Policy Recommendations

In view of the developments and areas of concern identified above, this part of the report aims to put forward several policy recommendations which could tackle human capital weaknesses while making the best use of existing strengths. Based on the foregoing analysis, policy makers can explore the following recommendations, in the areas of educational attainment and labour market development.

Educational Attainment

- Recommendation 1: Intensify the efforts directed at reducing the Early School Leaving (ESL) rate. Despite measures to tackle early school leaving, the rate registered for Malta is still one of the highest in the EU. More specifically, access to quality education is uneven, disadvantaging lower socio-economic groups as well as those with learning and behavioural difficulties and disabilities. In particular, the low average test scores observed in secondary school level need to be tackled since disparities between the very good achievers and the low ones is bringing down the average score. In view of this challenge, a rigorous investigation of such disparities is to be undertaken with the aim of implementing specific actions that are tailor made to help relatively low achievers. Measures targeting the ESL rate have been repeatedly recommended within the country specific recommendations for Malta throughout the last decade.

- Recommendation 2: Social inclusion of immigrants within the education system needs to be further encouraged. This may require the introduction of new learning methods which move away from rigid practices to allow for higher flexibility in the learning process of children and younger people. Language plays a key role in facilitating this integration process. Against this background, adequate support facilities for students with a migrant background are required to facilitate their transition into a new environment.

- Recommendation 3: Further encourage apprenticeships to ensure that young people especially low achievers have the opportunity to obtain the necessary qualifications, while applying the skills acquired in practice with the assistance of experts. This is considered to be of utmost importance especially within the context of a favourable labour market situation which may be hampering efforts to reduce early school leaving. Through the establishment of partnerships with stakeholders both at local and European levels, quality apprenticeships can prevent and reduce local workforce unemployment and inactivity.

- Recommendation 4: Efforts need to be sustained in terms of encouraging participation by low-skilled employees in adult learning, through incentives targeted especially at those persons that have precarious jobs. Participation in adult learning is increasing but is still low for the low-skilled and the inactive. Indeed, life-long learning was a country-specific recommendation in 2016 whereby the participation of low-skilled persons in life-long learning is seen as crucial in strengthening the labour supply in Malta. Against this background, career guidance and

information about training and funding opportunities should be available to this category of workers.

- Recommendation 5: Adopt a holistic approach whereby the creation of skills is mainstreamed within each element of economic and social development policies in Malta. This implies that the country is to adequately provide for the skills demanded by the setting up or expansion of certain sectors. For instance, the sustainability of sectors such as the medical cannabis sector and the video-gaming sector also hinges on the availability of skilled labour. To this end, it is also crucial to develop sound measures for skills forecasting as a basis for policy development, with proper consultation amongst education providers, policy makers and employers.

Labour Market

- Recommendation 1: Ensure equal opportunities amongst priority categories of workers, including females (addressing the gender pay gap), older workers and workers with a disability. Gender inequality continues to be a concern in the labour market. In addressing this area of concern, an equal treatment is required between the sexes such that for instance, a more equal use of work-life balance arrangements between the sexes has been shown to have a positive impact on women's employment (European Commission, 2016). In contrast, gender differences in work and care responsibilities can be further exacerbated by the lack of paid leave arrangements for fathers - relative to mothers - or insufficient incentives to make use of them. Furthermore, this may also give way to higher labour market discrimination. In strengthening the principle of equal pay between men and women, further transparency is required. Similarly, ensuring equal opportunities for older workers as well as workers with disability first involves an understanding of the specific needs and aspirations of these categories of workers. For instance, with respect to workers with disability, employers should ensure that the required restructuring in jobs, modifications in work schedules and other alterations are available for such workers.

- Recommendation 2: Continue to sustain work-life balance to ensure longer working lives, which address not only the facilities but also the culture in the workforce. This involves inducing a higher degree of flexibility in the labour market with the aim of eliminating or reducing real and perceived barriers to entering in the labour market. More specifically, this includes flexibility-based schemes such as flexible start and finish times, reduced hours options and switch from full-time to part-time options which serves to improve the retention of older workers in the labour market. Furthermore, family-oriented measures such as subsidised childcare at the workplace and dual-purpose sick leave also contribute to striking a balance between work and family life, hence making it possible for females to work longer hours.

- Recommendation 3: Ensure that Malta remains an attractive place to live and work to retain migrant workers as well as the local population. This chapter has pointed towards a surge in the

attractiveness to immigration over the past years. Nevertheless, it has been observed that the length of stay of foreign workers is rather short. While this may be attributed to such workers being engaged in project-based assignments, the retainment of foreign workers potentially requires higher policy effort. To this end, factors such as the cost of living, in particular the affordability of property for rent and the quality of life are to be monitored so that the necessary actions are taken.

- Recommendation 4: Social integration at the place of work is to be ensured. This could include developing a Centre to educate foreigners coming over to Malta about regulations and work practices. This centre could also provide courses to equip foreigners with the basic vocabulary that they require in order to be able to communicate in their line of work.

- Recommendation 5: Make use of European Social Funds to tackle in-work poverty. This chapter has shown that there is a notable share of the workforce engaged in economic sectors associated with a relatively low average basic salary. Against this background, measures are required to address the mass of workers who are on relatively low wages. Such workers are also often time poor, in that their work commitments leave insufficient time for up-skilling, re-skilling and multi-skilling purposes. Employer direct incentives could contribute to alleviate in-work poverty by compensating employers who offer training opportunities to their workforce, including training during working hours.

- Recommendation 6: Introduce mechanisms which favour higher procyclicality of wages and salaries. While workers' income should always be protected from cycles, the countercyclicality of wages and salaries should be kept in check. Otherwise, the economy could face the risk of an upward pressure on wages at a time when a cyclical downturn is surfacing. Against this background, mechanisms that reduce this risk are to be encouraged. For instance, performance bonuses given to workers during times when the firm is doing well pose a much lower threat than permanent increases in wages which may not be sustainable under an economic downturn scenario.

- Recommendation 7: Workplaces should consider introducing the concept of mentoring as well as a knowledge-transfer programme that should be designed, to ensure that companies preserve competence and knowledge especially where there is high staff turnover.

- Recommendation 8: Marketing campaigns are to be strengthened to ensure that present and potential employees are aware of the opportunities arising in different sectors. This includes addressing misconceptions attributed to a number of occupations including those which are more subject to gender stereotypes.

CHAPTER 4: RESEARCH & INNOVATION AND THE EMERGENCE OF NEW SECTORS

4 RESEARCH & INNOVATION AND THE EMERGENCE OF NEW SECTORS

4.1 Introduction

Growing economies are characterised by high economic structure dynamism, where the composition of the economic system changes through economic development. Economic development is in fact a process in which new activities emerge, old ones disappear, and the weight of all economic activities and their patterns of interaction change (Saviotti & Pyka, 2004). This concept within the development of the Maltese economy was illustrated in Chapter 2 of this Report which identified the lead and laggard sectors of the economy and an outline of how the Maltese economy has changed over the years.

The development of new sectors and productivity growth in existing sectors are complementary and not necessarily independent aspects of economic development (Saviotti & Pyka, 2004). The complementarity arises from the need to balance productivity and demand growth. Productivity allows the production of goods and services with less resources, and unless sufficient new demand in the economy is created by new sectors (besides from lower pricing due to productivity), the required utilisation of resources (including labour) would fall. On the other hand, new sectors with new goods and services can only be generated through innovation activities, for which resources can be 'freed up' through productivity growth in existing sectors.

Economic development and competitiveness thus necessitates innovation for productivity growth in existing sectors, the generation of new niches within innovating sectors, and the creation of new economic sectors. At any point in time, however, an economy possesses limited resources for innovation activities. A fundamental question which inevitably arises relates to which economic sectors a nation's innovation effort should mostly focus upon in pursuit of competitiveness. Smart specialisation is the EU and national approach in this regard; it involves the identification of strategic areas for intervention based both on the analysis of the strengths and potential of the economy and on an Entrepreneurial Discovery Process (EDP) with wide stakeholder involvement[43]. Smart specialisation is a business-driven process

[43] Source: European Commission, http://s3platform.jrc.ec.europa.eu/what-is-smart-specialisation- [Accessed May 2019]

encouraging investment in areas complementing the country's other productive assets in order to create future capability and comparative advantage. Malta's current R&I smart specialisation strategy has influenced its recent economic structure development and shapes its future outlook. An update to this R&I strategy is also currently being worked upon by the authorities.

This chapter seeks to analyse developments in the Maltese R&I sector, and economic structure and productivity, within the context of the above introduced concepts. Specifically, it presents:

- A literature review on how innovation and R&D are expected to contribute to productivity and competitiveness, especially in the context of small states and the current digital revolution.
- An overview of Malta's strategic objectives and progress in R&I.
- A qualitative analysis of how innovation is shaping new growth areas in the Maltese economy.
- Policy recommendations for future actions in the area.

4.2 Literature review – Innovation for productivity and competitiveness

This sub-section aims at presenting a review of knowledge and findings in the literature on the ways/ extent innovation can lead to enhanced productivity and economic growth. This review is intended to provide the framework within which the analysis of R&I and emergence of new sectors in Malta discussed in the rest of this section can be better assessed. Hence, the review also focuses on the relationship between innovation and productivity within the context of small states.

Research, development and innovation

The terms research, development and innovation are often used interchangeably and conjunctly, perhaps in a confusing manner. However, the terms refer to complementary but different concepts and stages towards increased productivity. Hence it is deemed to best first have a clear formulation of what these terms stand for within this Chapter's analysis.

The Oslo Manual prepared by the OECD and Eurostat is the most established reference for the definition of innovation. The 2018 Manual defines innovation as "a new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process)" (OECD and Eurostat, 2018). Within this definition a distinction is made between product innovation and process innovation. Product innovation refers to the market introduction of a new or significantly improved good or services, whilst process innovation refers to the implementation of a new or significantly improved production process, distribution method or support activity for goods or services.

The Oslo Manual also clarifies that 'innovation' can also signify the activity that produces this outcome. Indeed innovation activities are defined as including "all developmental, financial and commercial activities undertaken by a firm that are intended to result in an innovation for the firm" (OECD and Eurostat, 2018). Research and experimental development (R&D) is considered as one of these innovation activities. It is defined as comprising "creative and systematic work undertaken in order to increase the stock of knowledge and to devise new applications of available knowledge". R&D is only one of a range of activities that can generate innovations or through which useful knowledge for innovation can be acquired. Other activities include market research, engineering activities to assess the efficiency of processes, employee training activities, software development or analysing data from the users of digital goods or services (OECD and Eurostat, 2018).

Within the above definitions, innovation is an outcome based concept where the new product or process are made available in the market or put into use. R&D is one of the inputs (innovation activities) that could lead to this outcome. As formally defined, while R&D is one of the important inputs for innovation, it is neither a sufficient nor necessary condition for innovation to occur. For instance, the diffusion of existing

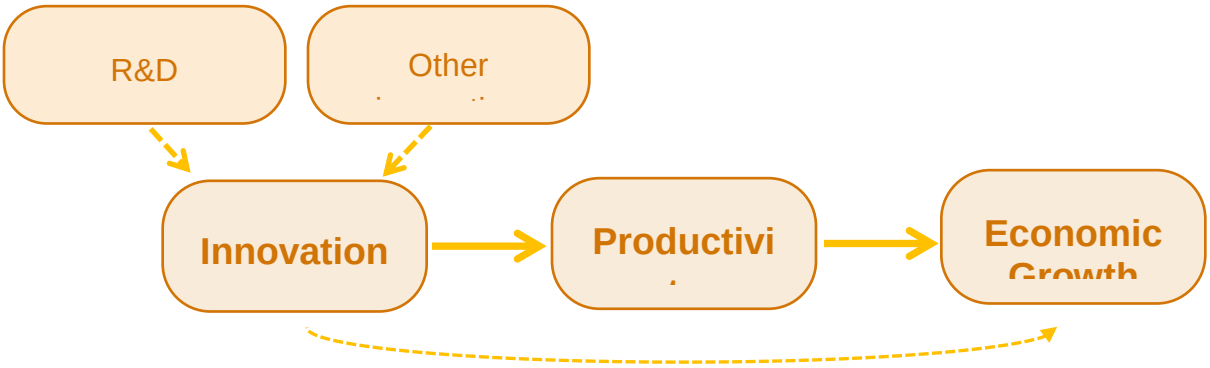
technologies and practices across an economy is also a form of innovation. Research and innovation are however intrinsically linked, and the need to improve the links between the two (getting more innovation out of research) has led policymakers to develop Research & Innovation (R&I) strategies.

Innovation developments within the Maltese economy have been assessed in this report within this conceptual framework. A clear understanding of these definitions is also important as they are the basis on which the widely referred to Eurostat data is compiled.

Innovation and productivity

Innovation and its main R&D input are considered as one of the main drivers of long-term economic growth. As presented in the below diagram, innovation resulting from innovation activities (such as R&D) leads to enhanced productivity which in turn enhances the economy's long-run growth potential. The channels through which this chain operates are then summarised. – the focus of this Chapter is on the Innovation Activities → Innovation → Productivity channels.

Figure 62: From innovation to economic growth



The link between productivity and economic growth is described in economic theory through the growth accounting framework. Within this framework, economic growth not explainable by growth in factors of production (capital and labour) is attributed to productivity growth (growth in Total Factor Productivity [TFP]). The TFP-economic growth link and the determinants of TFP have been discussed in further detail in Chapter 1 of this report.

There are two main channels through which innovation can translate into productivity improvements. Firstly, innovation in existing firms can both increase their efficiency and improve the goods and services they offer, thus increasing demand as well as reducing costs of production. Secondly, innovating firms are likely to grow more than others and new entrants with better products to offer are likely to displace existing inefficient firms, increasing aggregate productivity levels (Hall, 2011).

Empirical evidence on the relationship between innovation and productivity finds economically significant impacts of both product and process innovation on productivity (Hall, 2011). Most of the studies have found a positive effect of product innovation on productivity. Product innovation enhances firms' productivity by creating a new source of demand potentially giving rise to scale effects or requiring less inputs than old products (Mohnen & Hall, 2013). A product innovation completely new to the market has larger potential in terms of creating productivity gains (Mohnen and Hall, 2013). Process innovation is directly related to reductions in costs and hence it is expected to produce more direct productivity gains. Empirical evidence is, however, more ambiguous here due to the difficulty of measuring the real effect of process innovation. (Hall, 2011). Even though innovation is in many cases difficult to measure, it is generally associated with increased productivity. Empirical studies demonstrate that, for instance, patents, as a measure of innovation output, have a significant impact on firms' productivity performance (Fazlioglu et. al, 2016)

Product innovation (new goods and services) can also produce a more direct impact on economic growth through the creation of new economic sectors which stimulate aggregate demand in the economy. Besides productivity improvements in existing sectors, the creation of new economic sectors is necessary to balance productivity and demand growth (Saviotti & Pyka, 2004). The creation of new sectors is on the other hand dependent on productivity enhancements in existing sectors which release resources for innovative activities. Saviotti & Pyka (2004) indicate how increasing firm efficiency raises the rate of creation of new sectors, speeding up economic development.

R&D is one of the main innovation activities (input to innovation output) on which the literature has focused upon. R&D can increase productivity by improving the quality or reducing the average production costs of existing goods or simply by widening the spectrum of final goods or intermediate inputs available (Hall et al.,2009). Furthermore, R&D often produces a social return which is larger than private returns due to spillover effects. R&D executed in one firm can affect the productivity performance of other firms operating in the same industry or in other industries, either locally or abroad. It can inspire new research projects or find new applications in other firms, sectors or countries. R&D done by universities and public research authorities also produce spillover effects throughout the economy. The spillover effects can be 'monetary' and 'non-monetary'. Monetary spillovers occur when new or improved intermediate goods or investment goods are sold to other firms at prices that reflect less than the full value of the progress they incorporate. Non-monetary spillovers are those that come from the knowledge created by R&D as it disseminates and becomes useful to other firms (Hall et al., 2009). Private rates of return to R&D have been found to be positive in many countries, and usually larger than those to ordinary capital. Social returns are almost always found to be substantially greater than private returns, and often quite asymmetric among trading partners and industries (Hall et al., 2009)

Other studies have sought to determine the contribution towards productivity and economic growth of R&I, defined in a broader manner. A 2017 policy brief by the EC Directorate-General for Research and Innovation has gathered the main findings from such studies (European Commission, 2017). While the estimated impacts vary depending on the methodology used and the period, countries and industries analysed, some typical findings of the estimates of R&I impacts on productivity and economic growth reported by the policy brief are:

- Two-thirds of economic growth in Europe from 1995 to 2007 derives from R&I, broadly defined.
- Among all investment categories that drive labour productivity growth, including investment in tangible capital, or economic competences, R&I accounts for 15% of all productivity gains in Europe.
- An increase in 10% of R&D investment is associated with productivity gains ranging from 1.1% and 1.4%.
- These impacts on productivity and economic growth are mainly driven by positive and significant rates of return to R&I investment for firms investing in R&I. Although there is significant heterogeneity across firms, returns from R&D investment in advanced economies is estimated to be in the range of 10% to 30%.
- The empirical evidence is still inconclusive on the impact of R&I on jobs. It is often argued that R&I-enabled new technologies such as ICT, robotisation or Artificial Intelligence are expected to automate a large number of existing jobs and deeply transform others, potentially resulting in job losses. However, at the same time, these technologies will also create new and higher quality job opportunities in technology and knowledge intensive sectors.
- The impact of R&I depends on a broad set of place specific factors. The following factors have been found to affect the levels of R&I investment and its productivity: (1) macroeconomic stability; (2) business environment and the functioning of markets; (3) financial conditions, (4) availability of human capital, (5) economic structure and degree of international openness; or (6) distance to the technological frontier. Hence the impact of R&I varies across countries/ companies.

Innovation in small states

Small states like Malta are less likely to benefit from the spillover effects of R&D and innovation since their scale limits the development of a nucleus of firms which devote substantial efforts towards innovation (Camilleri, 2013). Innovation and the generation of novel ideas are still key elements for productivity growth in small economies as they may compensate for small states' structural deficits. However, innovation activity may be costlier for such countries due to their scarce resources of technology and human capital. Small economies also need to overcome the natural barrier of limited funds for innovation activities such as R&D necessary for the development of an innovation-oriented economy.

Small scale does not inhibit small states from creating and building an innovation-oriented economy that generates value added by offering products and services which require high aptitude and technical skills. The main focus in such an economy is on knowledge-intensive activities and innovative operating models (Camilleri & Falzon, 2013). The business structure of small states tends to be dominated by SMEs whose disposition towards R&D investment and innovation is often hampered by issues of economies of scale, limited resources such as human resources and cash flows and vulnerability in the face of riskier R&D and innovation activities. SMEs typically seek to foster innovation through building relations with innovative suppliers and customers and through maintaining contacts with research-based institutions (Lasagni, 2012). In fostering innovation, small economies tend to rely to a greater extent on Foreign Direct Investment (FDI) and the absorption of technology from countries more advanced in the technological frontier (Vella, 2016). For smaller EU member states like Malta, innovation is facilitated through the expansion of the market, a regional innovation policy, structural funding and access to wider pools of human and technological resources, thus dampening the relevance of the small domestic limiting factor (Kattel et al., 2010).

The digital revolution

Unsurprisingly, in the digital era we are living in, research has devoted particular focus upon the role of ICT as an enabler of innovation and productivity growth. ICT is the driving force of the digital era and has the potential to spur innovation, job creation, productivity and economic growth (Correia et al, 2018). Progress in ICT has been associated with increased labour productivity, particularly progress in revolutionary technology with a widespread application in many industries. Mohnen et al. (2018) identify various channels through which ICT can affect productivity growth:

- Price reductions and quality improvements in ICT capital goods can lead to increased ICT firm investment, hence enhancing productivity.
- By increasing transparency and the information available to economic agents, ICT may render markets more efficient and thereby improve the allocation of resources.
- ICT may bring people closer together and create network effects, for instance through social media.
- By increasing knowledge diffusion ICT may accelerate the R&D spillover effects, making knowledge produced in one sector available more quickly in another sector, which can then be used to produce new knowledge.
- ICT can also improve productivity indirectly by boosting the productivity of research and development.

In the context of constantly changing competitive environments, rapid globalisation advances and diversification of demand, the use of ICT as part of a larger system of technological and organisational change that increases firm productivity over time is likely to increase (Martin, 2015). Empirical evidence shows a positive relationship between ICT and productivity growth. Mohnen et al. (2018) find that firms which invest more in R&D and/ or ICT experience higher productivity growth. In the context of small states, ICT innovations may be more influential as they enable the creation of specialist niche production that is supported by relatively small domestic resources and that has the potential to become regional or even global.

The emergence of digital technologies such as the Internet of Things, big data, cloud computing, robotics and artificial intelligence, are deeply transforming economies by enabling the development of new products, services and business models. These technologies enable productivity-enhancing processes and systems and contribute to ICT-driven innovation. They also hold the potential of creating more inclusive and sustainable growth by facilitating access to these innovations to larger segments of the population. They are also increasingly relevant for the creation of new and 'better' jobs. These technologies are however also very disruptive in nature and can produce negative distributional impact in the economy through job polarisation, inequality and labour displacement (at least in the short-run to medium-term). The digital transition needs to follow an inclusive approach where the access, adoption and uptake of digital technologies is widespread across individuals and firms.

The modern digital-based innovation may have modified the ways in which the traditional innovation pipeline (innovation activities → innovation → productivity → economic growth) we have started with operates. The main features of the changing nature of innovation include (Bilbao-Osorio, 2018):

- A dramatic acceleration in the pace of change in innovation.
- Rising innovation complexity, with innovations increasingly being the result of the convergence between different types of technologies to produce solutions for clients.
- Digitalisation-led presence of 'network effects' that can only be benefitted through scale and scope effects in innovation and to a highly populated community of users. This can have macro consequences on the concentration of productivity gains in particular firms or sectors.
- Consumers demanding 'solutions' rather than products or services – innovation is becoming increasing consumer-centred for the development of customised solutions.
- The importance of tangible 'capital' is slowly fading from some innovations. Many innovations have allowed companies to operate under 'zero marginal cost'.

Innovation policy

Given the documented importance of innovation for productivity and economic growth, promoting innovation is one of the main concerns of public policy authorities. While a literature review evidences a positive relationship between innovation and productivity, the relationship is influenced by the institutional and macroeconomic environment in which the firms operate, possibly leading to substantial differences across countries in the relationship between them. For instance, consideration needs to be given to the wider framework within innovation policy, such as the functioning of public institutions, the efficiency of the products market, the functioning of the labour market, trade market developments and the financial access of innovative businesses (Burkhard, 2018). Lack of consideration of these conditions, and the features of modern innovation shaped dominantly by digital technologies, may lead to undesirable economic results. Innovation policy thus needs to be carefully tailored to specific regional/ country circumstances and framework conditions. It should also take into consideration the whole range of innovation enabling framework conditions including physical infrastructure, human capital resources and regulatory/ institutional frameworks.

4.3 Innovation strategy and key performance indicators

The European Union and Innovation

Innovation policy within the EU is guided by the principles and action plan of the Innovation Union. The Innovation Union is one the flagship initiatives of the Europe 2020 strategy for smart, sustainable and inclusive growth[44]. It sets an integrated and strategic approach towards innovation within the EU with a strategic agenda for the design of policy instruments, measures and funding that contribute to innovation in the medium-long term. The action plan aims to boost the EU's capacity to innovate by addressing the main obstacles to innovation (including insufficient availability of finance, market fragmentation, expensive patenting, slow standard-setting, skills shortages) and by pooling efforts between innovation cycle actors, notably through Innovation Partnerships (EC, 2016).

Horizon 2020 is the currently active financial instrument designed for the implementation of the Innovation Union. The instrument seeks to support and integrate research and innovation, remove barriers to innovation and make it easier for the public and private sectors to work together in delivering innovation. The €80bln programme expiring in 2020 will be succeeded by Horizon Europe – this framework programme is currently being developed.

'Smart specialisation' is one of the ways through which the EC seeks to address excessive fragmentation and duplication of efforts. Smart Specialisation is a place-based approach characterised by the identification of strategic areas for intervention based on the analysis of both the strengths and potential of the economy[45]. It hence calls for greater specialisation in distinctive, original areas for comparative advantage. Its formulation is driven by an Entrepreneurial Discovery Process (EDP), where entrepreneurs in the broadest sense (actors with entrepreneurial capabilities including business, universities, research institutes and individual inventors) which are best placed to identify innovation-related opportunities are the driving force of the process. It is through this bottom-up approach with wide stakeholder involvement that a limited number of specialisation priorities are identified. The approach also aims at improving EU Cohesion Fund spending efficiency and impact, and consequently, having a R&I strategy for smart

[44] https://ec.europa.eu/info/research-and-innovation/strategy/goals-research-and-innovation-policy/innovation-union_en [Accessed: May 2019]
[45] http://s3platform.jrc.ec.europa.eu/what-is-smart-specialisation- [Accessed: May 2019]

specialisation (RIS3) in place is a prerequisite for Member States to receive funding from the European Regional Development Fund.

Malta's innovation policy framework

One of the essential framework conditions for innovation is the presence of a robust and integrated innovation- promoting public institution structure. In this regard, the roles and responsibilities for innovation promotion within Malta are carried out across several public bodies. The government entity responsible for innovation policy is the Parliamentary Secretariat for Financial Services, Digital Economy and Innovation, within the portfolio of the Office of the Prime Minister. The Malta Council for Science and Technology (MCST) is the officially appointed body within this Ministry that holds the mandate of advising government on science and technology policy. The MCST is responsible for the preparation of the national R&I strategy and related action plans. The Council is also responsible for managing and administering the national and EU R&I funding programmes. Malta Enterprise (ME), the national agency for economic development, plays a key role here through its role in attracting innovation through FDI and supporting R&D and innovation within the economy through financial support measures to enterprises, including SMEs.

The recently published EC peer review of the Maltese R&I system (EC, 2019a) provided a summary of the MCST & ME funding schemes for RDI companies in Malta, and their take-up up to 2018. This summary is re-presented here below. The EC peer review assesses the scheme take-up to be critically low, such that the actual public support to companies for R&I activities is low and does not succeed in meeting business demands. The review attributes this low absorption to both the general business environment in Malta (vast majority of non-innovating companies seeing no compelling reason to innovate; companies not being aware that they are conducting R&I activities that qualify for funding; Companies' lack the capacity and competences to make good use of funding opportunities), and to factors more directly related to the schemes themselves (flaws in design & implementation; competition between tax incentives targeting R&D and other tax credit schemes; too many schemes; red tape and paperwork; long application and selection processes; small amounts of funding; and unclear landscape and insufficient awareness of funding schemes available).

Table 10: RDI funding schemes in Malta and their take-up

Scheme	Scheme take-up
MCST schemes targeting all types of companies as well as public research actors	
FUSION Commercialisation vouchers (Grants)	209 applications over 2014-2018 (39% by companies) 89 projects over 2014-2018 (27% by companies). Companies get 18% of funds
FUSION Technology Development programme (Grants) for public-private consortia	58 applications over 2015-2018 (22% led by companies) 32 projects over 2015-2018 (22% led by companies). Companies get 32% of funds
ME schemes	
Innovation aid for SMEs (tax credit) for hiring personnel Research and Development 2014-2020 (tax credit and cash grant on wage costs) R&D Feasibility studies (grants) Aid for R&D (tax credits) for R&D projects Aid for R&D&I (tax credit) for hiring personnel	For each of the five schemes: between 0 and 2 applications/year, all applications accepted

(Source: European Commission (2019a), Peer review: Maltese Research and Innovation System)

The focus and drive towards digital innovation is also reflected in the number of newly formed public bodies which specifically focus on digital innovation. These include the Malta Digital Innovation Authority,

the Digital Malta Steering Committee, Tech MT and an Artificial Intelligence and Internet of Things (AI & IoT) Task-Force. Innovation is an economy-wide encompassing concept, and hence although there are authorities with specified responsibilities towards innovation, a successful innovation drive requires co-operation across a whole spectrum of public entities, such as entities responsible for education and economic development policies. Education policy and institutions are fundamental for creating a strong knowledge base towards innovation. Support and economic/ financial incentives are also key elements. Innovation policy making and implementation responsibilities remain rather scattered and fragmented across the public institutional system – this is a risk that should be evaluated and addressed as it could act as a significant barrier towards innovation.

Malta's current guiding vision towards innovation and smart specialisation is embodied in the 'National Research and Innovation Strategy 2020' published by MCST in June 2014 (currently being updated). The strategy sets three main goals:

- Achieving a comprehensive R&I support ecosystem
- Achieving a stronger knowledge base
- Achieving smart, flexible specialisation

With these goals the strategy follows the previously mentioned EU strategic concepts towards innovation. It focuses on the strengthening of the support framework that encourages local R&I and attracts R&I-based foreign investment. A stronger knowledge base through investments in human capital, research infrastructures and international collaboration supports the foundation for a knowledge-based economy with a highly skilled, innovative workforce. The thematic areas for smart specialisation are also identified – these are explored further in the next section. The strategy's vision seeks to foster the necessary framework conditions for the expansion of innovative activity, which would ultimately lead to higher innovation, productivity and economic competitiveness.

R&I key performance indicators

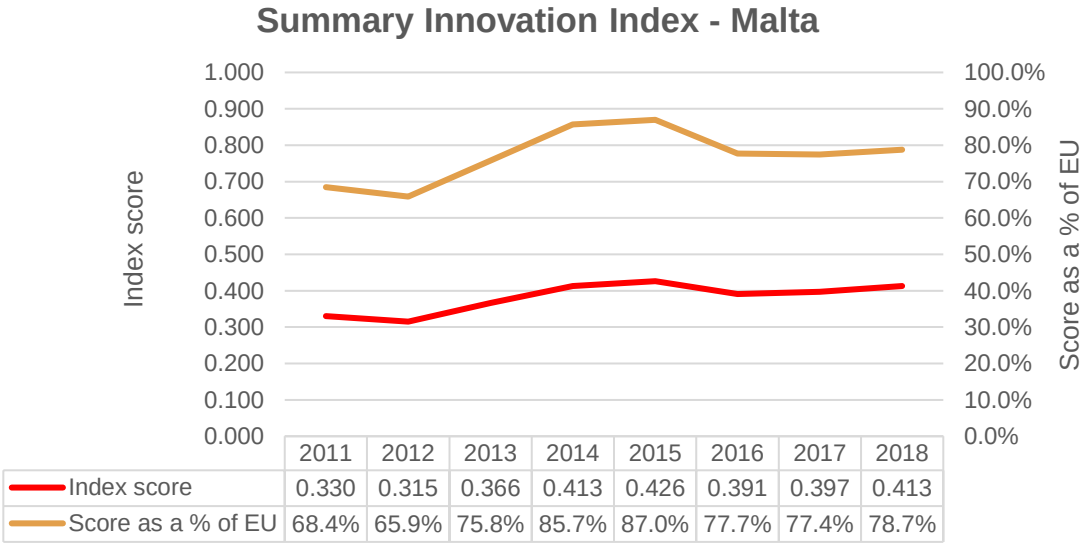
This section presents an analysis of developments in key innovation performance indicators for Malta. Malta's performance in these indicators is compared with that of other EU member states, as well as over time since 2011. The analysis is intended to provide further insights on the local innovation system's structural strengths and weaknesses, hence identifying the areas where good progress needs to be solidified and the areas where further investment is required.

These indicators are sourced from the EC's 2019 European Innovation Scoreboard (covering scores from 2011 to 2017) which brings together several indicators to assess the innovation performance of EU states. By collecting data from different sources, the Innovation Scoreboard is the most comprehensive dataset

available for the analysis of innovation developments in Malta. The dataset includes indicators of innovation enablers, innovation activities as well as innovation outputs – concepts which have been discussed in the previous sub-sections of this Chapter[46].

The Innovation Scoreboard measurement framework is composed of a total of 27 indicators grouped within ten innovation dimensions. The innovation dimensions are in turn categorised into four innovation categories. Score measures are calculated at each level and a 'Summary Innovation Index' is composed from the results of each innovation category. The harmonised methodology of the Innovation Scoreboard also allows a measurement of the relevant performance of a nation compared to the EU average with respect to each innovation category and dimension. The full description of the scoreboard's methodology is available from the European Commission's innovation portal[47]. The below figure presents the developments in the 'Summary Innovation Index' score for Malta since 2011, and in comparison to the EU average (% of EU score).

Figure 29: Summary innovation index (Malta) - Innovation Scoreboard



	2011	2012	2013	2014	2015	2016	2017	2018
Index score	0.330	0.315	0.366	0.413	0.426	0.391	0.397	0.413
Score as a % of EU	68.4%	65.9%	75.8%	85.7%	87.0%	77.7%	77.4%	78.7%

[46] It is relevant to note that the 2019 Innovation Scoreboard methodology was set prior to the publication of the updated innovation concepts definitions in the Oslo Manual, and hence some divergences between the interpretation of terms are present (e.g. definition of innovation activities).
[47] Available from: https://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards_en

(Source: European Innovation Scoreboard 2018)

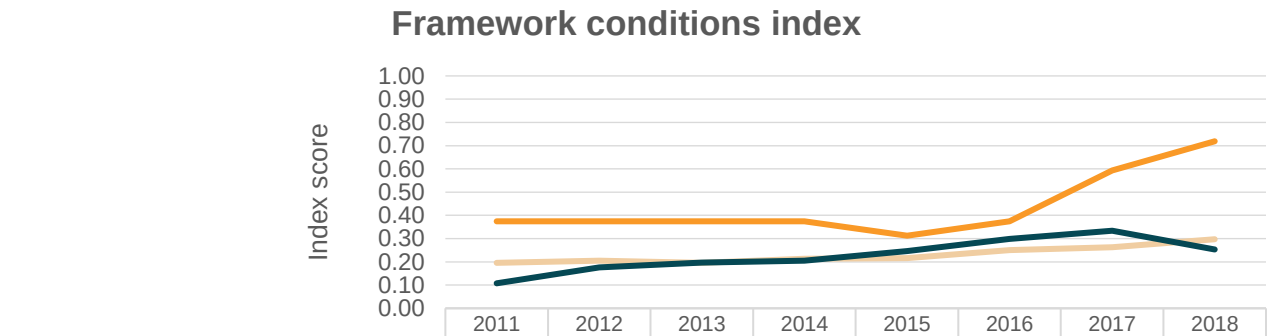
In general, the summary index score for Malta followed an irregular pattern over the period, with setbacks recorded in 2012 and 2016 but with an overall positive growth over the entire period. The fall registered in 2016 was recovered over 2017 and 2018 (one of the countries registering the highest increase), with the index returning close to the all-time high registered in 2015. The index score for the EU was relatively stable over 2011-2014 and has registered steady growth since. Movements in the score for Malta relative to the EU average hence mirror closely those in the absolute index. The relative performance to the EU in 2018 however remains below that measured in 2014 & 2015, and is measured at 79% of the EU average. Malta is classified by the scoreboard as a 'moderate innovator' (alongside the other target countries identified in this report, excluding Estonia which is classified as a 'strong innovator') and ranks 17th amongst the 28 EU Member states.

More meaningful insights can be obtained by looking at score developments for Malta within each innovation category, from which the above summary index is calculated. In the rest of this subsection, a statistical and qualitative assessment of developments in the domain and indicator components of each innovation category is undertaken to obtain more insights on innovation performance in different areas. While the Innovation Scoreboard is currently the most comprehensive framework available for the quantitative assessment of innovation performance, its coverage of innovation aspects is still dependent on the rather limited and fragmented data availability in the area. Even though it is the widest collection of currently available innovation indicators, it still does not cover all domains of the wide innovation concept. Furthermore, some of the indicators represent only proxies for innovation dimensions. Another limitation specific to small states is that a small change in absolute figures for some indicators may constitute a large per capita change – so scores are more volatile and influenced by one-off changes for small states. Nevertheless, it still provides a framework for quantitatively and qualitatively analysing innovation performance.

Framework conditions

The framework conditions category aims to capture the main drivers of innovation performance external to the firm. The main drivers captured through the included indicators are the availability of a high-skilled and educated workforce (human resources dimension), the international competitiveness of the science base (attractive research system dimension) and the environment in which enterprises operate (innovation-friendly environment dimension). The development in Malta's dimension indices composing the framework conditions category, and their comparison with the EU average, are shown below.

Figure 30: Framework conditions indices



	2011	2012	2013	2014	2015	2016	2017	2018
Human resources (Index)	0.196	0.205	0.196	0.214	0.216	0.250	0.263	0.297
Human resources (% of EU)	51.5%	54.0%	47.9%	50.6%	50.1%	56.9%	57.8%	64.0%
Research systems (Index)	0.108	0.176	0.197	0.206	0.247	0.299	0.334	0.253
Research systems (% of EU)	25.6%	40.7%	44.1%	46.7%	55.3%	65.1%	70.7%	53.4%
Innovation-friendly environment (Index)	0.375	0.375	0.375	0.375	0.313	0.375	0.594	0.719
Innovation-friendly environment (% of EU)	108.0%	108.0%	110.4%	110.3%	86.0%	89.7%	118.1%	131.0%

(Source: European Innovation Scoreboard 2019)

The following table summarises the innovation indicators for the framework conditions category, and compares the 2018 measurement value with that recorded in 2011[48], the 2018 scores for the EU average, and the average score for the comparison and target EU countries group identified in Chapter 2 of this Report (simple average for Cyprus, Czechia, Estonia, Portugal and Slovenia).

[48] The indicator scores of the annual Innovation Scoreboard are measured on the latest available data as at that particular year. For some of the indicators, the year's score is calculated based on preceding years' data. Hence, the 2011 and 2018 measures reported here do not always correspond to the actual data pertaining for that particular year, but instead refer to the latest available data utilised by the Innovation Scoreboard to calculate the 2011 and 2018 scores. The same applies for the presented results for the other investment dimensions that remain.

Table 11: European Innovation Scoreboard – Framework conditions

Category	Dimension	Indicators	2011	2018	2018 (% of EU)	2018 (% of comp group)
Framework conditions	Human resources	New doctorate graduates per 1000 population aged 25-34	0.20	0.53	25.3%	35.7%
		Percentage population aged 25-34 having completed tertiary education	31.3%	38.3%	96.2%	90.7%
		Percentage population aged 25-64 participating in lifelong learning	10.6%	10.6%	97.2%	95.2%
	Attractive research systems	International scientific co-publications per million population	388	982	91.7%	67.9%
		Scientific publications among the top-10% most cited publications worldwide as percentage of total scientific publications of the country	3.8%	4.5%	39.7%	52.5%
		Foreign doctorate students as a percentage of all doctorate students	2.7%	11.6%	57.3%	75.6%
	Innovation–friendly environment	Percentage of enterprises with a maximum contracted download speed of the fastest fixed internet	12.0%	23.0%	127.8%	121.1%

Category	Dimension	Indicators	2011	2018	2018 (% of EU)	2018 (% of comp group)
		connection of at least 100 Mb/s				
		Opportunity-driven entrepreneurship	N/A	N/A	N/A	

(Source: European Innovation Scoreboard 2019)

The disaggregation of the framework conditions category shows how the improvement in this category is underpinned by improvements in all the underlying indicators. While improvements in tertiary/ doctorate attainment have been registered, Malta still lags behind the EU and comparable group average. This is especially so for doctorate graduations; however, it should also be noted that the new doctorate graduates indicator may not be capturing the full extent of graduate students, as it is common for such graduations to be obtained beyond the age of 34. The importance of a strong human capital base for the general competitiveness and productivity in the economy has already been stressed in Chapter 3 of this Report. A highly educated and qualified workforce is also a key enabler of sustained innovation, as also recognised in Malta's R&I 2020 strategy which places investment in human capital as one of the pillars towards achieving a stronger knowledge base. In order to try and assess the importance of human capital within the Maltese innovation system the latest available Eurostat data (for reference year 2016) on enterprises by percentage of employees with university education by economic sector is analysed below. Specifically, the analysis focuses on the question: "Of those enterprises which introduced an innovation or have any kind of innovation activity, what percentage of these enterprises have over 25% of their workforce with university education?" We also assess the same question for those enterprises which have not introduced an innovation/ been involved in innovation activity to indicatively assess the potential contribution of human capital towards innovation. The results by economic sector are shown in the table further below. The figures provide an indication of:

1. The levels of university education within each economic sector;
2. The strong relationship between university education and innovation activity. In all economic sectors, innovative activity was associated with higher university education levels. Although we cannot interpret this relationship causally (it could be either that higher educated employees lead

to greater innovation or that innovative firms search for more educated individuals), there is a strong correlation between the two factors.

3. The sectors where university education may be relatively more important for/ sought for innovation, through the calculation of relative factors.

The development and enhancement of skills to support innovation and ensure the broader ability of a country to contribute to and benefit from innovations remains a key priority.

Table 12: Percentage of enterprises with/ without innovation activity by sector and university education levels

	Percentage of enterprises **with innovative activity** which have over 25% of their workforce with university education	Percentage of enterprises **with innovative activity** which have over 25% of their workforce with university education	Relative factor
Manufacturing	9.2%	3.6%	2.56
Construction	5.6%	0.0%	N/A
Wholesale and retail trade; repair of motor vehicles and motorcycles	12.7%	5.8%	2.19
Transportation and storage	9.1%	5.2%	1.75
Accommodation and food service activities	5.7%	1.0%	5.70
Information and communication	71.5%	48.2%	1.48
Financial and insurance activities	79.5%	53.1%	1.50
Real estate activities	50.0%	16.7%	2.99
Professional, scientific and technical activities	65.5%	44.0%	1.49
Administrative and support service activities	23.4%	12.4%	1.89

(source: Eurostat, NPB workings)

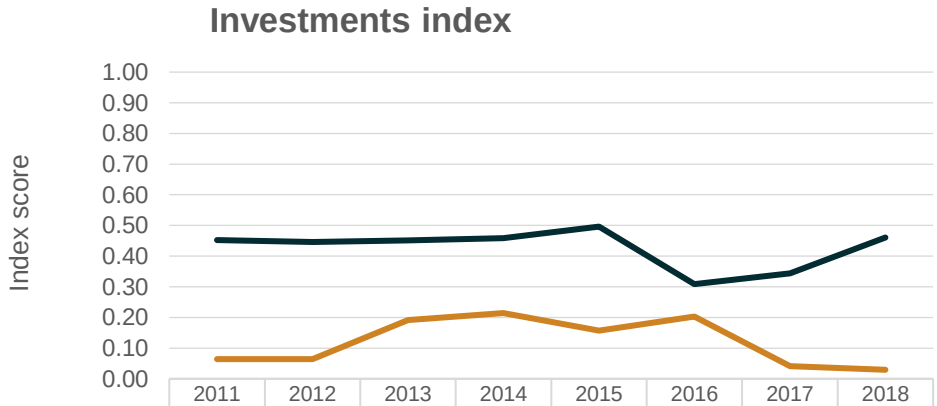
The scores for the research system dimension indicate that the local system appears to be less internationally attractive (foreign doctorate students) and influential (through international publications & citations) than those of comparable countries, suggesting that the further internationalisation of the

research system may be a step forward towards knowledge absorption and diffusion. Malta, on the other hand, ranks highly in terms of high-speed broadband infrastructure coverage amongst enterprises. According to a recent worldwide research on broadband speeds carried out by M-Lab, Malta is however ranked as a low performer amongst EU states in terms of absolute broadband speeds amongst the general population. In this study, Malta is ranked 22nd among EU member states and 47th in the world in terms of broadband speeds. It should be noted that the Innovation Scoreboard's framework conditions category does not measure and capture the entirety of framework factors which have an influence on innovation activity in an economy. In a 2018 report on R&I performance in the EU, the European Commission indicates that good and supportive framework conditions encompass different dimensions, including: effective regulation frameworks; the existence of robust and well-functioning public institutions; the efficiency of the products market; the functioning of the labour market; and the extent to which financial markets grant access to resources to innovative businesses (EC, 2018).

Investments

The Investments category is composed of indicators of investments made in the public and business sector towards innovation. The category seeks to measure the extent of financial support for innovation by governments/ venture capitalists (finance and support dimension), and of R&D and non-R&D investments undertaken by firms to generate innovation (firm investments dimension).

Figure 31: Investments indices



	2011	2012	2013	2014	2015	2016	2017	2018
Finance and support (Index)	0.064	0.064	0.191	0.214	0.157	0.203	0.041	0.029
Finance and support (% of EU)	11.2%	11.5%	34.7%	38.4%	26.8%	33.1%	6.6%	4.7%
Firm investments (Index)	0.453	0.446	0.451	0.458	0.496	0.309	0.344	0.461
Firm investments (% of EU)	98.3%	101.0%	101.3%	95.7%	101.0%	59.8%	67.6%	83.9%

(Source: European Innovation Scoreboard 2019)

The dimension scores presented in the above figure show that Malta registers a very low score in the finance and support dimension, relative to other EU member states. In terms of firm investments, following scores aligned to the EU average, a large drop in performance was recorded in 2016. However, the indicator seems to be converging back to the EU average. A better assessment of the factors behind these developments can be obtained by looking at the individual indicators composing these dimensions.

Table 13: European Innovation Scoreboard – Investments

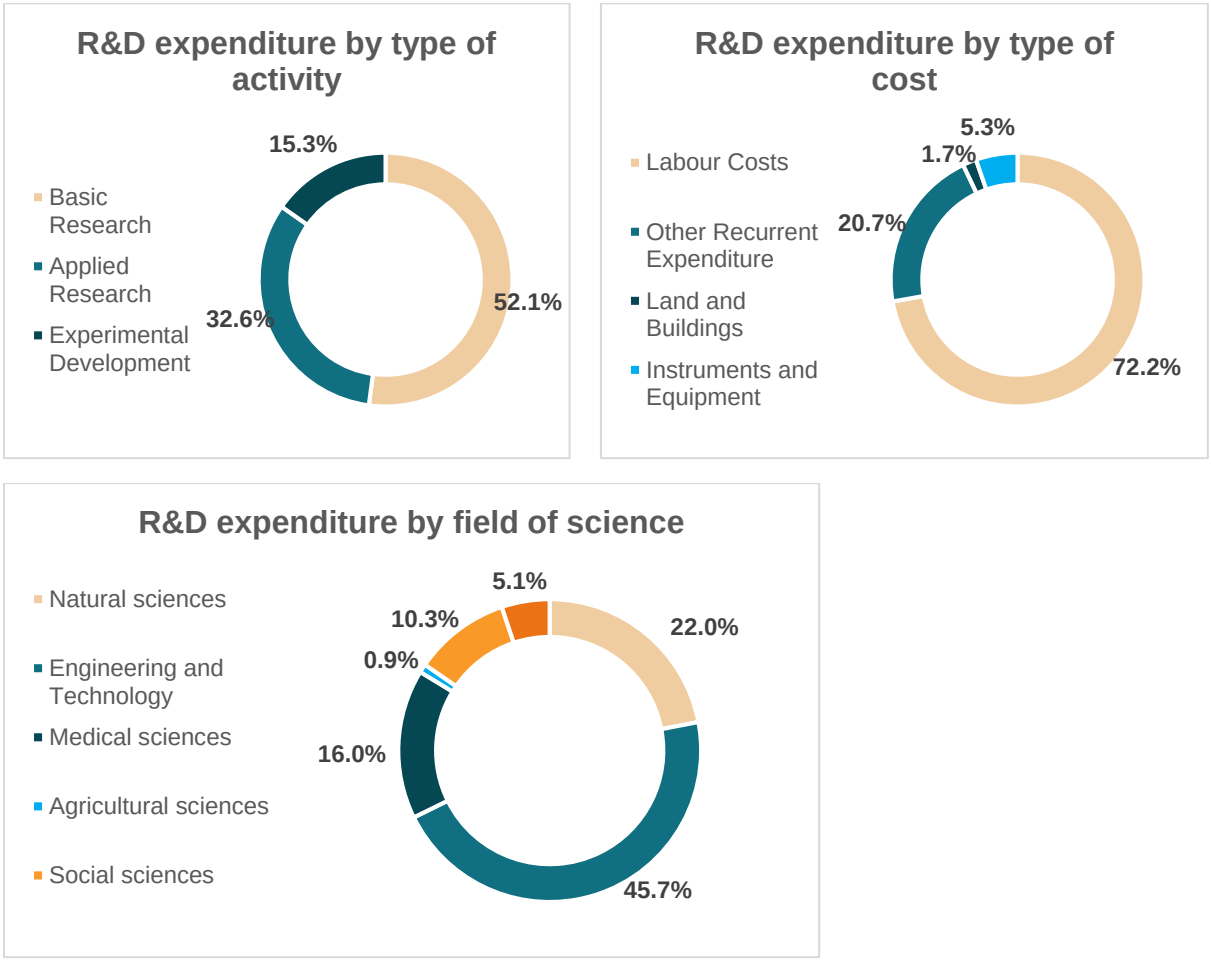
Category	Dimension	Indicators	2011	2018	2018 (% of EU)	2018 (% of comp group)
Investments	Finance and support	R&D expenditure in the public sector (% of GDP)	0.24%	0.21%	30.9%	38.6%
		Venture capital expenditures (% of GDP)	0.00%	0.00%	0.0%	0.0%
	Firm investments	R&D expenditure in the business sector (% of GDP)	0.37%	0.34%	25.0%	42.5%
		Non-R&D innovation expenditures (% of turnover)	1.06%	0.95%	110.3%	94.1%
		Percentage of enterprises providing training to develop or upgrade ICT skills of their personnel	23.00%	26.00%	113.0%	116.1%

(Source: European Innovation Scoreboard 2019)

The indicators show that the low score for the finance and support dimension results from the relatively low R&D expenditure in the public sector and the lack of venture capital investment in Malta. The share of public sector R&D expenditure in GDP has been on the decline since 2015 (0.36% in 2015 vs. 0.21% in 2017), although it is also relevant to note that over the latter part of the period the Maltese economy registered high GDP growth rates. Firm investments in R&D and non-R&D innovation (such as investment

in equipment and machinery and the acquisition of patents and licenses) are registered as above the EU average but below the comparison group. In assessing the progress in these indicators, the denominator effect (GDP/ turnover growth) also needs to be taken into consideration. Total absolute intramural R&D expenditure (GERD) has risen from around €40mln in 2010 to around €61mln in 2017 (source: Eurostat). Absolute R&D expenditures have thus risen alongside GDP, but it seems no inroads have been made towards increasing the share in GDP and achieve national and EU R&D targets given the higher growth rate in GDP. The below charts show a breakdown of the total R&D expenditures in 2017 (latest breakdown available), by type of activity, type of R&D costs and field of science to provide an overview of the nature and allocation of such expenditures. We can observe that most of expenditure consists of labour costs and goes towards basic and applied research with relatively little expenditure going towards experimental development.

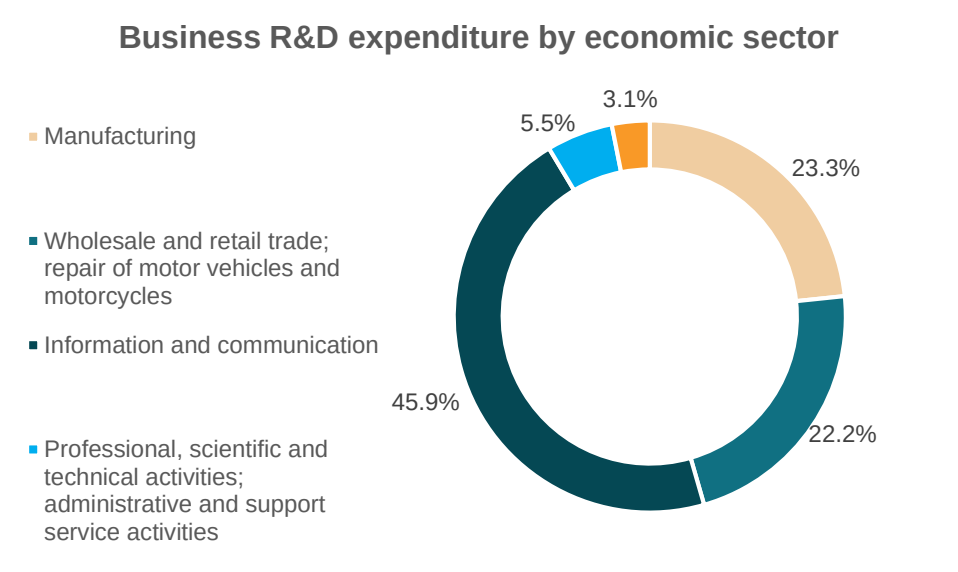
Figure 32: Breakdown of R&D expenditure (2017)



(source: NSO)

Looking at a latest available 2016 sectoral breakdown of R&D expenditure by the business enterprise sector (total of c. €36mln) available from Eurostat, one can observe that the three sectors – the manufacturing sector, the wholesale and retail sector and the information and communication sector – account almost for the whole business R&D expenditure (91% of total expenditure) in the economy. This sectoral breakdown is shown below.

Figure 33: Business R&D expenditure by economic sector



(source: Eurostat)

The large-share of R&D expenditure in the ICT sector, and also the above EU average percentage of enterprises providing ICT skills training to their employees (as recorded in Innovation Scoreboard), reflect the economy's focus on ICT-driven innovation as an avenue for competitive advantages and its drive towards digital innovation.

The above figures for R&D expenditure for the Maltese economy indicate the need to direct more resources towards this investment. R&D spending, both public and private, remains an essential element for making the transition to a knowledge-based economy as well as for improving production technologies and stimulating growth. The Innovation Scoreboard data shows that the availability of finance for innovation by venture capital expenditures remains non-existent in Malta. Seeking to attract more venture capitalist funding, and channelling it towards the most innovative enterprises, remains a potentially unexploited innovation-enhancing opportunity. A key limitation in attracting VC funding related to the limited deal pipeline will, however, likely to persist in such a small market.

Moreover, the relatively small scale of the local economy, industries and business structures is a natural barrier towards the integrated operation of the entire R&D cycle. As previously discussed, R&D constitutes

only one of the 'inputs' towards innovation, and within the Maltese context non-R&D innovation investments could hold a relatively more important role in the diffusion of new production technology and ideas. The 2017 Innovation Scoreboard indicator for non-R&D innovation expenditures, which includes components such as investment in equipment and machinery and the acquisition of patents and licenses, however shows that business non-R&D expenditure amongst Maltese enterprises is above EU average (but below comparison group), suggesting the potentially greater adaptability of this form of innovation investment to the characteristics of the Maltese economy.

The 2016 Community Innovation Survey (CIS), a survey conducted across EU Member States to collect data on innovation activities in enterprises, enquired about the reasons why enterprises which did not involve themselves in innovation activities (over 2014-2016) found no compelling reason to innovate, or what obstacles prevented them from doing so. Most enterprises expressed that they did not engage in innovation activities as they found no compelling reasons, rather than due to innovation barriers. The top expressed reasons for no compelling need to innovate were low demand for innovations in the market and no need for innovation due to previous innovations. The barriers for innovation were stronger for SMEs. Although there is no particular barrier for innovation that stands out, the most quoted were innovation costs being too high and lack of internal finance for innovation. Even though the larger local and multinational firms have the largest capacity and resources to engage in innovation activity and introduce innovations into the market, given the prevalence of SMEs within Malta's business structure, addressing innovation barriers that SMEs face is still a key innovation lever. Supporting the CIS results, a study by Farrugia (2017) finds that, despite the financial aid that is being provided both at a national and European level, SMEs still face challenges which hinder their willingness and aptitude to invest in R&I. From the study's interviews with SMEs it transpired that other financial platforms such as venture capital funds might be more attuned to the risk inherent in R&I projects and thus SMEs might need to start exploring other financial opportunities.

Innovation activities

The innovation activities category captures different aspects of innovation in the business sector. The dimensions and indicators within this category are measurements of innovation outputs and hence can be considered as reflecting the success of innovation investments in generating innovation. Although this category is termed as innovation activities, which in our previous discussions of the Oslo Manual classification referred to 'innovation inputs', the Innovation Scoreboard indicators in this category can be considered as measures of 'innovation outputs'. This discrepancy arises due to the two sources' different publication timing. The dimensions composing this category are:

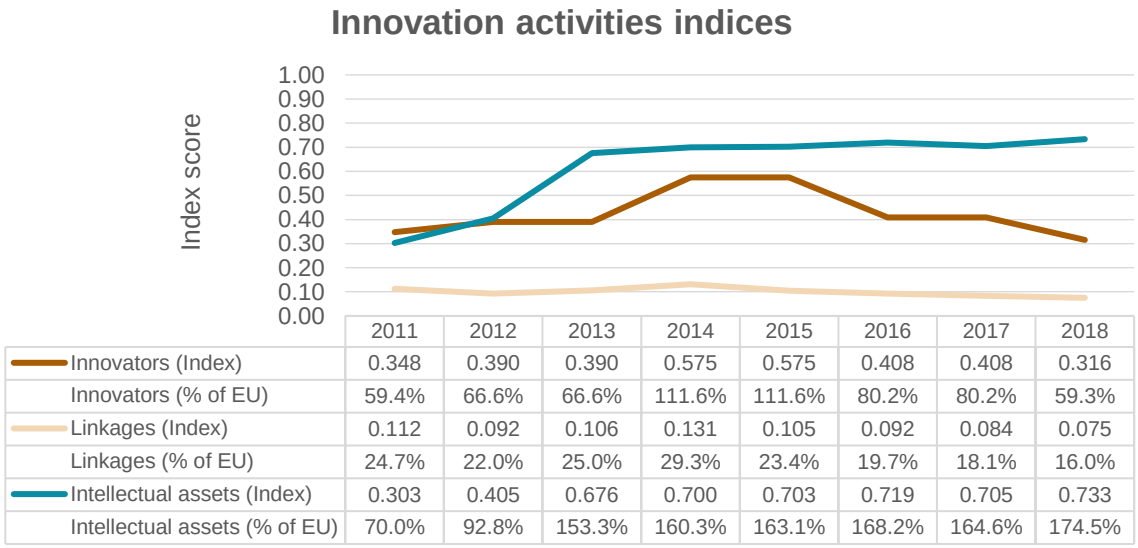
- Innovators which gauges the share of SME firms which have introduced innovations.
- Linkages which looks at research and collaboration efforts between the private and public sector

- Intellectual assets which measures different forms of Intellectual Property Rights (IPR) generated in the innovation process.

Malta's progress in these domains is illustrated in **Figure 34**, while description and measures of the underlying indicators are shown in

Table *14* that follows.

Figure 34: European Innovation Scoreboard - Innovation activities



	2011	2012	2013	2014	2015	2016	2017	2018
Innovators (Index)	0.348	0.390	0.390	0.575	0.575	0.408	0.408	0.316
Innovators (% of EU)	59.4%	66.6%	66.6%	111.6%	111.6%	80.2%	80.2%	59.3%
Linkages (Index)	0.112	0.092	0.106	0.131	0.105	0.092	0.084	0.075
Linkages (% of EU)	24.7%	22.0%	25.0%	29.3%	23.4%	19.7%	18.1%	16.0%
Intellectual assets (Index)	0.303	0.405	0.676	0.700	0.703	0.719	0.705	0.733
Intellectual assets (% of EU)	70.0%	92.8%	153.3%	160.3%	163.1%	168.2%	164.6%	174.5%

(Source: European Innovation Scoreboard 2019)

Table 14: European Innovation Scoreboard – Innovation activities

Category	Dimension	Indicators	2011	2018	2018 (% of EU)	2018 (% of comp group)
Innovation activities	Innovators	Percentage of SMEs who introduced at least one product innovation or process	25.9%	22.5%	65.6%	61.0%

		innovation either new to the enterprise or new to their market				
		Percentage of SMEs who introduced at least one new organisational innovation or marketing innovation	25.6%	25.9%	72.6%	84.2%
		Percentage of SMEs with in-house innovation activities	21.6%	20.5%	73.0%	60.0%
	Linkages	Innovative SMEs collaborating with others (% of SMEs)	5.2%	3.3%	28.0%	24.3%
		Public-private co-publications per million population	24.1	23.1	28.3%	35.8%
		Private co-funding of public R&D expenditures (% of GDP)	0.3%	0.2%	5.0%	10.0%
	Intellectual assets	PCT patent applications per billion GDP (in PPS)	0.3	1.7	46.8%	151.8%
		Trademark applications per billion GDP (in PPS)	19.0	46.5	591.8%	276.3%
		Design applications per billion GDP (in PPS)	0.9	9.9	238.4%	253.6%

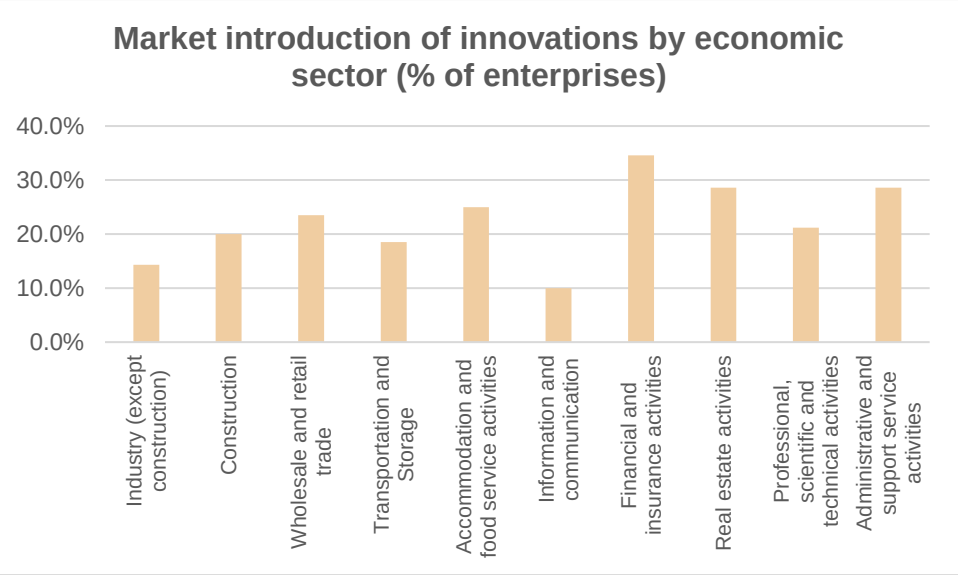
(Source: European Innovation Scoreboard 2019)

The share of SMEs that introduce product, process, organisational or marketing innovations in Malta is below the EU and comparable group averages, and a significant reduction in this share was recorded in the latest Community Innovation Survey (CIS) of 2016. The recorded innovation linkages across enterprises, and between the private sector and public sector are also recorded as being weak. The indicators in the intellectual assets domain record very strong results with Malta recording the highest number of trademark and design applications relative to the size of the economy. Malta is the overall best

performing country in this dimension, followed by Finland, Austria, Belgium and Greece. However, it should also be noted that whilst recorded product registration applications in Malta have increased (particularly in 2013) mainly from pharmaceutical and gaming companies, only a few companies actually develop their products locally. Core development activities are still undertaken outside Malta, and so this indicator may be producing an artificially high result.

The 2016 CIS (from which the Innovation Scoreboard measures for the 'Innovators' dimension are sourced) provides insights on which economic sectors were most active in introducing innovations into the market (within the 2014-2016 period). Market introduction of innovations includes changes to product or service design, changes to marketing methods and launch of market research/ advertising. The figure below illustrates the shares of enterprises that introduced innovations into the market by economic sector, showing that the financial insurance sector had the largest share of enterprises introducing innovations and surprisingly the information and communications sectors having the lowest share despite the high R&D activity recorded in the sector.

Figure 35: Market introduction of innovations by economic sector (% of enterprises)



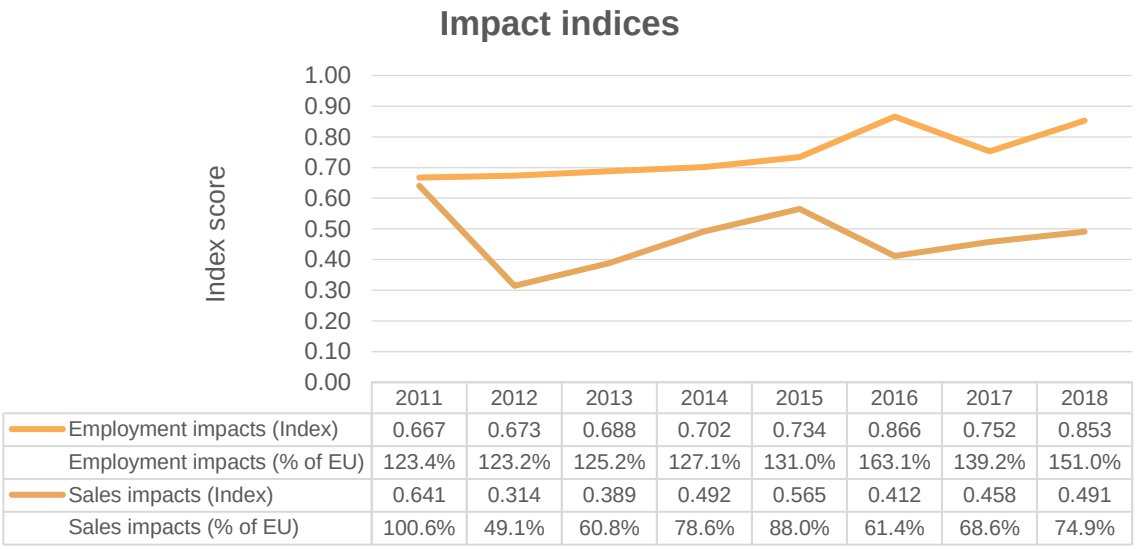
(source: Community Innovation Survey 2016)

Impacts

This category includes indicators on the employment (employment dimension) and sales/ export (sales dimension) structures of the economy which are typically influenced by innovation activity within the economy. The structures provide a valid indication of the extent to which an economy is advanced and

competitive in knowledge-based and technology-based activities. Even though these factors may be determined also by other factors besides innovation, it is recognised that innovation is a key element for maintaining and sustaining progress in these areas.

Figure 36: European Innovation Scoreboard (2019) - Impact indices



	2011	2012	2013	2014	2015	2016	2017	2018
Employment impacts (Index)	0.667	0.673	0.688	0.702	0.734	0.866	0.752	0.853
Employment impacts (% of EU)	123.4%	123.2%	125.2%	127.1%	131.0%	163.1%	139.2%	151.0%
Sales impacts (Index)	0.641	0.314	0.389	0.492	0.565	0.412	0.458	0.491
Sales impacts (% of EU)	100.6%	49.1%	60.8%	78.6%	88.0%	61.4%	68.6%	74.9%

(Source: European Innovation Scoreboard 2019)

Table 15: Innovation Scoreboard – Impacts

Category	Dimension	Indicators	2011	2018	2018 (% of EU)	2018 (% of comp group)
Impacts	Employment impacts	Employment in knowledge-intensive activities (% of total employment)	16.0%	19.0%	133.8%	140.3%
		Employment in high-growth enterprises in 'most innovative' industries (% of total employment)	5.9%	7.2%	139.7%	175.0%

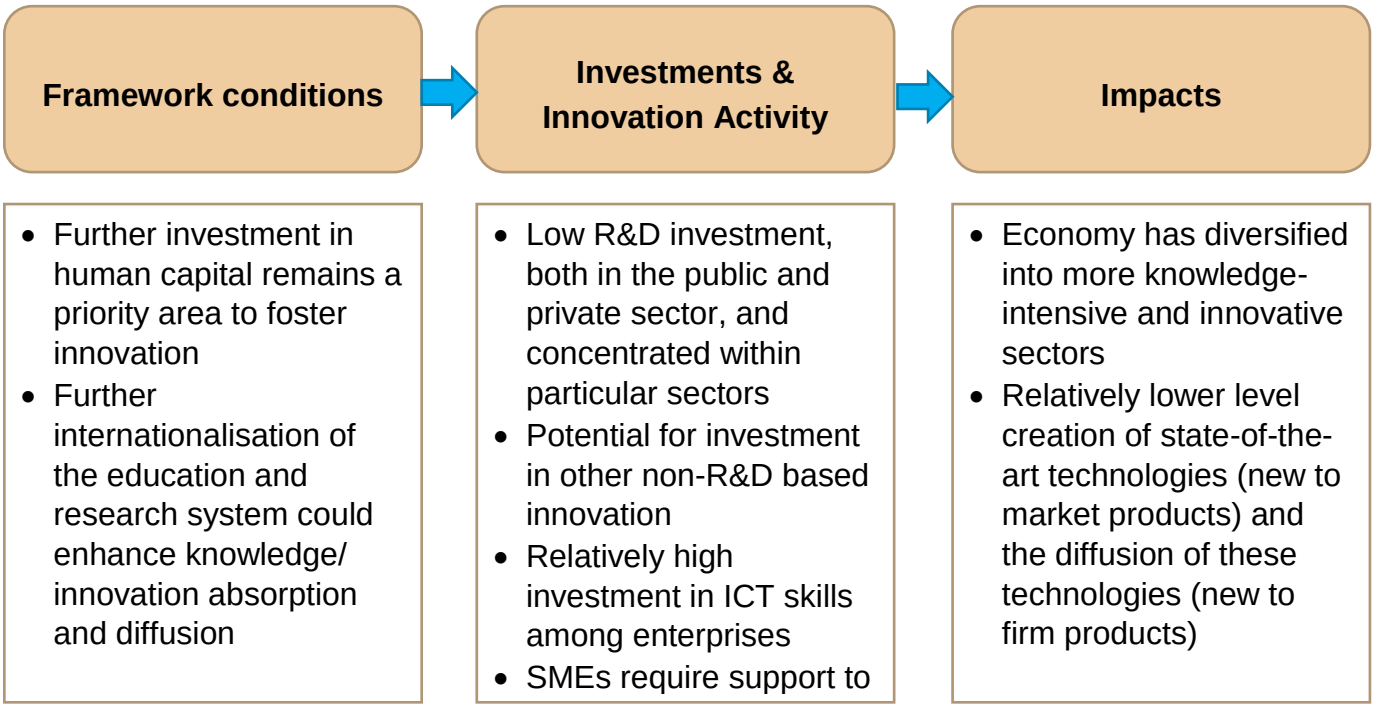
	Sales impacts	Exports of medium and high technology products as a share of total product exports	49.4%	54.8%	97.3%	104.1%
		Knowledge-intensive services exports as percentage of total services exports	65.4%	53.8%	78.7%	113.8%
		Sales of new-to-market and new-to-firm innovations as a percentage of turnover.	15.2%	8.2%	63.3%	74.9%

(Source: European Innovation Scoreboard 2019)

Employment in knowledge-intensive activities and in high growth enterprises within innovative industries has been rising in Malta and is higher than that recorded on average within the EU, reflecting the diversification of the economy into higher value added and knowledge-intensive industries/ sectors. The export of medium-high technology products is also relatively high, indicating a good level of technological competitiveness and the ability to commercialise technological advancements in the international market. The country's drive towards a more knowledge-based economy and promotion of the tech/ digital economy are factors that could be attributed to these observations. While knowledge-based activity appears to be high, the export of knowledge-intensive services has declined, possibly indicating the inability of the country to solidify its part in knowledge-intensive global value chains (however one must also take into consideration that a large share of services export for Malta are in the form of tourism services), but is still above the average of the selected comparison group. A comparably small (and declining) share of national enterprise turnover comes from the sale of new or significantly improved products, either new to the firm or new to the market. This indicator suggests a relatively lower level of creation of state-of-the-art technologies (new to market products) and the diffusion of these technologies (new to firm products) in Malta.

Summary

In this Section, the structure and measures of the Innovation Scoreboard have been applied as a base framework to obtain insights on the features across the whole local R&I system, from the background innovation barriers and enablers to indicators of the resulting economic impacts. The main insights across this R&I system are summarised in the below table:


Framework conditions
Investments & Innovation Activity
Impacts
• Further investment in human capital remains a priority area to foster innovation
• Further internationalisation of the education and research system could enhance knowledge/ innovation absorption and diffusion
• Low R&D investment, both in the public and private sector, and concentrated within particular sectors
• Potential for investment in other non-R&D based innovation
• Relatively high investment in ICT skills among enterprises
• SMEs require support to
• Economy has diversified into more knowledge-intensive and innovative sectors
• Relatively lower level creation of state-of-the-art technologies (new to market products) and the diffusion of these technologies (new to firm products)

4.4 Smart specialisation and new growth areas for the Maltese economy

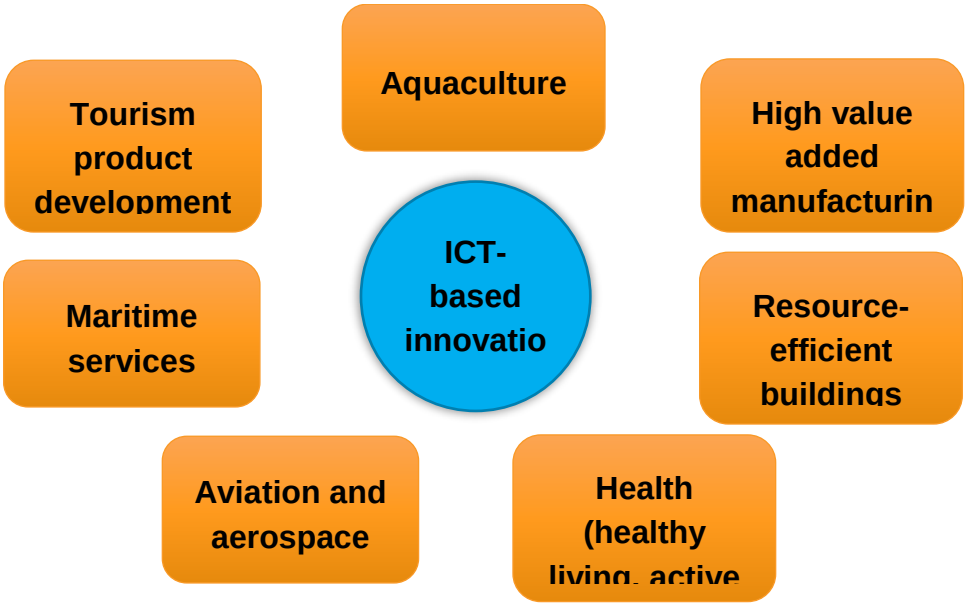
While the above assessment of high-level key performance indicators provides the platform for a critical discussion of high-level directions within Malta's innovation ecosystem, assessments of innovation advancements within specific economic sectors of the Maltese economy can provide more detailed insights. In this regard, this sub-section seeks to present an overview of sectoral innovation developments experienced by the Maltese economy over the recent past.

The country's Smart Specialisation strategy is here applied as a background framework to contextualise the discussion. The thematic areas for smart specialisation selected by the MCST National R&I strategy on the basis of the country's unique selling points, indigenous strengths and innovation/ comparative advantage potential are:

- ICT-based innovation
- Maritime services
- Aquaculture
- High value-added manufacturing with a focus on processes and design
- Aviation and aerospace
- Health with a focus on healthy living and active ageing, and e-health
- Tourism product development
- Resource-efficient buildings

ICT is identified as an enabling technology for all the identified economic sectors through its role as a tool for technological change. The importance of continued ICT investment in sectors such as digital gaming, financial services, health and tourism product development is also emphasised. ICT is thus placed as a key enabler to R&I together with human capital development (analysed in Chapter 3 of this Report) and developing an ecosystem for innovation-driven growth (R&I support ecosystem).

Figure 71: Malta's thematic areas for smart specialisation



(Source: National Research & Innovation Strategy 2020 MCST, 2014)

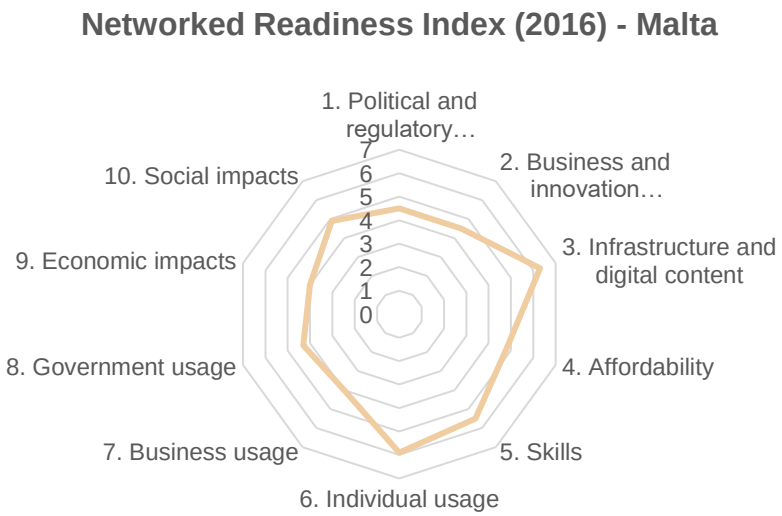
As explained in the initial section of this Chapter, productivity growth in 'traditional' sectors and the creation of new sectors (including niches within sectors) are complementary and not necessarily independent aspects of economic development. Innovation is one of the elements behind such non-independence, as it feeds into and contributes to both processes. The rest of this sub-section presents a brief review of the main recent innovation activities in each of the smart specialisation thematic areas that have/ are expected to contribute to productivity enhancements within the sectors, and that have created new niches and areas of growth for the Maltese economy.

ICT-based innovation

Within the national R&I strategy, ICT was identified both as a horizontal enabler across all specialisation areas and as a smart specialisation niche in itself (digital innovation). Extended integration of ICT-based innovation in sectors such as digital gaming, health, financial services and tourism product development are identified by the strategy as potential avenues for R&I diffusion within the economy. Investments in people, infrastructures and regulation/legislation for the benefit of business, citizens and government are viewed in the strategy as a basis for growth through the digital economy. This vision is re-emphasised in the National Digital Strategy 2014-2020 which builds a digital vision for Malta founded on three strategic themes – Digital Citizen, Digital Business, Digital Government – supported by regulation and legislation, infrastructure and human capital as the three key enablers.

Malta has consistently sought to further strengthen its technological readiness to put it in a strong position to exploit opportunities that arise from the emergence of new digital technologies. An internationally established measure of the such technological readiness is the World Economic Forum's Networked Readiness Index. The index seeks to measure the propensity of countries to exploit the opportunities offered by ICT, based on index scores for 10 technological readiness 'pillars' assessing the market environment for ICT penetration/ innovation and ICT infrastructure, skills, usage and impacts amongst other factors. Malta was ranked 34th amongst 139 countries in the last published 2016 Networked Readiness Index (World Economic Forum, 2016). Malta's score (within the range of 1 to 7(best)) for each of the 10 technological readiness pillars are illustrated below. The scores indicate that, at the time, the strongest areas for technological readiness were digital infrastructure/ content and individuals' usage, whereas the weakest domains were affordability and business usage.

Figure 38: Networked Readiness Index (2016)



Over the recent years, the country has made noticeable strides towards the achievement of the centre of ICT excellence/ digital island vision, and the sector has played a significant role in promoting innovation across the economic structure and contributing towards the development of new economic niches. The sector has expanded to cover a wide range of activities including blockchain technologies, fintech, cloud-based applications, cybersecurity, payment gateway services and cloud-hosting services. Notably, Malta has seized the opportunity to develop new activities based on exploitation of disruptive technologies in several sectors such as finance, gaming, cybersecurity (EC, 2019a). An economic drive is also being directed towards the development of the next-generation innovation technologies such as Artificial Intelligence and the Internet of Things.

As highlighted in the national strategies, the enablers for sustained progress in such digital innovation are investments in infrastructure, human capital and regulation/ legislation. The Digital Economy and Society Index (DESI) compiled by the European Commission provides a useful framework for assessing these enablers, and for understanding the resultant level of integration of digital technologies by Maltese enterprises. The DESI s a composite index that summarises relevant indicators on Europe's digital performance and tracks the evolution of EU member states in digital competitiveness. Below, we relate Malta's 2019 DESI results (ranked as 10th overall) with the digital innovation/ competitiveness enablers and ambitions of national policy.

- Infrastructure: Malta holds a robust ICT infrastructure, notably in the form a quality broadband connection across the entire territory. In the 'Connectivity' DESI dimension which includes measures of broadband coverage/ take-up measures, 4G coverage and 5G readiness, Malta is ranked 7th amongst EU member states. Malta performs particularly well in broadband coverage, ranking first in all the household coverage indicators thus achieving the European broadband coverage objectives. In the literature, enhanced connectivity is associated with cost savings and productivity gains, especially when accompanied by ICT investment, since it increases the information available to enterprises and facilitates the re-engineering of business processes to increase efficiency (Bartolo, 2016). According to the DESI country report for Malta, the country would benefit from focusing now on paving the way for 5G deployment (EC, 2019b). In this regard, the Malta Communications Authority (MCA) is expected to launch during 2019 a feasibility study and eventually publishing an Expression of Interest in order to identify interest in 5G and its use cases (Ministry for Finance, 2019). Last May, the MCA issued discussion paper summarising published information about uses and applications which identify 5G as an enabler with the intention to further stimulate the discussion towards a feasible 5G deployment (MCA, 2019). The 5G technology is identified as one of the pillars of Intelligent Connectivity and an enabler over which the digital transformation in the areas of Artificial Intelligence, Machine Learning, Virtual Reality and Big Data Analytics can transform economic sectors, including Healthcare, Automotive, Energy, Public Services and Utilities, Manufacturing and Logistics and Agriculture (MCA,2019).
- Human capital: In the human capital DESI dimension, Malta ranks 9th among EU states. Above average performance was recorded in terms of the percentage of individuals with above basic digital skills (39% of individuals), employment of ICT specialists (4.3% of total employment) and the percentage of graduates in ICT fields (6.8% of graduates). Below average performance is on the other hand recorded in terms the percentage of individuals possessing basic software skills (57% of individuals vs. 60% for EU). The eSkills Malta Foundation holds a key role in the improvement of digitisation skills, including through overseeing the implementation of the recently formulated of National eSkills Strategy (2019-2021). Various measures and initiatives are being carried out aiming to improve digital skills amongst all ages. The measures target the young aged through digitisation in education (e.g. re-designing of educational curricula), the working

population (e.g. continued professional development through short-life cycle courses in the industry), as well as the more elderly in the community (e.g. Ċavetta Diġitali initiative providing ICT training to the over 55s). Continued effort to further develop basic and professional ICT skills amongst the population is essential to support the digital innovation path of the economy and enhance the integration of digital technologies in enterprises, by augmenting the human capital (digital skills) sought after by local and multinational technology companies setting up on the island and expanding the local digital consumer market (e.g. e-Commerce). Sustaining a rise in the supply of digital skills to match the rapidly increasing demand for such skills is one of the key challenges for further development in the sector.

- **Regulatory/ legislative innovation:** Regulatory innovation has been one of the key enablers towards facilitating the development of the emerging technology sectors in the Maltese islands, most notably where it comes to blockchain technologies. Towards its ambition to become the 'Blockchain Island', in 2018, a legislative package comprising three legal acts was adopted to regulate the use of distributed ledger technologies (DLT). This framework covers virtual financial assets, including crypto-currencies and innovative technology arrangements and services, making Malta the first Member State having a regulatory framework for blockchain. Following the success within the blockchain sphere, the Government is looking at introducing new frameworks to promote other technologies such as Artificial Intelligence and the Internet of Things[49].
- **Integration of digital technology:** Malta ranks 9th in the DESI measure of the use of digital technologies by enterprises. The table below compares the recorded adoption levels of selected digital technologies/ services by Maltese enterprises with those for the EU average. While Malta ranks lowly in Electronic Information Communication Sharing (rank 18) amongst enterprises, it performs above in all other domains and has the highest adoption rate of big data analysis.

Table 16: Integration of digital technology (DESI)

	Electronic information sharing	Social media (% enterprises)	Big data (% enterprises)	Cloud (% enterprises)	SMEs selling online (% SMEs)	Selling online cross-border (% SMEs)

[49] https://www.maltachamber.org.mt/en/government-to-establish-authority-regulating-disruptive-tech [Accessed: July 2019]

	(% enterprises)					
Malta	29%	26%	24%	22%	20%	9%
EU average	34%	21%	12%	18%	17%	8%

(Source: DESI 2019)

A powerful tool towards co-ordinating knowledge, expertise and efforts towards supporting enterprises' integration of digital technologies are Digital Innovation Hubs (DIH). DIH are one-stop-shops that help companies to become more competitive in their business/production processes, products or services using digital technologies. It is a multi-player co-operation seeking to assist enterprises in grasping digital opportunities by providing the latest supporting knowledge, expertise and technology for piloting, testing and experimenting with digital innovations. They are an integral part of the European Single Digital Market Strategy, with all Digital Innovation Hubs being internationally linked in a pan-European network. Malta has currently two operational innovation hubs – the Malta Digital Hub dedicated to the development of digital technology and the creation of synergies between ICT and life sciences and the MITA Innovation Hub which seeks to support and mentor start-up founders in the development of innovative digital solutions. Accelerators can also be a powerful tool in supporting digital innovation. The MITA Innovation Hub also runs an accelerator programme providing seed investment to early stage tech start-ups with a business idea based on emerging technologies. In 2018, MITA supported 12 start-ups, of which seven were blockchain based, while the others focused on the internet of things, augmented reality, mobile technology, ecommerce and big data (EC, 2019b). Strengthening digital hubs is one of the potential avenues towards enhanced digital innovation in Maltese enterprises.

The expansion of the ICT services and digital technologies has been guided and accompanied by extensions of the institutional framework with responsibilities for the promotion of digital innovation, both on a general level as well at technology-specific levels. Such extension brings the benefit of greater and more targeted/ focused resources towards the development of digital/ technology innovation, but also a larger risk of excessive policy fragmentation, overlapping roles/ responsibilities and uncoordinated policy efforts.

One of the legal acts enacted in 2018 established the Malta Digital Innovation Authority (MDIA) as the authority responsible for protecting and support all users and also encouraging all types of innovations by allowing for maximum flexibility in the certification of Innovation Technology Arrangements (EC, 2019b). This effectively placed Malta as the first nation with a regulatory framework for blockchain and has been a fundamental instrument in attracting leading multinational blockchain companies to the island. Furthermore, in March 2019, the public-private partnership Tech.mt (partnership between Government and the Malta Chamber of Commerce) was established with the objectives of promoting Malta as a tech centre, assisting tech companies based in Malta in exporting their technologies abroad, and facilitate innovation in new technologies[50].

In the field of Artificial Intelligence (AI), a task force has been set up with the aim of defining a policy framework and national strategy for the technology through an undergoing national consultation. One of the stated objectives of such a strategy is to replicate the success in blockchain technologies and put Malta as a centre of excellence and technological hub in the field of AI by attracting leading AI companies to set-up operation in Malta, stimulate local start-up activity and raise awareness and visibility of the Malta AI sector[51]. Another stated pillar of the strategy is 'public sector adoption' whereby Government would take a lead in showcasing the benefits that can be brought about by the technology through a number of public sector applications being assessed as providing better services to citizens/ businesses.

In terms of public adoption, a strategic plan called 'Mapping Tomorrow' has been recently launched to announce the digital transformation of public administration through an investment of €40 million. AI public sector use cases would feature as part of this plan. In 2018, Malta became the fi rst country to use emerging blockchain technologies to issue digital, tamper-proof and self-sovereign education credentials (Ministry for Finance, 2019). Other applications include initiatives being pursued by Government in Distributed Ledger Technology. Over 2019, the intentions to run Malta's Registry of Companies on a blockchain-powered system, and to register all rent contracts on blockchain following a rent reform, were announced[52] [53].

[50] https://www.maltachamber.org.mt/en/tech-mt-launched [Accessed: July 2019]
[51] https://malta.ai/malta-launches-national-ai-strategy-public-consultation/ [Accessed: June 2019]
[52] https://www.maltachamber.org.mt/en/malta-s-registry-of-companies-to-run-on-blockchain-based-system [Accessed: June 2019]
[53] https://www.maltatoday.com.mt/news/national/95841/rent_contracts_will_all_have_to_be_registered_on_the_blockchain_prime_minister_says#.XRIjIegzY2w [Accessed: June 2019]

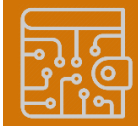
The Malta Financial Services Authority (MFSA) published in 2019 Malta's first FinTech strategy with a vision to "to establish Malta as an international FinTech hub which supports and enables financial services providers to infuse technology in product and service offerings to drive innovation" (MFSA, 2019). The FinTech strategy recognises that while disruptive technologies provide opportunities for FinTech startups to enter the market with innovative products it also provides an opportunity for incumbent firms to improve their services. The MFSA stated its aim to act as an enabler of innovation through the (i) the establishment of a FinTech Regulatory Sandbox to promote innovation and experimentation, and (ii) supporting the development of a FinTech Innovation Hub to further stimulate collaboration and innovation.

As discussed in an earlier section of this Chapter, while the integration of emerging technologies contribute to ICT-driven innovation and productivity enhancements, by their very name ('disruptive technologies') they can also produce negative distributional impact in the economy through job polarisation, inequality and labour displacement. Hence, it is essential that the digital transition follows an inclusive approach where the access, adoption and uptake of digital technologies is widespread across individuals and firms.

Given Malta's strengths in ICT applications in several domains, the new opportunities emerging at the European level in this field, in particular the €9.2bln Digital Europe programme of the EU (2021-2027), deserve particular attention. Malta is very well positioned to capitalised on these developments given its focus on digital innovation and its strong base in sectors such as blockchain, AI, cybersecurity and other technologies which will feature in the Digital Europe programme (EC, 2019a).

The table below summarises the main opportunities for future R&I in the ICT sector, as well as challenges that must be taken into account for sustaining R&I. Addressing these challenges is in itself an to enhance innovation in the sector. Similar summary tables are presented at the end of the remaining sub-sections on innovation sectors.

Table 17: Summary of ICT R&I opportunities and challenges

	Opportunities	Challenges
ICT R&I 	• Horizontal integration with other economic sectors • Robust and high-quality ICT infrastructure • First mover advantages in the regulation of certain digital technologies • 5G deployment • New Digital Innovation Hubs • The Digital Europe programme (2021-2027) • Rapid technological advances in the market present innovation opportunities	• Sustaining a rise in the supply of digital skills to match the rapidly increasing demand • Co-ordinating and synergising digital economy policies across various involved entities • Preventing and mitigating potential 'disruptive' effects (job polarisation, labour displacement, inequalities) from emerging technologies. • Rapid technological advances in the market also reduce the market life of new innovations

Maritime services and aquaculture

Malta's maritime sector is considered to be a mature economic sector which has existed for a long time and diversified over the years. It is a crucial sector since Malta's most abundant resource is the sea, and it is estimated to account for c. 9% of the Gross Value Added being generated within the economy (ESPON, 2018). When compared to a ratio of around 1% in the European Union, this shows the relative importance of the sector to the Maltese economy. Major contributors within the Blue Economy are coastal and marine tourism and transhipment activities, both of which are however characterised by relatively low productivity (ESPON, 2018). The sector currently provides a wide range of services however the services remain fragmented. Therefore, there is scope for improved and perhaps more integrated maritime services.

Growing R&I niches such as Marine Biotechnology and Marine Energy and Resources see room for future potential and growth. Marine Biotechnology involves the exploitation of new biomaterials from indigenous species. Possible developments in this industry include the testing of anti-fouling materials, water quality monitoring equipment and other oceanographic research activities. With regards to Marine Energy and Resources, the greatest innovation appears to be multi-use of space in the offshore economy which forms part of the long-term Blue Growth Strategy. The Coastal and Maritime Tourism sector also has quite a strong potential with the cruise-and-stay niche market being the strongest for innovation and

offers the least strain on local limited resources. Increased coordination and cooperation with local and international research institutions can strengthen the research aspect within these sectors.

Despite the various policies aimed at the Maritime sector, the lack of collaboration by innovators has resulted in relatively low innovation developments within the sector. To emphasise its role in encouraging these alliances, the Malta Marittima Agency (MMA) in 2017, in collaboration with the University of Malta, launched the Maritime Seed Award (MarSA) where a total of €100,000 was allocated for maritime research and innovation and will fund start-up project for particular developments in the sector. The several local and European funding programmes managed by MCST support innovative projects also in the Marine and Maritime sector. Such funds include the FUSION funds and MarTERA (Maritime and Marine Technologies for a new ERA) which is an ERA-NET Co-fund initiated by JPI Oceans with the aim of strengthening the European Research Area in marine and maritime technologies.

Although progress has been obtained over the past few years, Malta's innovation within this sector remains somewhat unexploited (ESPON, 2018). In this regard, the National Research and Innovation Strategy 2020 tackles opportunities that could be taken by Malta since its geographical position and EU membership provides a bigger opportunity to build more international linkages with foreign research groups and R&I specialised companies. Also, post-graduate degrees are somewhat limited and do not necessarily focus specifically on maritime services. Another barrier could be that there exists some fragmentation with regards to policy making and this challenge is being sought to be addressed by the MMA by bridging the gap between the public sector and the industry.

Aquaculture

Malta's aquaculture industry has developed to its current status over a period of approximately twenty years. R&D is carried out both within the public and the private sector. Malta has developed a good degree of knowledge in this sector and has taken part in a number of EU-funded R&D projects.

By 2020 it is estimated that the production target will reach 5,000 tons in addition to the tuna penning production and the sector will have up to 1,185 full time jobs, both direct and indirect, and a Gross Value Added of about €70 million contributing to the Maltese economy (MSDECC, 2014). However, a main struggle relating to aquaculture activities is their environmental impact. The main challenge to grow sustainably in the future would be of improving operational management to enhance efficiency and reduce the impact it may leave on Malta's environment.

According to the Aquaculture Strategy for 2014-2025, the Government plans to develop further this sector by encouraging species diversification with increased research and development. This will be done through the construction of a commercial scale marine hatchery that will satisfy the Maltese industry as well as the identification of designated marine search areas. Government is also planning to introduce the

concept of fallowing particularly for sheltered areas to maintain the quality of the coastal environment whilst also improving the regulation of relevant farm operations including the disposal of tuna offal. The main emphasis with regards to research expressed in the strategy is the development of alternative species with the aim of diversifying the species produced by the local industry. Development will focus on the research and production of amberjack due to Malta's knowledge of breeding techniques on this species. Development and testing of alternative tuna feeds to reduce reliance on baitfish could also improve sustainability and competitiveness of the capture based species. In addition, a national body for aquaculture research has been set up, the Malta Aquaculture Research Centre (MAR), whose main focus is researching into breeding new species for aquaculture, optimising techniques for production and nutrition of marine fish.

There is a good degree of collaboration between the public and private sector, however there is scope for exploring further existing strengths by focusing more on areas of common interest between the different players. It is entirely dependent on marine resources relying mainly on tuna penning and the farming of closed cycle species such as sea bream and sea bass that are cultured from eggs produced in hatcheries. Development of designs in Recirculation Aquaculture Systems (RAS), technology for a variety of species, fish nutrition facilities used for investigative research on new products, hatchery technology and research in the Veterinarian and Biomedical/Nutraceutical spheres are expected to be main areas of future R&I.

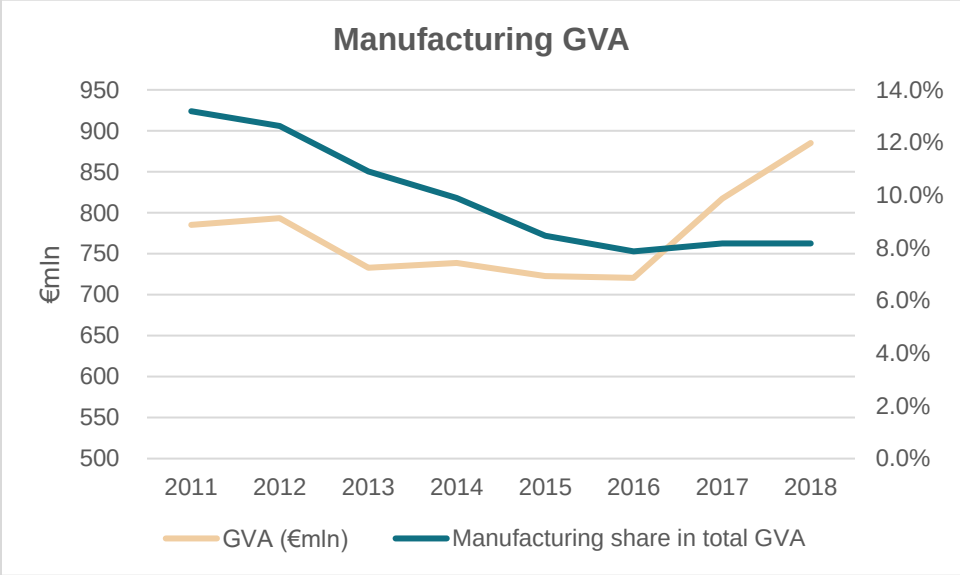
	Opportunities	Challenges
Maritime services and aquaculture R&I 	• Mature economic sector and integral part of economy • Innovation in new niches such as Marine Biotechnology and Marine Energy & Resources • Building international linkages with foreign research groups and R&I specialised companies • Increased funding opportunities • Aquaculture: Researching into the mitigation of environmental impacts, breeding new species and optimising techniques	• Low productivity in the major economic contributors • Fragmentation of maritime services • General lack of collaboration between innovators

High-value added manufacturing

Manufacturing is one of Malta's historic economic pillars. Over the recent decades, the sector has recorded contractions in its relative contribution to the Maltese economy with contractions in traditional segments such as the textile industry. However, it is also one of the sectors which has undergone a radical systematic transformation over the recent past. Originally positioned as a low-cost manufacturing base with easy access to export, the sector has had to gradually focus more on higher-value-added and knowledge-based manufacturing industries to remain competitive. The contraction in traditional segments founded upon cost competitiveness, has been partly offset by growth in other segments such as printing, aviation servicing and pharmaceutical manufacturing. Focus has shifted from large-scale low value added production for mass markets, to exclusiveness, added value and well-targeted niche production. The national R&I strategy identifies that innovation has the potential to further sustain this transition towards higher value added manufacturing. Two focus areas for innovation in the sector are highlighted – process innovation (through optimisation of resource use, energy efficiency, automation etc.) and innovation in product design (product development, prototyping, etc.).

Despite Malta's gradual shift towards a more services-oriented economy, the manufacturing sector maintains an important role within the Maltese economy (including employment) and remains one of the predominant sectors for research and innovation investment. The figure below charts the evolution of the manufacturing sectors' contribution to the economy's Gross Value Added (GVA) over the last years, and its share in GVA. It can be observed that up to 2016, the sector's GVA has contracted continuously in absolute terms, and more rapidly in relative terms due to positive growth in other economic sectors. Since 2016 however, high growth rates in manufacturing GVA have been recorded at c. 13% in 2017 and 8% in 2018, such that the sector's share has even marginally increased. On the back of this turnaround, in 2018 the sector produced c. €885mln of GVA, equivalent to 8.2% of total GVA (source: NSO). In interpreting these results, it should be noted that the results for this sector tend to be very volatile and heavily influenced by one major player in the market.

Figure 39: Manufacturing GVA



(Source: Eurostat)

More disaggregated data can provide additional understanding of the niches within the manufacturing sector which have driven such a turnaround. By comparing changes in value added with changes in labour hours for the sector, insights on changes in the productivity levels within the sector can be discerned. GVA per labour hour (worked by employees and self-employed) for the industry is illustrated below. We note that in the absence of sectoral deflators, sectoral productivities cannot be calculated with precision for Malta. In view of this absence, we use the GDP deflator to deflate GVA for a better approximation of labour productivity. With this analysis it is discerned that the increase in value added is not only a result of higher labour hour input resulting from increased activity in the sector, but also due to increased labour productivity.

	2011	2012	2013	2014	2015	2016	2017	2018
GVA (€mln)	785.2	793.6	733.0	738.9	722.6	720.6	817.2	885.2
Deflated GVA (€mln)	785.2	777.5	704.4	693.6	662.2	651.3	721.5	765.0

Hours worked ('000s)	41,558	40,297	40,941	41,759	41,779	42,689	42,329	43,594
GVA/ per hour	18.9	19.3	17.2	16.6	15.9	15.3	17.1	17.6

The enhanced labour productivity may be attributable to the capital investments undertaken in the sector in more advanced and productive machinery/ technologies that enable higher value adding production. The sector has gradually transitioned from a labour intensive to a technology driven one. The manufacturing sector has progressively transformed into more capital intensive and attracted investment in activities such as electronic components, automotive components, injection moulding, precision engineering, aircraft maintenance and pharmaceuticals manufacturing and medical devices amongst others.

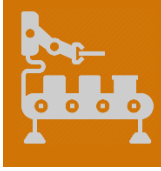
Embracing the fourth industrial revolution is an opportunity for the local manufacturing industry to make the next competitiveness leap. The integration of innovations in digital technologies into the manufacturing sector, could position Malta as a hub for 'Smart Manufacturing'. The integration of technologies such as artificial intelligence, robotics, advanced analytics, cloud computing and sensor technologies with existing manufacturing operations is the major opportunity for more efficient and bespoke manufacturing.

The manufacturing industry predominantly consists of locally owned enterprises (mostly SMEs except for some larger enterprises in the food and beverage industry) operating alongside a small number of relatively large foreign-owned multinational subsidiaries. Many small manufacturers also work as sub-contractors for the larger players. The industry structure points to two linked channels for innovation advancements within the sector. The first is innovation towards more knowledge based and technology driven manufacturing by the larger players in the industry, or the attraction of new foreign/ local investment in these areas. This links to the second channel where innovation comes from SMEs that seek to innovate to secure services from the larger enterprises. For both these channels to be effectively operational, a supporting policy framework that provides investment incentives addresses the major innovation/ growth barriers commonly being faced is required.

Given the country's small size, limited industrial space for expansion is a natural limitation. Manufacturing companies benefit from significant spillover benefits from clustering in industrial estates/ parks. The country has over the recent years invested in a Biotechnology Park and the Safi Aviation Park to cluster development in the life sciences and aviation sectors. However, further expansions of the sort will be increasingly constrained by manufacturing space limitations as well as competition from other land uses (e.g. public spaces such as Benghajsa and Ta Qali). The requirement of high standard logistic facilities

(warehousing, transportation facilities) for competitiveness poses further challenges in this area. Another major challenge is enhancing the innovative capability of local small and medium sized manufacturers. A study by Cutajar (2016) looking into the innovative capability of local manufacturing SMEs, finds that absorptive capacity (ability to obtain and utilise knowledge from external sources), openness to change, collaboration and funding are all essential components of innovation capability inside these enterprises. Most of the firms interviewed in the study ranked lowly in these variables. The study also found that skills shortage and funding constraints needed to deliver a project that is up to international standards, is an additional challenge. Skills shortage is a challenge experienced also by the larger enterprises in the sector. While this is a current national challenge, it is even more so a sector such as manufacturing which is seeking to diversify into more advanced activities that require diverse and specialist skills which were previously not so associated with the sector.

The availability of knowledge and its diffusion into the manufacturing sector thus remains a key element in sustaining the sector's transition into advanced manufacturing, enhance its productivity and maintain its international competitiveness. The integration of digital technologies in manufacturing processes would provide the sector with the impetus to continuously evolve and transition to the next level of higher value-added manufacturing.

High value-added manufacturing R&I 	Opportunities	Challenges
	• Embracing the fourth industrial revolution and integrating digital technologies such as Artificial Intelligence, robotics and advanced analytics.	• Limited industrial space • Logistics limitations • Skills shortages for advanced manufacturing • Low innovation absorptive capacity by SMEs

Aviation and aerospace

The aviation sector was selected as one of the smart specialisation thematic areas by the national R&I strategy, in view of the growth experienced in the relatively new economic sector, and its R&I potential emanating from the relatively high critical mass of human resources as well as numerous established international R&D links in the area. The potential of R&I to assist the sector into moving up the value chain by diversifying into new high value-added niches was identified. The major pillar of the sector has traditionally been the Maintenance, Repairs and Overhaul (MRO) sub-sector. The sector has however increasingly diversified into other niches such as production of aircraft components, avionics, aircraft sales and charters, aircraft management and aeronautical engineering services, back-office set-ups, financial and legal services, software development, training schools and flight academies, and R&D and innovation

activities. The country has managed to regularly attract foreign investment in the sector, creating a local cluster of aviation companies and the conditions for the development of innovation clusters. Aviation is a sector significantly driven by 'regulatory' innovation and hence constant monitoring of changes in the regulatory landscape is of importance in maintaining a competitive edge.

Public infrastructural investments, such as the €17mln investment for the establishment of the Safi Aviation Park inaugurated in 2012, have been directed for the accommodation and facilitation of such expansion and clustering. Corporate tenants of the 240,000sqm airside aviation park, have continuously invested in the park's facilities and expanded the range of services produced at such facility. Given the reliance of core aviation business operations on ICT services, sustained development in the country's ICT infrastructural set-up will further sustain the sector's progress. Aviation-related training provided by MCAST will also contribute to the supply of the required specialised human capital.

	Opportunities	Challenges
Aviation and aerospace R&I 	• International R&D links • Diversification of the sector • Expanding aircraft register • Previous investment in clustered infrastructural facilities	• Limited industrial space • Integrating digital technologies and sustaining skills upgrading

Tourism product development

Tourism is typically a key pillar of small island economies, and Malta is no exception. Visiting tourist numbers are increasing year-on-year, with a total of c. 2.6mln tourists visiting Malta in 2018 (2010: 1.3mln). The contribution of the tourism sector to the economy is difficult to quantify since tourism-related production is classified under diverse NACE classifications. A review of studies applying Input-Output models and Computable General Equilibrium models shows that the contribution of the tourism sector to Malta's total GVA lies in the region of 12-17% taking into account indirect and induced effects (Cassar et al, 2017). While recognising that tourism is not an R&D intensive sector, the national R&I strategy identifies tourism product development key niche where Malta has potential growth through innovation. Innovation can contribute to increased variety and quality of the tourism products that attract tourists to the Maltese islands. Innovation and product development can increase cost-effectiveness in the industry by increasing the number of products and services available for tourists as well as the amount of spending by individual visitors. Given the wide-encompassing nature of tourism services, this is a

specialisation area with strong potential for extensive integration with other areas such as ICT, maritime services, health and the creative industries.

Analysing certain recent trends in tourism in Malta can provide insights on where the major opportunities and challenges sector lie, and hence where innovation can play an influential role in grasping these opportunities and overcoming challenges. The Maltese holiday product has diversified such that according to Malta Tourism Authority (MTA) surveys, an increasing number of tourists are motivated to visit Malta by important niche tourism areas such as culture, health, wellness, scuba diving and other sports segments, besides by the traditional 'sun and sea' factor. The development of niche markets has helped significantly in diversifying the Maltese tourism product and tackling the long-standing issue of seasonality (Attard, 2008). Innovation that facilitates the development of niche tourism sectors, together with concerted stakeholder effort to promote these sectors, should further reduce the seasonality dependence of the Maltese tourism product.

Tourism data also shows that the average length of nights spent in Malta has been on a downward trend since 2004 (10.2 nights in 2003 vs. 7.1 nights in 2018), reflecting Malta's increased connectivity and viability as a short holiday destination with the proliferation of low-cost airlines (Attard, 2018). Given this decline in the average length of stay, tourist expenditure on a per capita basis has remained flat. In real terms, expenditure per visitor per night is actually estimated to have declined in recent years, even after allowing for lower airfares (Attard, 2008). This suggests the county has been attracting higher tourist volumes but with lower spending patterns. Innovation that enhances the quality of the tourism product can help in attracting more affluent visitors, and support the shift towards high-value tourism from high-volume tourism and increasing the economic and social return to society. This is especially important in view of the islands' tourism capacity and sustainability challenges flowing from the very high visitors per inhabitant ratio (c. 5.2 in 2018), high population density and limited geographical size. The growth in tourism thus needs to be accompanied by innovation in the tourism product (and other areas of the economy) that minimise the adverse effects of tourism on the use of natural resources, infrastructure, mobility and environmental/ cultural heritage.

The digitalisation of tourism product offering is perhaps the most promising avenue for innovation within the sector. The application of smart technologies in the tourism industry can enhance the tourist experience through improved information provision/ personalisation, product marketing, safety and security, and generally improved customer service. A tourist survey study by Farrugia (2016) revealed that 70% of tourists became aware of Malta via websites/ mobile applications, whilst 55% of respondents indicated that they tend to extensively consult mobile applications and electronic information prior to their holiday. The use of RFID (Radio Frequency Identification) in combination with data analytics for automated and personalised tourist information and service provision, for example, is one of the

technologies expected to shape product tourism in the coming years. These results indicate the technological readiness of visiting tourists and hence how increased digital product offerings in the Maltese tourism product offering can be beneficial to the sector's prospects.

In this regard, Ministry of Tourism has embarked on the implementation of a Digital Tourism Platform that will provide a suite of location-based services to enhance foreign visits to our country. The Platform will create a centralized repository of information (data warehouse) that will better guide tourists to and through the different attractions. Information related to various areas (such as culture, transport, etc) will be collated into the aforementioned data warehouse, through the use of web services and other technologies. This information will be customized according to the user's profile and location and will be accessible through mobile devices (such as tablets and smart phones) as well as a number of information kiosks installed in main tourist areas.

	Opportunities	Challenges
Tourism product development R&I 	• Expanding market with increased tourist arrivals. At the same time capacity constraints require innovations for higher value added tourism • Innovation integration with other sectors such as health, maritime services, creative industries to further develop tourism niches • Technological readiness of visitors – digitalisation of tourism offering	• Typically not an R&D intensive sector • Higher share of micro and small sized enterprises

Health

The national R&I strategy identifies health and medical research as a significant component of Malta's R&D investment and an area with scope for further innovation potential. The Strategy aims to cultivate a multidisciplinary approach towards health research and innovation solutions through integration with other areas where the country has a strong knowledge base, such as ICT, social sciences and engineering. Innovative e-health solutions and solutions for active and healthy ageing are identified as particular focus areas.

R&I is a key tool towards addressing the growing challenges being faced by the Maltese health system. According to a report published by the European Observatory on Health Systems and Policies, the main outstanding health challenges for Malta are: adapting the health system to an increasingly diverse population; increasing health system capacity to cope with a growing population; implementing a redistribution of resources and activity from hospital to primary care; ensuring access to innovative expensive medicines whilst concurrently tackling the need to continue identifying efficiency improvements; and addressing the issue of medium-term financial sustainability associated with steep demographic ageing (Azzopardi-Muscat et al, 2017).

These challenges motivate the pursuit of potential innovative solutions for a more efficient, accessible, and equitable healthcare. Health is probably the sector where the importance of the research-innovation link is strongest, given the sector's need for evidence-based innovation and policy implementation. Bridging further the gap between research and policy implementation (both public and private) would assist in providing the research evidence on local health services necessary to identify and implement more effective and sustainable ways to organize, manage, finance, and deliver high quality care to persons living and working in Malta. A bottom-up approach with enhanced communication and cooperation amongst concerned stakeholders is the best means to transform research outcomes in innovative products and services that improve productivity while reducing healthcare costs and increasing health care effectiveness (MCST, 2011).

As in other specialisation areas, the country's smallness creates limitations for R&I but also presents the opportunity to specialise in specific niches which are not easily accessible in larger countries. The National Strategy for Health and Research & Innovation (MCST, 2011) had through stakeholder consultation identified Malta as an ideal centre for pilot projects in health care such as biobanking, testing new drugs, servicing clinical trials and health tourism. In this regard, the life sciences sector has become one of the major components of the local healthcare industry, with many companies operating in the pharmaceutical, medical device, healthcare technology and health tourism sectors. The knowledge-based sector is also one of the major drivers of health R&I. The government investment in the Life Sciences Park has facilitated this drive by bringing together university students, researchers, lecturers, hospital professionals and industry to interact and establish new technology and research-based firms and clusters. The park attracts several educational institutions, which now use the facilities to carry out market-driven technology development and applied research. The Digital hub within the same park, facilitates the synergies with ICT on fields such as imaging, software applications and interpretation of data.

The health sector in Malta is currently undergoing a period of change and transformation, with major developments including the privatisation of three state hospitals accompanied by undergoing/ in the

pipeline government investments in new health care facilities, such as the Paola Primary Health Care Southern Regional Hub and the construction of an acute mental health hospital at Mater Dei. Both developments represent an opportunity for the introduction of product innovation through more advanced health technologies that contribute cost-effectiveness and increased productivity in the delivery of health services. The planned expansion of the Gozo general hospital with the opening of a campus by Barts and The London School of Medicine and Dentistry is set to further promote the health tourism niche. The legalisation of medical cannabis and the regulation of its production for medical and research purposes, is a landmark which could lead to the development of a completely new sector within the medical industry, and a new field for medical R&I. This regulatory innovation will place medical cannabis as one of the top fields for advanced research and innovative projects in the medical industry.

The inroads of more advance digital technologies, such as robotics and AI, in healthcare applications are also expected to be a major innovation and productivity driver of future healthcare. In a National Round Table Consultation organised by the Department of Health Services Management at the University of Malta and the Directorate for Health Information and Research, which brought together the ideas of stakeholders from academia, the public service, private sector and NGOs, it was expressed that particular attention should be devoted to research on the implementation of new technologies within the Maltese health system (including digital health and social media). The role of new technologies and digital health is perceived as a fundamental asset, which needs to be further developed in order to provide innovative solutions, considering the rapid and continuous technology advances in the sector.

It was recently announced that a new robotics system will be implemented for medicines dispensing at Mater Dei Hospital. The system is aimed at improving patient safety and reducing errors. The system merges computers with robots and the pneumatic tube system. Doctors would be able to file an order online for medicines, and within three minutes that would be sent to the ward where the patient is situated. The robot will process the medicines bought by government, split them up into packets of single medicines, which will have a bar code stuck on. Then when a pill is ordered, a robot will take the pill using the scanned bar code, take it to the pneumatic tube, which will then send it to the doctors and nurses in

the ward. The nurse will then take the pill to the patient, and scan the barcode on the patient's wristband to ensure that it is the right medicine the patient requires[54].

Additionally, government has also announced that will invest in AI robots that assist MDH doctors in surgical operations. Robots will be able to learn with every new operation performed, and the aim is for Malta to be one of a few European countries with the technology[55].

	Opportunities	Challenges
Health R&I 	• Innovative e-Health solutions and solutions for active and healthy ageing • Specialised innovation in niches such as biobanking, testing new drugs, servicing clinical trials and health tourism • Innovation in new sectors such as medical cannabis • Innovation diffusion by privatised state hospitals	• Gap between research and policy implementation

Resource-efficient buildings

This thematic area was identified by the Smart Specialisation Strategy with the goal of exploring innovative solutions for improved resource efficiency in new and existing buildings, including through demonstration projects and optimisation. Such innovative solutions are expected to partly contribute towards addressing the water scarcity problem, moving towards cleaner energy production, and creating green jobs and growth. Besides the various potential benefits that innovation in resource-efficient buildings can bring to

[54] The Malta Independent (2018), *New robotics system to be installed at Central Procurement and Supplies Unit over next 3 years*
[55] The Malta Independent (2018), *Robots to assist Mater Dei Hospital doctors perform surgical operations*

both developers and occupants alike, they can also contribute to the competitiveness of the economy via operational cost savings especially in terms of lower energy and water consumption levels. Some studies also associated positive productivity effects to sustainable buildings. For instance, the Global COGfx study found that occupants of green certified buildings scored 26 per cent higher in terms of cognitive functioning and reported fewer health problems.

A general lack of awareness of the potential benefits of resource-efficient buildings however seems to be limiting innovation efforts in the sector and hindering it from a more expansive growth phase. In Malta, there are only seven certified green buildings, indicating a great untapped potential[56]. In such a situation, three tools can play an important role in fuelling innovation in the sector:

1. Regulation: The need of compliance with building resource-efficiency regulations may support the diffusion of resource-efficient innovation through increased demand from those who require resource-efficiency improvements to comply with such regulations. In this regard, the transposing of Directive 2010/31/EU of the European Parliament and of the Council on the energy performance of buildings into the Building Regulation Act may have positive effects on innovation in the sector. As stated by the Act, these regulations promote the improvement of the energy performance of buildings within the territory of Malta.
2. Policy targets/ commitments: In 2015, Malta published its first plan towards Nearly Zero Energy Buildings (NZEB) in Malta, in which targets for new NZEB, both for residential and other buildings are established. The drive towards the achievement of such set targets may strengthen commitments towards further innovation in the area. The drive towards NZEB is also supported by the ZEROCO2 initiative, an Interreg Europe project (with the University of Malta, the Energy and Water Agency and the Building Regulation Office as local stakeholders) focusing on the promotion of near zero CO2 emission buildings due to energy use, expected to run until March 2020.
3. Demonstration projects: A factor which may play an important role in the promotion of innovation in this sector are demonstration projects by the public sector, which showcase the benefits of resource-efficient buildings. Some focus has been made on Government-owned and occupied buildings which are normally quite heavy consumers and can serve as role models for the private sector. High energy performing public buildings serve as an example and aspiration to the general public and as a model for other buildings (Gatt & Yousif, 2018). The Malta Policy Action Plan Report issued by the local ZEROCO2 project stakeholders concludes that projects should be

[56] https://issuu.com/becommunications/docs/money_jul-lowres/34 [Accessed: June 2019]

devised to improve energy performance rating of public authority buildings, such as Ministries, public offices, health centres, public schools and sports complexes from ERDF funds. The focus should be on technologies that have yet to be proven and studied in our local climate such that they serve as a learning curve for contractors and installers (Gatt & Yousif, 2018). A notable example of an ongoing investment of this kind is the Sustainable Living Complex project being undertaken by the University of Malta. The complex will serve as a test bed of sustainable building techniques and test new technologies related to solar power, heating, ventilation, and water management facilities. Public projects of this kind can lay the ground for the diffusion resource-efficient building innovation in the private sector as well.

Through stakeholder consultations, the NZEB plan for Malta had identified the low level of skills of the workforce with very limited knowledge of energy efficiency related matters as a major barrier for the diffusion of resource-efficient buildings. In this regard, the NZEB plan recommended that the roadmap of the Build Up Skills project – a national roadmap for energy training of workers in the building industry – is followed-up and implemented. An updating of this study and roadmap formulated in 2013, would provide an updated assessment of the skills gap and the extent to which this acts as barriers to the niche sector, and an updated roadmap for sustainable building construction.

Despite these limitations and barriers to innovation in this specialisation area, developments in the industry still present significant opportunities for R&I in the niche sector. Increased barriers and limitations may actually be viewed as enhancing the need for R&I to overcome such limitations. For example, the observed changes in the Maltese building typography may be a limiting factor towards the attainment of higher energy efficiency through renewable energy sources, but also creates the need for further R&I to discover alternatives and adapt to changing circumstances. For example, the MedSolar project by the Solar Research Lab at the Institute for Sustainable Energy for instance, aims to design PV panels that cater for the specificities of Maltese and Mediterranean roofs. Another project by the lab focuses on studying the viability of shallow geothermal energy for heating and cooling of buildings. Malta's commitment to develop a long-term renovation strategy to support the renovation of the national stock of residential and non-residential buildings, both public and private, in accordance with Article 2a of Directive 2010/31/EU, should also be viewed as an opportunity to integrate and support resource-efficient building R&I. The draft 2018 National Energy and Climate Action Plan also communicated that in order to foster R&I specifically in the area of energy and low-carbon technologies, a separate strategy for R&I specific to the energy sector will be developed by the end of 2019. This new strategy will aim to boost R&I efforts by the public and private sectors in the next decade.

	Opportunities	Challenges
Resource efficient buildings 	• Innovation to addressing water & energy concerns, and creating green jobs/ growth • Development of renewable energy sources tailored to specificities of Maltese buildings • Long-term strategy for renovation of national stock of residential and non-residential buildings	• General lack of awareness of potential benefits • Need for demonstration projects to spur innovation • Low workforce skill levels and knowledge in connection with energy efficient building

Future smart specialisation

The current smart specialisation strategy, whose identified specialised areas have been reviewed in the preceding discussion, extends up to 2020. The MCST is currently working on a new strategy for the post-2020 via the bottom-up Entrepreneurial Discovery Process (EDP), holding public consultations with the key academia, business, government and civil society stakeholders.

While the smart specialisation areas to be selected in the new strategy are not expected to be all the same as those of the current strategy due to changes in recent past and anticipated future sectoral developments, supporting and sustaining innovation efforts in the current thematic areas is necessary for innovation continuity. Changing the specialisation priorities fundamentally does not seem to be warranted, especially in the absence of evidence on its implementation from the monitoring system (EC, 2019a)

Nevertheless, the changed surrounding economic realities and the lessons drawn from the application of the first smart specialisation strategy need be taken into account in the devising of the new strategy. The preparers, MCST, have indicated that an evaluation of the current strategy has revealed that focus needs to balance between looking at broad economic sectors as well looking at narrower economic niches (and how such emerging niches can contribute to the broader economic sectors). It is also evident that the promotion of cross-sectoral innovation (cross-clustering) should be even further emphasised than previously done in the current strategy. An issue which is sought to being addressed is the measurement

and monitoring of innovation activity within the selected specialisation areas. While funding take-up is a proxy for R&I activity, this only captures a part of innovation activity, which as evidenced in this report encompasses a wide range of activities. A more holistic quantitative measure would enable more objective evaluation of achievements in the selected areas and would accompany more subjective assessments as performed in our review. A fully-fledged system for monitoring innovation progress in the specialisation areas is expected to accompany the strategy guiding future R&I in the economy. We also understand that the NSO is undertaken an innovation survey that will assist in this monitoring process. The updated strategy should also be accompanied by a awareness initiatives amongst actors in the R&I sphere.

4.5 Conclusions and policy recommendations

In its 2019 country report for Malta, the EC stated that "in the long run, the increased economic activity may exacerbate existing bottlenecks and put further pressure on natural resources and infrastructure, while labour shortages, low skill levels and low innovation reduce firms' growth prospects". Economic growth in the long-run is determined by supply-side factors of the economy, i.e. the factors of production (labour and physical capital) and their productivity. Given that factor of production quantities are mostly inelastic in the long-run, sustained economic growth cannot be pursued without continuous improvements in production quality and productivity, of which R&I is recognised as one of the major determinants. The current period of high growth and low unemployment should not lead to short-sightedness in R&I investment. More R&I will nurture existing and future sectors of the Maltese economy. There is a need to invest today in the creation of the foundations for this knowledge-based society (EC, 2019a).

This Chapter's analysis has looked at the conditions and recent developments in the Maltese R&I ecosystem to discern insights for future policy in the area. A holistic analysis of the R&I eco-system involves an end-to-end assessment of the innovation chain from the background framework conditions for R&I, to innovation activities (inputs such as R&D), innovation outputs and the impacts of innovation. Policy clearly has an important role to play in the 'input' segments within this chain (framework conditions and innovation activities), in order to achieve the targeted innovation outputs and impacts. However, it is still essential that a system that monitors innovation outputs and impacts is in place, to monitor progress in objective achievement and be in a position to identify adverse outcomes. This concluding section presents a series of policy recommendations along this R&I chain, based on the insights obtained from the above analyses. The assessment also embeds findings, conclusions and recommendations included in the Peer Review of the R&I system recently published by the European Commission (EC, 2019a)

Table 18: Policy recommendations summary

Framework conditions	Innovation activities	Innovation outputs & impacts
• Leadership role by Government in promoting R&I • Enhanced support through R&I funding mechanisms • Policy-making structure that enhances cross-government coordination to avoid policy fragmentation • Addressing skills shortages in various sectors of the economy • Improved access to finance for SMEs for innovation • Development of innovation hubs	• Increased public investment in research, development and innovation • Encouraging local R&I activities by multinationals, including non-R&D based innovation activities • More public private partnerships in R&I • Internationalisation of the Maltese R&I system	• Strengthening academia-business linkages and knowledge transfer activities • Development of a system monitoring innovation outputs and impacts, including potential disruptive impacts from emerging technologies

Framework conditions

Leadership role by Government in promoting R&I

- As expressed by the EC peer review of the Maltese R&I system, the under-investment in research and development (as exemplified by the distance from the target of 2% of GDP expenditure on R&D by 2020) may stem from a lack of ownership of R&I at the highest governmental level (EC, 2019a). Hence the peer review suggests that Government needs to play a more active leadership role by placing clearer priority on research and innovation.
- The EC review puts forward a number of recommendations for policy structure and 'institutional' reforms towards this objective, including the formation of a R&I 'Core Group' led by a Minister, a new Government subcommittee to address RDI issues, and an upgraded role of MCST in its R&I promotion functions.

- Nevertheless, R&I policy strategy and policy formulation should primarily remain a bottom-up process. The EC review also suggests the establishment of an independent Consultative Forum that represents all relevant stakeholders in the R&I system, acts as an advisor to Government entities, and provides the views of stakeholders towards R&I policy design and policy implementation.

Policy co-ordination

- The above recommended institutional reforms would also assist in improving central policy co-ordination from high-level structures of policymaking. In several of the smart specialisation areas reviewed in this report, policy-making and implementation is scattered between various public entities. Clearer cooperative mechanisms across relevant entities would help in avoiding the risk of over-fragmentation of R&I policy implementation and support in enhancing the role of R&I in the Maltese economy. A monitoring system is of key importance in facilitating more synergies in the policy mix. Policy evaluation should also become regular practice (EC, 2019a)

Support through funding mechanisms

- Cross-entity co-ordination needs to be enhanced also with regards to funding mechanisms. Currently funding instruments for R&I are dispersed across several funding bodies, with separate designs and no clear view of complementarities with others in the system. Further streamlining, simplification and clarification of funding schemes, would support synergies and enhance their take-up.
- Efforts by funding agencies to radically simplify the funding scheme application and selection processes and reduce red tape, the development of more proactive scheme delivery methods in a client-centred approach and the systematic promotion of a more transparent and coordinated support system, are amongst the measures recommended by the 2019 EC peer review of the Maltese R&I system (EC, 2019a) to enhance funding scheme absorption rates.
- The EC peer review of the Maltese R&I system, highlights that Malta lacks a funding channel for basic and applied research aimed for researchers at academic institutions/ public institutions, putting it at a competitive disadvantage with respect to other Member States. It hence recommends for the establishment of a Maltese Research Fund and an additional FUSION funding line directed to Higher Education Institutions and public institutions only, with no requirement for industry participation.
- The 2019 Country Report for Malta (EC, 2019c), indicates how current R&I funding and support measures remain general in scope and do not specifically target the development of technologies that address priority areas such as the environment and climate change. Current and future funding schemes should be more targeted towards addressing priorities which the country is/ may be facing.

Addressing skills shortages

- The most common R&I barrier identified across the local innovation areas, in both innovating traditional sectors and new emerging sectors, is skills shortages. Innovation brings with it the demand for a new set of labour skills, and unless such demand is met innovation progress is hampered. The role of education and training in producing the talent required by the economy is thus clearly of crucial

importance. The system needs to remain nimble and agile in adapting itself to address the skill requirements of the economy, including anticipated future requirements.

- Currently, the importation of talent from abroad is one of the ways in which skills shortages in the domestic labour force is being addressed. In the immediate future, measures to retain such talent remain important in maintaining the availability of qualified human resources for the business sector, as well as for the public research sector.
- The EC peer review also identifies the need to increase research capacity by increasing the number of qualified researches. It identifies that potential initiatives to increase the human resource include longer-term support for doctoral students, reinforcement of applied research with mandatory university-enterprise collaboration, supporting scientifically talented individuals in progressing through the education levels up to university education, and attracting and retaining researchers.

Access to finance for SMEs

- Home grown R&I remains constrained by limited access to finance for innovative firms without collateral. SMEs experience difficulties in accessing finance because of interest costs and collateral requirements, making access to finance expensive for a small-scale enterprise. The recently established Malta Development Bank (MDB), whose remit includes facilitating in plugging financing gaps for SMEs, could play in an important role in assisting home grown R&I. One of the stated priority areas of the MDB is indeed to sustain competitiveness by investment in innovation, skills, knowledge-generation and technology[57]. Financing facilities for SMEs and collaboration schemes with retail banks that improve access to finance for SMEs, such as the one recently introduced with BOV, should assist in spurring innovation amongst the smaller local enterprises.

Innovation hubs

- Innovation hubs are a powerful tool for overcoming fragmentation limitations which naturally result from a small-scale economy. Further promoting and expanding the operations of already operational innovation hubs and looking into the development of other sectoral specific hubs such as Digital Innovation Hubs are a means of facilitating innovation and also connecting the local R&I with the European integrated hub network.

Innovation activities

Public investment in Research, Development and Innovation (RDI)

[57] https://mdb.org.mt/en/home/Pages/About-Us.aspx [Accessed: 02/07/2019]

- Investment in RDI is necessary to sustain the current economic success over the medium-long term. Investment by the public sector is also key as the private sector alone is likely to invest less than the socially optimal level given the presence of certain R&I barriers (sunk costs, risks & uncertainty, access to finance etc…), and due to the presence of significant positive spillover effects towards other firms that accrue from these investments. Hence, besides facilitating R&I investment by the private sector, the Government also holds a central role in accompanying private sector investments with its own investment to facilitate innovation creation (for example through demonstration projects), the diffusion of innovations, and the achievement of set targets. The robust fiscal position that the Government has managed to build, should enable it to fulfil both of these roles more effectively.

Encouraging local R&I activities by multinationals

- Local research-intensive sectors are heavily dependent on foreign investment (e.g. pharmaceuticals, medical devices, electronic components), which means that core R&D activities are undertaken at the multinationals' headquarters outside Malta. Only a few of these companies actually develop products locally. Strengthening the earlier discussed framework conditions would develop an attractive R&D ecosystem that encourages multinational firms to relocate more of their RDI activities to Malta. The EC peer review of Maltese R&I system argues that the availability of a skilled workforce, including at the level of technicians, with foreign experience, attractive public incentives, and an effective fabric of R&D collaboration between and within public and private sectors are essential elements in this regard.
- In certain areas, the limited local resources are unable to support the full R&D cycle. Local firms mainly engage in non-R&D based innovation with a focus on design, process, organisational and market innovation (EC, 2019a). Other non-R&D forms of innovation investments can also be key inputs for innovation outcomes, and hence should also be adequately supported.
- In addition, support to nontechnological and other types of innovation (marketing, organisational, design, etc.) should be enhanced (EC, 2019a).

Public-private partnerships in R&I

- The review by the EC of the Maltese R&I system specifies that Malta is performing poorly in terms of public-private partnerships in R&I. It recommends further investigate the suitability and relevance of current instruments in promoting such partnerships and address shortcomings. The review indicates that an intersectoral mobility scheme, such as the Knowledge Transfer Partnership (KTP), if properly designed, appears as a relevant option in the Maltese context. Other countries have found that applied Research Competitive Funding calls that include a requirement for university/enterprise collaboration have also yielded results.

Internationalisation of the Maltese R&I system

- Malta can tap more into opportunities for international R&D collaboration and seek to further reinforces international, multilateral and bilateral collaboration. The EC identifies different possible incentives for the achievement of such objectives: further promoting and facilitating participation in the EU Framework Programmes (including to Spreading Excellence and Widening Participation programmes) and in other international partnerships (e.g. PRIMA) by means of a dedicated budget for internationalisation; and reinforcing the Internationalisation Partnership Award Scheme (EC, 2019a)

Innovation outputs and impacts

Strengthening academia-business linkages

- A divide between research and enterprise activity results in innovation investment inefficiencies, in that research activity (input) fails in translating into the development and market introduction of innovative outputs. Tightening this link within the R&I chain should be one of the priority policy areas, in order that innovation activities/ investments effectively translate into the desired innovation outputs. Efforts should be directed towards directing research to focus on the fields required by business enterprise as well as towards incentivising enterprises (by providing necessary resources and mitigating risks) to venture into innovation opportunities identified from research.
- The efficiency in producing innovation outputs, and the impacts of such outputs, would also be enhanced through increased knowledge transfer across and within academia and business.

Monitoring system

- A comprehensive monitoring system which enables a more quantitative/ objective evaluation of innovation outputs and impacts, for example through a set of monitorable indicators, should be developed. This should attempt to enable both the assessment of progress in identified innovation areas (such as post-2020 Smart Specialisation areas), as well as the monitoring of the socio-economic variables (e.g. sectoral employment, income, inequalities, exports) for assessing the potentially positive and negative impacts that innovation (such as disruptive technology innovation) could be leading to.

CHAPTER 5: SUSTAINABLE COMPETITIVENESS AND DEVELOPMENTS IN THE INFRASTRUCTURE AND REAL ESTATE MARKETS

5 SUSTAINABLE COMPETITIVENESS AND DEVELOPMENTS IN THE INFRASTRUCTURE AND REAL ESTATE MARKETS

Changes in the productivity with which a country uses its resources is often the key aspect considered in the analysis of competitiveness at a macro-economic level. The notion of competitiveness is closely linked to changes in productivity and other current trends in economic development that influence the use of resources. The focus on productivity and competitiveness improvements arises from the fact that these can then be transformed into growth of real incomes and improvements in the quality of life of citizens.

In recent years, however, in response to emerging challenges researchers have begun to recognize the need to go beyond economic dimensions such as productivity and add a broader perspective to the competitiveness concept. This discussion has led to the emergence of the 'sustainable competitiveness' concept, which is defined as "the set of institutions, policies, and factors that make a nation productive over the longer term while ensuring social and environmental sustainability" (Corrigan et al. 2014).

The aim of this Chapter is to present an overview of the sustainable competitiveness concept and to relate it to current developments in two key markets for the Maltese economy – the infrastructure market and the real estate market. The form of analysis presented within this first publication of the Annual Competitiveness Report is intended to promote and lay the theoretical groundwork for further analysis in this area by other entities/ researchers, as well as by subsequent Annual Competitiveness Reports. For this purpose, the analysis is structured as follows. Section 5.1 further describes the sustainable development concept and the framework within which local developments can be evaluated in relation to this concept. The expected relationships (based on economic theories in the literature) between the infrastructure and real estate markets, and the sustainable competitiveness concept are also explored in this sub-section, such that local developments in these two markets, respectively reviewed in Sections 5.2 and 5.3, can be related to the tenets of this concept. To conclude, Section 5.4 summarises the main conclusions obtained from the analysis. Policy recommendations which emanate from the analysis are evaluated in the concluding Chapter 6 of this Report.

5.1 Sustainable competitiveness

The sustainable competitiveness concept

Sustainable competitiveness embeds into the competitiveness concept the tenets of sustainable development – development that takes an integrated view of the economic, social and environmental dimensions so that it meets the needs of the present without compromising the ability of future generations to meet their own needs. The concept, thus, goes beyond real economic performance and augments it with social and environmental elements that enhance the well-being of society in a

sustainable way. It advocates that institutions, policies, and other factors should ensure that all members of society can participate in and benefit from improved competitiveness, and that resources are efficiently managed to secure prosperity for present and future generations. Within this framework, current changes in productivity must be viewed in the context of a social equilibrium and sustainable use of such resources (Karbowski et. al, 2017).

Given modern global economic, technological, social and environmental developments, an integrated view of economic competitiveness, social sustainability and environmental sustainability (as embodied by the sustainable competitiveness concept) is in the interest of any nation, including countries experiencing rapid economic growth, such as Malta. A sustainable competitiveness assessment can assist in the identification of current factors/ conditions which may eventually constitute as a barrier towards future sustainability of such growth. This includes the identification of current economic resource/ institutional issues which, if not addressed, would act as a constraint on the sustenance of competitiveness, as well the identification of side-effects developing in the social and environmental spheres which could in turn feed back to act as a drag on competitiveness growth. For example, a sustainable competitiveness analysis for Malta is relevant in assessing:

- Economic competitiveness: Whether the country is developing the necessary economic capacity, capital and resources (physical capital/ infrastructure, human capital, technology etc…) required to ensure sustainable economic growth and competitiveness. Sustained economic growth requires equivalent sustained increases in the underlying economic resources mentioned above. This consideration is particularly relevant for Malta given its scale limitations.
- Social sustainability: The inclusiveness of growth is a main consideration in a booming economy. Inclusive growth simultaneously achieves economic growth and balanced social outcomes. An unbalanced social model can undermine the stability of the growth process for both current and future generations. If inequalities (actual as well as perceived) lead to significant social discontent, the capacity of individuals to contribute to and benefit from higher rates of economic growth can be affected (Corrigan et al, 2014).
- Environmental sustainability: Natural capital is a key component of the sustainable competitiveness concept. At a country level, finding an appropriate combination of technology/ production in view of the country's natural carrying capacity can prevent natural resource limitations from becoming a drag on future competitiveness. At a business level, environmentally sustainable practices could also fuel productivity and be an important source of innovation, contributing to competitiveness (Corrigan et al, 2014).

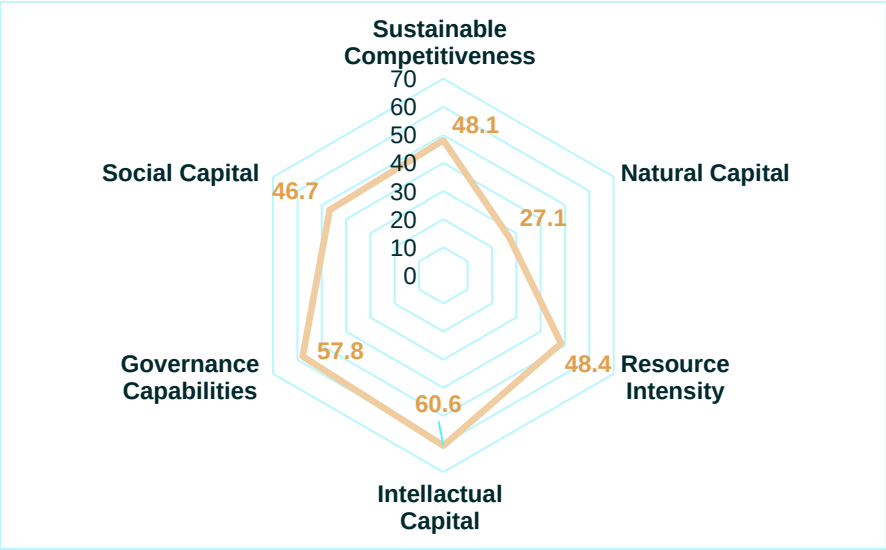
Indicators of sustainable competitiveness

Measurement frameworks and instruments for sustainable competitiveness are valuable tools to obtain relevant insights on its highly interdependent challenges, and how to best address them. The most comprehensive available measure of country competitiveness that considers both current competitiveness and the ability to sustain future competitiveness is probably the 'Global Sustainable Competitiveness Index' (GSCI) developed by SolAbility. The latest published GSCI for the year 2017 is based on 111 measurable and comparable quantitative indicators from international databases, integrating the three dimensions of sustainable competitiveness/ development: the economy, society and the environment. Its index methodology seeks to cover the pillars and fundamentals that shape the current and the future competitiveness of a nation-economy - natural capital availability, resource efficiency, social cohesion, government-led development direction, and innovation and business capabilities (SolAbility, 2017). Essentially, the GSCI measures sustainable competitiveness on the basis of five components:

- Natural Capital: The given physical environment incorporating all the resources that are available which allows the country to be completely self-sustaining, and the level of depletion of these resources that could endanger future self-sufficiency.
- Social Capital: The sum of social stability (cohesion) and the well-being of the whole population including health, security, freedom, equality and life satisfaction.
- Resource Management: The capability of using the resources that are available to the country (natural capital, human capital and financial capital) in an efficient way both when capital is in abundance or is scarce.
- Intellectual Capital: The process of creating jobs through innovation and value-added industries in the globalised markets which will generate wealth. It also reflects the ability to sustain the wealth created.
- Governance Efficiency: Results of core state areas and investments – infrastructure, market and employment structure, the provision of a framework for sustained and sustainable wealth generation.

In the 2017 GSCI Malta achieved a score of 48.1, placing it 38th amongst the 184 included countries. The figure below presents Malta's score by each component of the index.

Figure 40: Malta GSCI score by component



The weakest score for Malta is by far in the natural capital component, which places the country in the bottom ranks at 172nd. This is an unsurprising result given the country's natural limitations. A cross-country comparison with the next two smallest states in the EU - Luxembourg and Cyprus, which respectively rank 101st and 179th in the natural capital component, also indicate the influence of country scale and resource endowments. However, while the indicator includes natural factors which are to varying extents uncontrollable, it also includes indicators of environmental degradation (e.g. land degradation, renewable freshwater availability)[58]. Given the nature of this indicator, an analysis of variations in ranking over time that would control for factors which may be largely uncontrollable, would be more meaningful (i.e. variation over time would better isolate the impacts of environmental degradation over time, controlling for initial natural resource endowment). However, due to annual GSCI methodology adjustments (with adjustments to indicators making up the components) it is not possible to reliably perform such a comparison. Although this component largely reflects natural factors and resource endowments, it highlights how Malta's competitiveness drive needs to overcome natural capital limitations, and that considerations for environmental sustainability to sustain competitiveness are stronger as high environmental degradation exacerbates this limiting factor. In terms of the other

[58] The full list of indicators making up these components can be viewed from the same Global Sustainable Competitiveness Index report by SolAbility (2017): http://solability.com/solability/sustainability-publications/the-global-sustainable-competitiveness-index-2

components, Malta performs highly in the intellectual capital component (rank: 16) and the government capabilities component (rank: 22) – the aspects which these components seek to quantify have been outlined earlier.

Malta's 2017 overall sustainable competitiveness score (48.1) is below that recorded for the EU average (simple average of 51.7). The overall score ranks Malta as 24th amongst the EU member states. A comparison by component is shown in the table below. Malta records a lower score than the EU average in all dimensions, except for the intellectual capital and governance capabilities indicators.

Table 19: Malta and the EU average GSCI score by component

	Sustainable Competitiveness	Natural Capital	Resource Management	Intellectual Capital	Governance Capabilities	Social Capital
Malta	48.1	27.1	48.4	60.6	57.8	46.7
EU average	51.7	45.5	50.4	55.5	57.0	50.2
Malta rank	24th	27th	19th	9th	12th	21st

(Source: The Global Sustainable Competitiveness Index 2017 SolAbility)

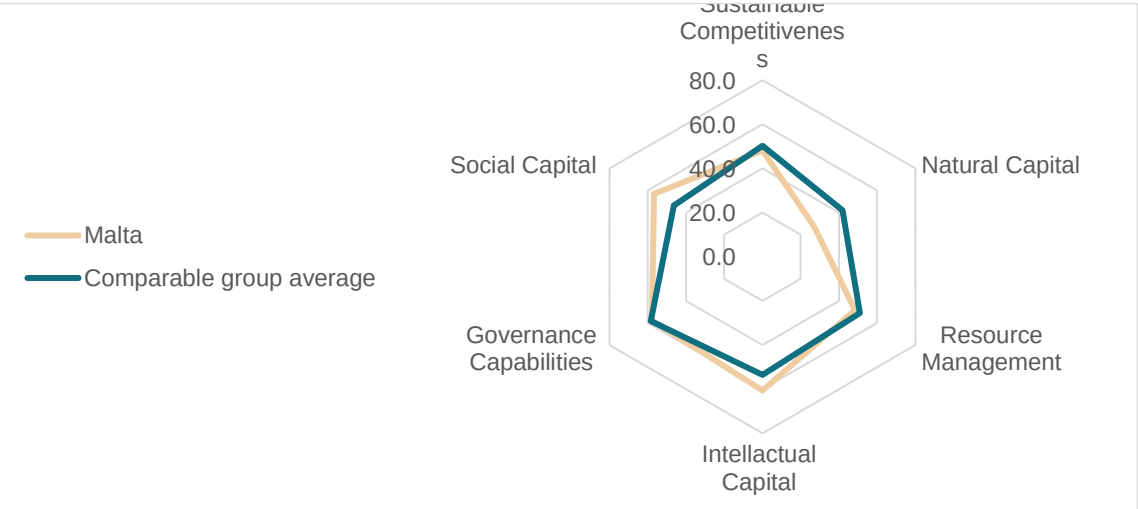
The table and diagram that follow present a comparison of Malta's ranking in the respective GSCI components with the rankings of the five comparable and target countries identified in Chapter 2 of this report (Cyprus, Czechia, Estonia, Portugal and Slovenia). Malta places 5th (among the group of 6) in the overall sustainable competitiveness index, with the ranking varying in each of the respective components.

Table 20: Malta and comparison group GSCI ranking by component

Country	Sustainable Competitiveness	Natural Capital	Resource Management	Intellectual Capital	Governance Capabilities	Social Capital
Estonia	10	9	39	28	6	131
Slovenia	11	91	9	14	8	93
Czechia	21	123	23	21	2	59
Portugal	33	89	20	29	75	100

Malta	38	172	36	16	22	89
Cyprus	97	179	24	53	89	85

Figure 41: Comparison of Malta GSCI score by component with comparison group (simple avg.)



(Data Source: The Global Sustainable Competitiveness Index 2017 (SolAbility)

Infrastructure, the real estate market and sustainable competitiveness

As can be seen from the above introduction, sustainable competitiveness incorporates many different but interrelated aspects. The previous chapters of this Report have already looked into some of these aspects in relation to the latest developments in the Maltese islands, including the economic/ institutional determinants of competitiveness, sectoral productivity, human capital resources and the role of innovation in shaping competitive advantages. In this Chapter we focus on two other selected aspects of sustainable competitiveness – economic infrastructure and the real estate market. Both of these are important elements of sustainable competitiveness and can produce spill-over effects in its different dimensions such as environmental sustainability, inclusiveness of growth and price competitiveness. As also expressed by the IMF in its 2018 and 2019 Country Reports for Malta, these are two current areas which present major challenges to sustaining Malta's current economic growth. The IMF reports expressed how the rapid economic expansion and the growing population, with the continued influx of foreign workers, are putting pressure on physical infrastructure and resulting in a continued property market price appreciation, with implications for future productivity and social welfare/ inclusion (IMF, 2018; 2019). Monitoring developments in these two areas is thus of critical importance in terms of assessing the competitiveness sustainability of the Maltese economy.

Infrastructure and sustainable competitiveness

In connection with the Maltese economy, recent IMF Country Reports in Malta (2018 & 2019) expressed the view that physical infrastructure has not kept pace with economic development. The rapid economic and population growth have led to increased infrastructure needs and pressures, most notably (but not limited to) on transport and waste management infrastructures. At the same time, the demand for health and education services is ever increasing. The IMF thus recommends that policies should focus on boosting public investment in a budget-neutral manner to address infrastructure gaps/ bottlenecks which would constrain medium-to-long term growth and competitiveness. Infrastructural quality improvements would alleviate constraints on future economic growth, increase social inclusion, spur and crowd-in investment, and promote higher productivity growth (IMF, 2018).

The importance of infrastructure to explain growth and competitiveness performance has been long acknowledged in the literature. Infrastructure can directly enter the production function, as well as improve Total Factor Productivity (TFP). Lack of adequate infrastructure, on the other hand, is usually seen as a bottleneck that can harm prospects for investment and therefore, growth (Lopez, 2003). This is also recognised by the previously reviewed competitiveness indicators, the GCI and the GSCI, which include infrastructure (quantity, quality and availability) as one of the components of current and future (sustainable) competitiveness. Quality transport infrastructure improves inter-connectedness, lowers transportation (congestion) costs, and facilitates labour mobility and the transfer of goods within a country and across borders. Quality utility infrastructure ensures stable access to utilities (such as power and water services) which are necessary for modern economic activity. The role of infrastructure in promoting competitiveness is also evaluated by the services provided by the physical infrastructural assets. Infrastructure services such as energy, water provision, transport, telecommunications and waste management are fundamental to all kinds of economic production and household activities.

The theoretical literature on the impact of infrastructure on economic growth and competitiveness of domestic producers shows that positive direct, indirect, as well as wider impacts can be reaped from infrastructure investment. Direct impacts arise from the fact that it enables businesses to generate additional production capacity, reduce the cost of inputs in the production process, and reduce transaction costs (Palei, 2015). Another direct impact on economic growth is the creation of economic activity and jobs in the construction industry in the initial period of construction work. The increase in construction demand also leads to economic ripple effects through the supply chain as the construction industry also requires inputs from other related/ interlinked sectors in the economy. Indirectly in the longer term, infrastructural investments can also indirectly increase the productivity of the workforce, contributing to national competitiveness. Furthermore, investments in social infrastructure such as education and healthcare facilities enhance competitiveness through their contribution to human capital. With adequate infrastructure and efficiency-related services, countries can also compensate for the lack of certain natural resources. Hence infrastructure investment can boost the economy in two ways:

- Directly in the short term through ripple effects on economic activity and employment;
- Indirectly in the long term, through raising the productive capacity of the economy by reducing transaction and other costs allowing a more efficient use of inputs.

In terms of sustainable competitiveness, the report "Exploring the Economic Rationale for Infrastructure Investment" by the Scottish Government aptly summarises the following ways in which infrastructure enables sustainable and inclusive growth:

Figure 42: Sustainable competitiveness with infrastructure investment

Inclusive and Sustainable Growth	
Market impacts	• Facilitating the development of key sectors and technology (e.g. new technologies) • Improving private sector competitiveness (increased competitiveness that drives down prices and raises quality) • Unlocking private sector capital and investment (e.g. FDI)
Demand side economy impacts	• Stimulating economy through construction phase itself (supporting jobs, and ripple effects through supply chain)
Supply side economy impacts	• Improving productive capacity in the economy (e.g. by improved connectivity) • Enhancing productivity, labour market and skills (e.g. social infrastructure)
Social and environmental impacts	• Reducing regional disparities (improving connectivity and accessibility) • Reducing emissions (e.g. low carbon technologies) • Improving environmental quality and improving health and well-being
Supporting the foundations of economic activity (Economic resilience, provision of lifeline services, effective operation of the economy)	

(Source: Exploring the Economic Rationale for Infrastructure Investment Scottish Government, 2018)

Social and environmental sustainability: The research on the distributional implications of infrastructure developments is more limited given data limitations in the area. However, research offers some suggestive evidence of an equity-enhancing effect. Infrastructure development is expected to affect poorer households primarily by improving their access to affordable services (Calderón & Servén, 2014). Productive public investment can also potentially alleviate inequality even if expenditures are uniformly

distributed in the case where the poorest groups of society face constraints that prevent them from acquiring private substitutes for infrastructure services. Infrastructure gaps often affect disproportionally the poor, as the richer groups are better able to adopt coping mechanisms. The lower-income segments of society would thus attribute a larger relative proportion of the resulting infrastructure investment benefits. Hence, public infrastructure investment could lead to both increased growth and reduced inequality. In connection with environmental sustainability, large infrastructural investments can have large environmental impacts (both positive and negative) in the immediate construction phase as well as over the long-term period. Investments with controlled immediate adverse impacts and substantial future benefits in terms of energy/ raw materials consumption savings and reduced waste/ pollution generation, are the ones most aligned to the sustainable competitiveness concept. Investment in cleaner technologies, such as cleaner energy production and clean water provision, directly lead to improvements in environmental quality, health and wellbeing.

The real estate market and sustainable competitiveness

Rising property prices stemming from the surging demand in this market is another challenge to sustainable competitiveness, as they reduce the availability of low-cost housing with adverse repercussions on affordability for the lower-income segments of society (social sustainability considerations). Even though supply in the property market can be expected to gradually catch-up with the strong demand, fast rising property prices and rents are in the meantime intensifying affordability concerns (IMF, 2019). Sustained high growth in property prices can also put upward pressure on wages that could eventually be harmful to competitiveness.

The potential impacts of property price growth can affect national competitiveness are various, and the resulting net effect can be both positive and negative depending on the national circumstances and the price growth level. House price developments have direct and indirect impacts on the macroeconomy and the financial system. Balances or imbalances in these two domains are determinants of future/ sustainable competitiveness. Furthermore, the two domains are clearly interrelated and can create self-reinforcing feedback mechanisms – financial system stability contributes to the smooth functioning of the macroeconomy, whilst a macroeconomy free of major imbalances is a key requirement for financial stability. Likewise, instabilities in one system easily feed into the other. The major threats to national competitiveness from excessive housing price increases, especially if such rises are greater than justified by economic fundamentals (demand and supply factors), are thus macroeconomic and financial instability. This sub-section thus presents a brief overview of the channels suggested by economic theory through which property price developments can impact these two domains.

House prices and the macroeconomy

- Property residence is often the largest and most important asset of households and therefore accounts for a major share of household wealth. This also applies to the local context, where data

across three waves of the Household Finance and Consumption Survey (latest in 2017) conducted by the Central Bank of Malta (CBM) reveal that the Household Main Residence constitutes close to 48% of households' total assets (Georgakopoulos, 2019). This is also due to the homeownership rate in Malta being amongst the highest in Europe, measured at 81.6% (22.7% with mortgage or loan; 58.9% with no outstanding loan or mortgage) in 2018. House price changes thus have a significant effect on households' perceived lifetime wealth (if changes are viewed as permanent), which in turn determine the spending and borrowing plans of households as they wish to smooth consumption over the life cycle. This positive wealth effect for homeowners from a house rise price would thus be expected to stimulate private consumption and economic activity.

- A more direct impact channel of property price fluctuations on economic activity is via investment (residential and commercial property investment). An increase in property prices raises the value of property relative to construction costs and new construction becomes more profitable when property prices rise above construction costs, incentivising property investment.
- Property is also the most commonly used collateral for loans, and hence property prices affect the borrowing capacity and borrowing costs of households and firms to finance the above changes in desired spending and investment plans. This is particularly so for households in view of the large share of property in household wealth portfolios. Rising house prices thus ease credit constraints, for example through eligibility for home equity release loans (a similar scheme has been recently released in Malta).
- The increase in consumption and investment from higher household wealth, however, may finally feed into higher consumer prices. The increased demand in the economy will bid up prices for goods and services in the economy. Also, higher house prices raise the cost of living for workers, causing them to demand higher wages, and in turn raising business costs which may have to be passed on to consumer prices for goods. Higher costs of living erode the competitiveness of the economy. Alternatively, rising wage costs would have to be absorbed by businesses, hampering their investment potential.
- It is also recognised that house price variations do not solely have an impact on the absolute level of wealth but also on its distribution. Higher house prices cause a redistribution of resources between tenants (higher rent costs) and prospective new buyers (higher property/ mortgage costs) on one side and property owners on the other. The positive wealth effect is therefore also offset by negative net income effects on tenants and prospective buyers. The resulting net effect is often difficult to determine, but the higher the share of property owners the more likely that the wealth effect dominates the income effect. The final net impact also depends on whether the property price changes are uniform across property market segments or they are concentrated in geographical/ property type segments. The high share of household main residence in households' asset portfolio imply strong wealth distributional impacts resulting from the uniformity/ non-uniformity of price increases.
- Rapidly increasing house prices also impacts the affordability of accommodation, make home ownership more difficult for the lower income segments of society, and can lead to gentrification.

House prices, the financial stability and the macroeconomy

- As discussed above house prices may affect consumption and investment via wealth effects and hence credit demand for bank lending. At the same time, the higher value of the property collateral which borrowers can offer eases borrowing constraints and credit supply. Due to these factors, credit and property cycles have historically tended to move in tandem.
- Moreover, there are bi-directional links between bank lending and house prices which may give rise to mutually reinforcing cycles in credit and real estate markets. Part of the additional available credit resulting from the easing of borrowing constraints (due to higher property collateral) may also be used to purchase property, pushing up property prices further and forming a self-reinforcing process. The feedback loop can leave banks' and households' balance sheets heavily exposed to housing values, such that a collapse of house prices may lead to banking sector distress. The process can also act in the reverse direction in the case of a collapse in property prices which may occur following a reversal/ correction of house prices which had not been driven by fundamental factors.
- This 'financial accelerator' process demonstrates the interactions between macroeconomic and financial stability resulting from property price changes. Property price fluctuations may significantly amplify the effects of macroeconomic shocks (e.g. demand, supply, policy shocks), and non-fundamental movements in house prices may give rise to imbalances in the economy and in the financial system. House price fluctuations may therefore have a major effect on economic activity and the soundness of the financial system (Goodhart & Hoffman, 2007).

The real estate market, infrastructure and environmental sustainability

Besides having the above implications for economic and social sustainability, real estate market developments also play an important role for environmental sustainability within the sustainable competitiveness concept. Higher property construction levels in a booming real estate market produce environmental externalities and place additional pressure on natural local resources, especially for resource-constrained nations like Malta. Infrastructure investment to close infrastructure gaps also imply higher construction activity, and so similar considerations apply. Interactions between the two spheres also exist – more property construction can lead to additional strains on infrastructure by limiting the usability of infrastructure services. A delicate balance between sustaining a solid property market, infrastructure investment and environmental sustainability needs to be achieved for sustainable competitiveness.

The achievement of this delicate balance can be supported by enhanced environmental sustainability in construction. Building energy performance and resource efficiency in the use of products for the construction of buildings and infrastructures have an important impact on energy demands and the environment (EC, 2012). The construction sector could contribute to sustainable competitiveness by increasing its activity in areas such resource-efficient buildings and the renovation of buildings and infrastructures (EC, 2012). The opportunities and barriers for innovation in resource-efficient buildings

have been reviewed in Chapter 4 of this Report. A critical mass has yet to be reached in this area, but the contribution potential remains significant. Malta's commitment to develop a long-term renovation strategy to support the renovation of the national stock of residential and non-residential buildings, both public and private, is also an opportunity for addressing infrastructure, real estate and environmental sustainability requirements for sustainable competitiveness in an integral way.

Based on the above analysis the below figure summarises the channels through which the real estate market may impact sustainable development and its domains:

Figure 43: The real estate market and sustainable competitiveness – Summary of channels

Real estate market and sustainable competitiveness - Channels		
Economic competitiveness	Property prices	Macroeconomic stability • Wealth effects • Private consumption • Investment and construction activity • Consumer prices House prices, the financial stability and the macroeconomy • Household, firms and financial sector balance sheet exposure to property prices • Financial accelerator
Social sustainability		• Wealth distribution effects • Accommodation affordability
Environmental sustainability (& economic competitiveness)	Construction	• Economic contribution of construction activity and investment • Construction externalities • Resource-efficient buildings • Building renovation

5.2 Developments in the infrastructure market

In the preceding sub-section, substantial potential benefits of carefully managed infrastructure investments towards sustainable competitiveness have been identified. However, rapidly rising demand for infrastructure services, private market failures and/ or public fiscal constraints or policy failures can

lead to underinvestment and the creation of infrastructure gaps. This sub-section presents an overview of developments in the local infrastructure market, also in light of the views expressed in the IMF's Country Reports for Malta that physical infrastructure has not kept pace with Malta's rapid economic development. This sub-section's analysis is structured as follows. Available indicators of the level of infrastructure stocks, quality, investments and investment efficiency are first analysed; followed by considerations on infrastructure gap indicators and the project pipeline to close this gap. It should be noted that due to limitations and lags in data availabilities, any recent infrastructural projects are not reflected in the various quantitative assessments presented in this analysis.

Infrastructure stock and investment

There is currently no universally recognised conceptual definition of the range of assets classifiable as infrastructure. Furthermore, International System of Accounts do not contain a statistical definition of what is classified as infrastructure within the national accounts. Without a clear conceptual and statistical definition, it is hard to pin down and evaluate a country's level of infrastructure stock and investments. In the literature, asset types are typically conceptually classified as infrastructural either based on the economic characteristics of the assets or their function. Infrastructure classification is sometimes divided between core economic infrastructure (permanent engineering structures, equipment and physical facilities that are the basis for providing energy, transport, telecommunications, water and sanitation services to productive sectors and households) and broader social infrastructure (hospitals, schools, and other public buildings). In this Report, we will be referring to both types of infrastructures. Given the characteristics and functions of both types of infrastructural assets, these are most likely (but necessarily) to require public provision.

In the context of this ambiguity in the classification and measurement of infrastructure investment, we hereby present some alternative measures which can be used as indicators to gauge the extent of infrastructure stock and investments in Malta. We present a historical time-series review of these indicators to provide an indicative assessment of the country's performance in terms of infrastructure investment and gaps in its infrastructure stock. While neither of these indicators is likely to individually constitute a precise estimate of actual infrastructure investments/ stocks (each indicator has its own strengths and limitations), taken together they can provide a reasonable high-level overview of the range and trends in these variables.

An analysis of the annual 'flow' of investment as well as of infrastructure 'stock' levels is required for a complete analysis of the state and developments in infrastructure market. The most commonly used

measure of investment in the economy is Gross Fixed Capital Formation (GFCF)[59], by the public and private sector. The definition of GFCF (as per Systems of National Accounts), however, also includes investments that are not necessarily infrastructure-related such as machinery and equipment and intellectual property products, and so an evaluation of investment sub-sets is often necessary to obtain indications of infrastructure related investments. Obtaining a reliable estimate of infrastructure stock is a more challenging task requiring some methodology assumptions. Researchers typically apply the perpetual inventory method to obtain estimates of capital stock – a method based on the sum of past investment flows, adjusted for depreciation. The perpetual inventory method requires assumptions on initial capital stock and depreciation rates.

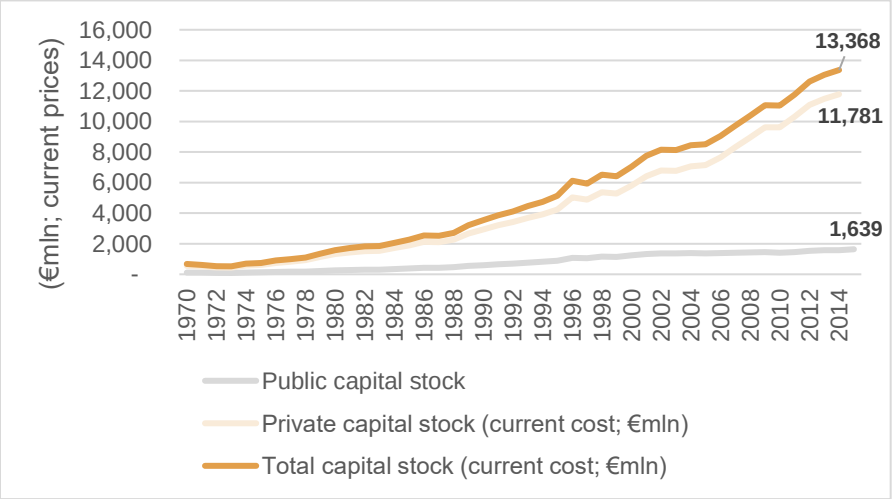
The most extensive collection of international public capital stock estimates, including estimates for Malta, is the 'Investment and Capital Stock Dataset' published by the IMF. The IMF methodology constructs capital stock series (for the period 1960-2015) for 170 countries, utilising the perpetual inventory method various databases to compile a comprehensive series for public, private, and public-private-partnership (PPP) investments (GFCF). The public-sector capital estimates from this dataset are often referred to as estimates of national infrastructure stocks. More recent work acknowledges that public capital is not synonymous with infrastructure, since not all public capital is infrastructure (e.g. Government offices) and not all infrastructure is public (e.g. telecommunications infrastructure in some countries). Infrastructure thus consists of subsets of both public and private capital assets. Even though this dataset's methodology approach contains some strong assumptions and limitations, in the absence of specific studies on the subject for Malta, we refer to this data set below to infer insights on historical national infrastructure stock levels.

The chart below graphs the developments in total, public and private capital stock estimates for Malta according to the IMF Investment and Capital Stock dataset (€mln; at current prices) over the period 1970-2015 (based on data availability for Malta; unavailable data for 2015 private stock). Although as explained above, infrastructure is mostly associated with public capital stock levels, we also present the series for private capital stock as this is also likely to contain infrastructural elements. Total capital stock has gradually accumulated over the years to reach an estimate of c. €13.4bln in 2014[60]. Of this total stock, c. €1.6bln (c. 12%) consists of public stock. It is interesting to note that over the latest years, the share of

[59] The definition of Gross Fixed Capital Formation as per the 2008 System of National Accounts, also includes investments that are not necessarily infrastructure-related such as machinery and equipment and intellectual property products.
[60] The rise is also influenced by inflation levels as the measure is at current prices.

public capital stock in the total stock estimate has gradually declined, from c. 17.5% in 2000 to the latest estimate of c. 12.0%. This observed trend may be attributed to different factors, including the changing role of the state and the shift to more privatised markets, higher private sector investment, and increased foreign direct investments particularly following EU accession (and periods of inclusion in the Excessive Deficit Procedure that limited public investment).

Figure 44: IMF Investment and Capital Stock dataset – Public, private and total capital stock (€mln)

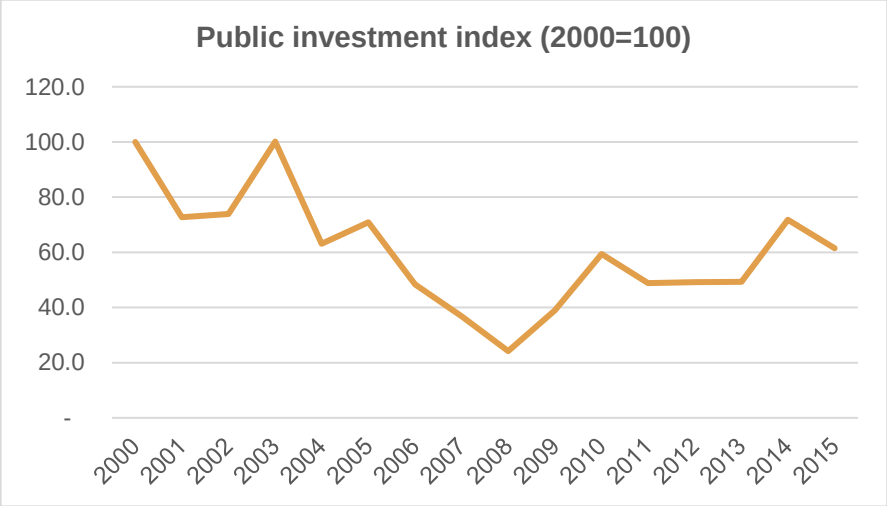


(Data source: IMF Investment and Capital Stock dataset 1960-2015)

It can also be observed that the recorded growth in public capital stock has declined since the 2000s. To further analyse this trend, the below chart presents an index of the recorded public investment levels over this period, measured at constant 2011 international dollar prices (hence controlling for inflation and purchasing power) over the 2000-2015 period[61]. As expected, annual investment flows are of a volatile nature. As a general trend over the period, however, one can observe an initially declining level of public capital investment up to 2008, followed by a generally increasing investment thereafter.

[61] The lack of data on the purchasing parities applied in the calculation, does not enable us to compare investment levels on the same metric (local currency at current prices) as the stock levels above.

Figure 45: IMF Investment and Capital Stock dataset – Public investment index (2010=100)



(Data source: IMF Investment and Capital Stock dataset 1960-2015)

In assessing the public capital stock and investment levels, a number of underlying economic trends and methodology caveats with respect to the segregation of public and private contributions must however be kept in mind. The methodology relies on the challenging practice of disentangling private and public sector GFCF contributions, and hence the method may not fully reflect the real public sector contribution (and hence public infrastructure value proxied by public capital stock). Governments may contract the private sector to provide infrastructure services, with annual payments for these services being classified as public current spending whilst investment spending classified as private. In addition, some entities controlled by the public sector but outside the general government (State-owned/ parastatal entities) may undertake infrastructure spending that is not recorded as public investment. Similarly, special purpose vehicles linked to PPPs contracts are typically classified as private, even if they are controlled by the public sector. Hence data needs to be interpreted with these possible caveats in mind. These factors, together with the higher infrastructure investments from the private sector resulting with successive privatisations of state-owned enterprises (including enterprises connected with infrastructure provision such as the Malta International Airport, shipyards, telecom companies, public transport, etc) and asset concessions over the years, may lead to a certain level of underestimation of the real infrastructure stock on the basis of public capital stock. From the other end, a level of overestimation may come from the fact that the definition of GFCF on which investment is measured, also includes investments that are not necessarily infrastructure-related. Despite these limitations, the public capital stock estimates of this dataset are the most widely used internationally comparable estimates of infrastructure stock/ investments.

In view of the above, a different way of assessing infrastructural investments is next presented by applying to Malta an alternative approach that has been adopted by the UK Office for National Statistics for this

purpose. This also allows us to review more recent data up to 2018. This approach is based on the functional characteristics of infrastructure assets, and relies on the use of the functional classification hierarchy in the European System of Accounts (ESA) for the functions of Government (including GFCF). This approach better allows the identification of how much public investment is infrastructure-related, rather than in other non-infrastructure related investment (e.g. machinery, intellectual property assets). Some element of subjectivity is still present in determining the government functions classifications that correspond to the infrastructure investment definition. We base our estimates on the classifications adopted by the UK Office for National Statistics (2017) and extend the analysis with other assets to better reflect the public-private investment conditions in the Maltese economy, and to include housing and social infrastructure. The Classification of Functions of Government (COFOG) for GFCF included in our analysis (some functions have been grouped) are:

- Transport and street lighting
- Waste management
- Housing and community development
- Communication
- Hospital services
- Recreational and sporting activities, cultural services and landscaping
- Education

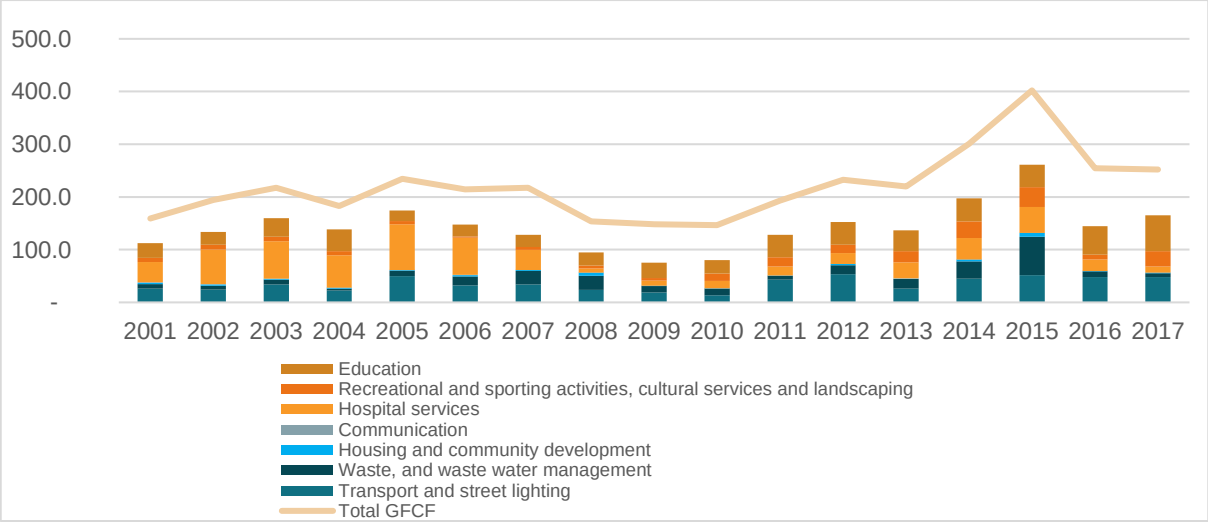
The table and chart overleaf present the volume of General Government investment (GFCF) in the above indicated functions.

Table 21: General Government GFCF (€mln; current prices)

General Government GFCF (€mln; current prices)	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Transport and street lighting	25.9	24.4	34.0	22.3	50.1	32.0	34.3	23.5	18.8	13.4	43.4	53.5	26.1	45.0	51.7	48.0	48.2
Waste, and waste water management	8.8	7.3	8.9	3.8	10.3	17.4	25.0	26.9	12.3	12.9	6.8	16.8	18.4	33.0	72.9	10.7	7.1
Housing and community development	2.6	2.6	2.3	1.7	1.0	2.1	2.1	6.0	0.2	0.5	0.5	2.7	0.7	3.2	7.3	1.0	1.2
Hospital services	38.5	66.0	70.8	61.6	86.5	70.5	38.3	7.5	9.9	14.1	17.5	20.5	30.7	40.7	48.8	21.8	11.7
Communication	0.8	0.1	-	0.1	0.1	0.6	0.1	0.3	0.2	0.1	0.1	0.1	0.2	0.2	0.2	0.1	0.1
Recreational and sporting activities, cultural services and landscaping	7.7	8.9	8.5	7.8	6.1	2.7	5.3	5.6	5.1	13.6	17.4	15.6	21.0	31.8	38.0	8.7	28.8
Education	28.2	24.1	35.5	41.4	20.0	22.2	23.2	25.2	28.8	25.4	42.8	43.6	39.8	43.6	42.1	54.3	68.0
Total 'infrastructure-related' investment	112.5	133.4	160.0	138.7	174.1	147.5	128.3	95.0	75.3	80.0	128.5	152.8	136.9	197.5	261.0	144.6	165.1
Total GFCF	159.3	194.2	217.2	182.6	234.3	214.5	217.6	153.7	148.4	146.6	192.9	232.9	219.8	300.8	402.2	254.5	252.1
Infrastructure related investment (% of total GFCF)	70.6%	68.7%	73.7%	76.0%	74.3%	68.8%	59.0%	61.8%	50.7%	54.6%	66.6%	65.6%	62.3%	65.7%	64.9%	56.8%	65.5%

(Data source: Eurostat)

Figure 46: General Government GFCF (€mln; current prices)



(Data source: Eurostat)

The above figures show how the absolute level and composition of Government investments in these functions has varied over the years, reflecting national projects and priorities over time. As expected, the levels of investment in each of the areas fluctuate over the years (e.g. more investment in hospital services over the 2000s namely in the form of investment in a new general hospital). Over the latest years, the largest investment increases (on average and in relative terms) were in assets related to transport, waste and waste water management and recreational and sporting activities, cultural services and landscaping. In the last 5 recorded years (2013-2017), infrastructure-related investment (as per our definition) ranged from €137mln to €261mln, averaging €181mln. The share of 'infrastructure-related' investments in total Government investment generally stood in the region 50% to 65%, excluding the initial years characterised by high investment in hospital infrastructure.

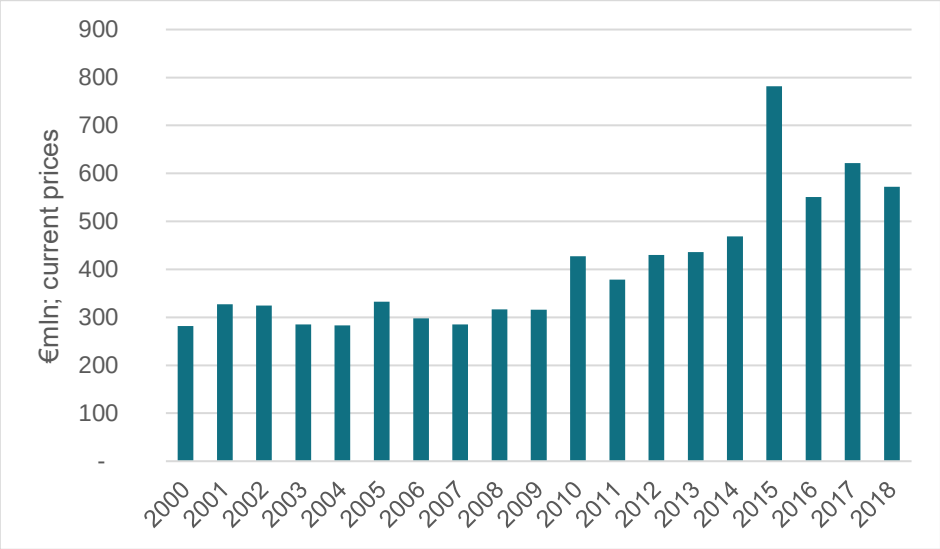
The above reported figures reflect only investments in infrastructure assets by General Government, and hence are likely to understate the level of infrastructure investment in the whole economy. In the methodology adopted by the UK Office for National Statistics which we have been largely following in identifying infrastructure investments, private investment was gauged through a firm-survey on acquisitions of capital assets. Since this granular data is not available for Malta, we adopt an alternative approach in the attempt of gauging private sector investment. We refer to official statistics on total GFCF in the economy (public and private) over the recent years and look at one of its sub-sets which is mostly closely infrastructure related.

If we take the 'Other buildings and structures' sub-set as representative of infrastructure investments, we obtain the below presented investment series. This statistical category includes buildings other than dwellings, land improvements, and notably 'Other Structures'. Examples of the latter include streets, roads, airfield runways, bridges, tunnels, subways, harbours, waterworks, long-distance pipelines, communication and power lines, local pipelines and cables, constructions for manufacture, and constructions for sport and recreation[62]. Investment in this category has increased over the last decade, also reflecting the increase in public investment referred to earlier (this series includes both public and private investment), reaching c. €572mln in 2018 (€622mln in 2017). In 2015, investment had almost reached €800mln following large-scale public projects materialised in the aviation and energy sectors

[62] For classifications in ESA 2010 - https://ec.europa.eu/eurostat/cache/metadata/Annexes/nasa_10_f_esms_an1.pdf

(Ministry for Finance, 2018). Although the available data is not sufficiently granular to precisely identify infrastructure investment[63], it can provide a general idea of total infrastructure investment levels in the economy.

Figure 47: GFCF in 'Other buildings and structures'



(Data source: Eurostat)

This sub-section presented a number of possible measures that could provide an indication of the historical level of infrastructure stock and investments in the country. The limitations arising from the lack of universally agreed upon infrastructure classification (and measurement) must be however kept in mind. Each measure has its own strengths and limitations in terms of methodology employed and coverage of infrastructure-related investments by different parties. Hence, neither of them can be reliably considered as providing a precise estimate, and interpretation depends on the breadth of infrastructure definition adopted. Taken together, however, they still provide valuable insights. The holistic view purported by these indicators is that, following periods of stable infrastructure

[63] From one end, overestimation may be resulting from the fact that the 'other buildings and structures' category still incorporates within it non-infrastructure investments. On the other end, certain types of infrastructure investments may be classified under other categories such as equipment investment. For instance, the energy interconnector, which has become an integral part of energy infrastructure, has been classified as equipment investment. It is thus not possible to obtain a precise estimate of economic infrastructure investments with the currently available data.

investment by the private sector and declining levels in the public sector (or shifting levels from the public to private sector), investment has recovered strongly since 2015.

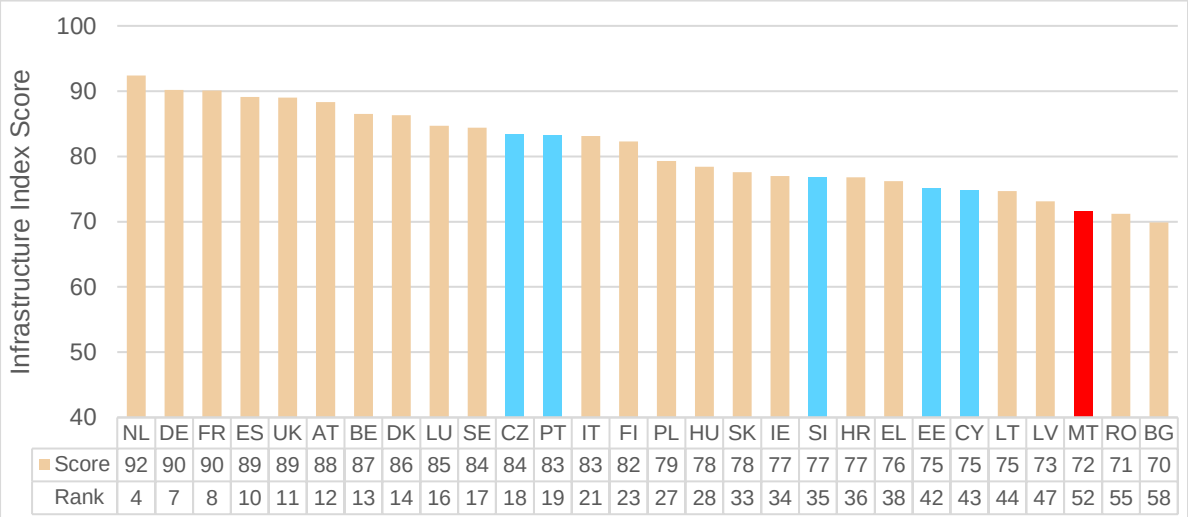
Infrastructure quality and investment efficiency

Besides analysing infrastructure investments in quantitative financial terms, assessing the coverage, quality and efficiency of infrastructure services is also key in assessing infrastructure provision. To the extent possible, the quality of service provision and the degree to which investments help improve the coverage and quality of public services should also be appraised (Andres et al, 2014). It is necessary that infrastructure investments are highly efficient in converting increased infrastructure quality into quantity, i.e. investment efficiency with a high economic rate of return to infrastructure investment. The economic disadvantages from poor quality infrastructure are clear. Inadequate transportation network coverage and quality can severely constrain producer-consumer connectivity; unreliable provision of utilities can restrict productive capacity and undermine an economy's attractiveness for investors; and underdeveloped communications networks can slow dissemination of information and knowledge (Atoyan et. al, 2018). Low-quality infrastructure can also lead to higher supply costs, business delays, and reduce labour mobility. Poor quality residential, educational and health buildings lend themselves to adverse human capital and social outcomes.

Infrastructure quality

The previously referred to 'Infrastructure pillar' within the WEF's Global Competitiveness Index (Pillar 2) includes measures reflecting both quality and coverage of transport and utilities infrastructure. In this dimension, Malta is ranked as 52nd amongst the 140 covered countries, and 26th amongst the 28 EU Member States. The below table compares Malta's score and rank with that of other EU Member States – the results for comparable and target group identified in earlier Chapters of the Report are highlighted below. The scores indicate that Malta has a gap to close in terms of infrastructure quality and coverage with respect to these target countries.

Figure 48: GCI Infrastructure index score - EU Member States



	NL	DE	FR	ES	UK	AT	BE	DK	LU	SE	CZ	PT	IT	FI	PL	HU	SK	IE	SI	HR	EL	EE	CY	LT	LV	MT	RO	BG
Score	92	90	90	89	89	88	87	86	85	84	84	83	83	82	79	78	78	77	77	77	76	75	75	75	73	72	71	70
Rank	4	7	8	10	11	12	13	14	16	17	18	19	21	23	27	28	33	34	35	36	38	42	43	44	47	52	55	58

(Source: Global Competitiveness Report 2018)

An analysis of the results by selected infrastructure sub-components (infrastructure asset types) is also shown in a table underneath for a more detailed comparison with the selected country comparison group (and absolute ranking amongst all nations). Malta ranks last in overall infrastructure quality amongst the comparison countries, mainly as a result of a poor score in the road quality indicator (ranking of 105 overall), and lower scores for utilities infrastructure (45th overall for electricity infrastructure and 38th overall for water infrastructure). The highest performance is recorded for Water Transport which includes sub-indicators for shipping connectivity (overall rank – 31) and efficiency of seaport services (overall rank - 35). Within the Air Transport sub-indicators, a relatively high score is also achieved for efficiency of air transport services (overall rank – 31), but a lower airport connectivity (overall rank – 80) drags down the overall score for transport

.

Figure 49: Comparison of GCI Infrastructure indicators with comparison group

		Overall Infrastructure	Quality of roads	Air transport (connectivity & efficiency)	Water transport (connectivity & efficiency)	Electricity Infrastructure	Water infrastructure
Czechia	Rank	18	68	38	90	24	23
	Score	83.5	49.1	63.3	42.1	99.1	93.6
Portugal	Rank	19	5	32	23	51	22

		Overall Infrastructure	Quality of roads	Air transport (connectivity & efficiency)	Water transport (connectivity & efficiency)	Electricity Infrastructure	Water infrastructure
	Score	83.3	84.2	72.4	60.1	97.4	93.7
Slovenia	Rank	35	41	89	38	25	21
	Score	76.9	61.0	45.5	49.3	99.1	94.2
Estonia	Rank	42	38	88	56	44	30
	Score	75.2	61.4	46.4	42.3	98.3	91.1
Cyprus	Rank	43	23	54	73	17	34
	Score	74.9	70.3	59.9	33.5	99.6	89.9
Malta	Rank	52	105	60	31	45	38
	Score	71.7	37.3	57.5	55.0	98.1	88.9

(Source: Global Competitiveness Report 2018, , http://reports.weforum.org/global-competitiveness-report-2018/country-economy-profiles/#economy=

The range of a nation's economic infrastructure goes beyond the transport and utilities infrastructures included in the GCI, and for example also includes waste management and communications infrastructure. However, there are no/ limited readily available indicators for these domains. Nevertheless, in line with statements by the IMF in the latest Country Reports for Malta, the overall GCI results indicate that although infrastructure investment has increased over the last years, continued investment is required to improve infrastructure quality.

Infrastructure investment efficiency

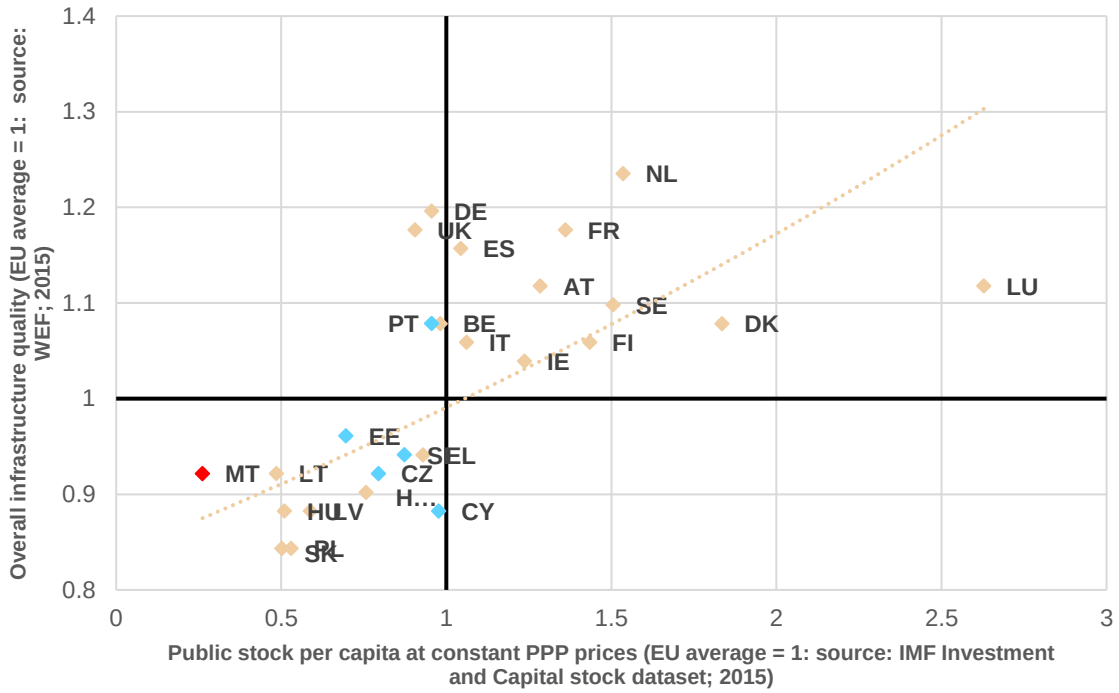
The gains from infrastructure investment depend on the efficiency with which the expenditure outlays are converted into higher quality infrastructure services. The largest output and

competitiveness gains can be achieved when investment boosts are accompanied by higher investment efficiency. The comparison of a country's reported infrastructure quality to its stock (a quality-quantity comparison) is a commonly adopted method of evaluating investment efficiency. This type of assessment, comparing Malta with EU states and target countries identified in this Report, is presented below. The only available measure of infrastructure stock which can be applied for this form of analysis is the 'public capital stock' estimates reported by the IMF 'Investment and Capital Stock Dataset'. The features, methods and limitations of this indicator have already been discussed. Since this dataset extends only up to 2015, this is the latest time period for which the analysis could be undertaken[64].

The normalised comparison presented in the ensuing figure shows that whilst Malta records the lowest public capital stock per capita (proxy for infrastructure per capita) amongst EU states, the level of infrastructure quality is relatively high when considering this low level of public capital stock (even though the absolute infrastructure quality score is still below average and amongst the lowest in the EU). Indeed, if one were to calculate a simple quality to quantity ratio, Malta would record the highest ratio. This is also indicated by the comparison with the target countries (coloured in yellow). Whereas Malta has a significantly lower public capital stock per capita, its recorded infrastructural quality measure is in the region of that of other comparable countries, with the exception of Portugal which records substantially higher quality.

[64] Overall infrastructure quality scores from the 2015 Global Competitiveness Report were utilised for a same-period comparison (therefore scores are different from the previously recorded 2018 results).

Figure 50: Infrastructure Quality vs. Quantity - EU Member States



(Data sources: Global Competitiveness Report 2015-2016; IMF Investment and Capital Stock dataset.)

These comparisons suggest that the low level of infrastructure quality recorded for Malta results more from low infrastructure stock levels rather than low investment efficiency. Interpreting this result still requires caution due to previously discussed limitations of the various measures. Results could also be distorted by the public opinion-based infrastructure quality indicator, since the notion of what is considered low/high quality may vary across countries and may be subject to response biases.

The high-level of investment efficiency indicated by this analysis can also be partly attributed to the expectation that the highest returns from infrastructure investment are obtained when existing infrastructure levels are low. Studies suggest that low levels of infrastructure (such as the case in Malta when one considers the third-party indicators referred to above) are associated with larger returns produced by increased investment (i.e. decreasing returns from investment, with higher returns to scale at low infrastructure stocks/ quality). These indications give support to the potential benefits which can be obtained from further infrastructure investment in the country. Furthermore, if infrastructure upgrade plans are also accompanied by improved investment efficiency, the potential for infrastructure service quality improvements that reduce supply-side bottlenecks and enhance productivity are even more substantial (or equivalently, the same gains can be achieved with lower financing needs).

Infrastructure gaps

The indicators reviewed in the preceding sub-section have already displayed indications of infrastructure gaps for Malta, in terms of both quantity and quality, i.e. a gap between the current state of infrastructure provision (in terms of quantity, quality, or investments) and required/ desired target aimed to be bridged over a period of time. Assessing infrastructure deficits is important since these can act as bottlenecks to economic sectors, directly curtailing growth potential. This sub-section seeks to present a more detailed analysis of these infrastructure gaps and their trends, both within the country and relative to other countries. This dual-level of comparison reflects the need to assess both vertical and horizontal infrastructure gaps:

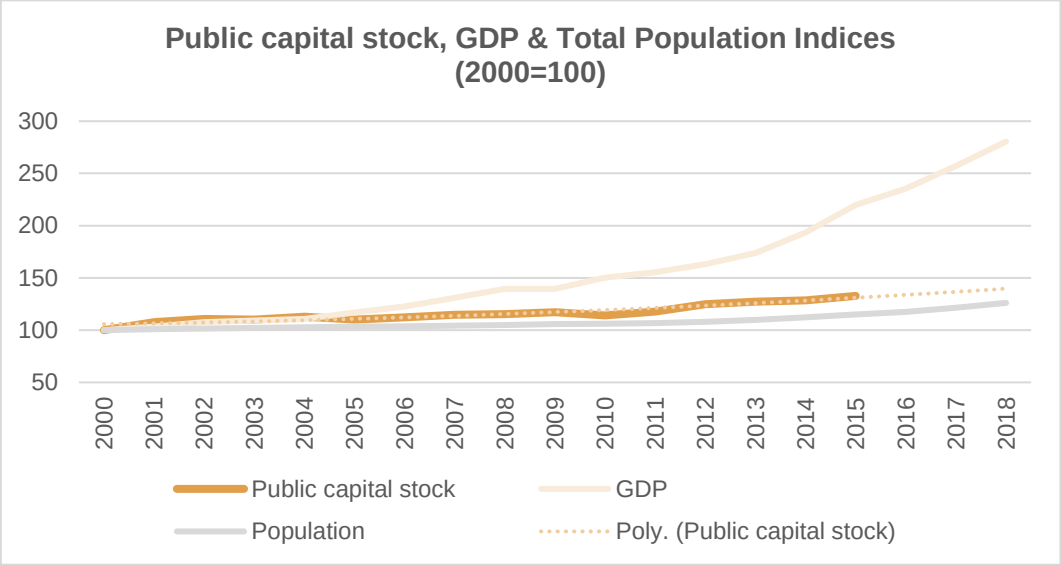
- A vertical gap is defined in relation to factors that are internal to the country being analysed. This means identifying differences between supply and demand trends as a result of economic activity. Gaps emerge when the domestic infrastructure supply trends differently from demands, i.e. a negative infrastructure gap emerges when the provision of infrastructure services fails to match the demand for these services generated by economic activity.
- A horizontal gap refers to the distance from a certain objective. The gap can be defined in terms of comparison with other countries or with a defined coverage/ optimal provision/ standards target (e.g. universal access to infrastructure services). In our analysis, we focus on the horizontal gap in infrastructure stocks, quality and investments with respect to the comparable country group identified in Chapter 2 (Cyprus, Czechia, Estonia, Portugal, Slovenia).

Infrastructure stock gap

One methodology used by researchers to assess vertical (within country) infrastructure stock gaps is the comparative analysis of the evolution in infrastructure stock with selected demand indicators (Perrotti & Sanchez, 2011). In line with this approach, the below chart shows the comparison of the trend in the public capital stock level as measured by the IMF 'Investment and Capital Stock' dataset (at constant prices), with the trends of two different variables which may be considered as reflecting demand pressures on infrastructure – total population and economic activity measured by nominal GDP. The comparison indicates that public stock levels

have not kept up pace with the generally rising economic activity (as measured by GDP[65]) over the period, particularly in latter years where economic growth has accelerated. Whilst 2016-2018 data for public capital stock is not available, it is expected that the gap has widened further given the high economic growth. The minimal total population growth rates recorded up to 2012 meant that the growth in this infrastructure demand indicator did not exceed that of supply. More recent population growth driven by increasing levels of foreign worker immigration has however matched the growth in public capital stock up to 2015, and most likely exceeded it given the accelerated population rise[66]. These declining levels of public capital stock per capita also suggest rising infrastructure pressures from population growth.

Figure 51: Infrastructure stock vertical gap indicators



(Data sources: IMF Investment and Capital Stock dataset 1960-2015; Eurostat)

It is also recognised that tourism activity is another major source of infrastructure demand pressure in the Maltese economy. The number of inbound tourists visiting the islands has rapidly increased over the last years, such that the country with a population of nearly half a million people has been visited by c. 2.6mln inbound tourists in 2018. In order to try and also

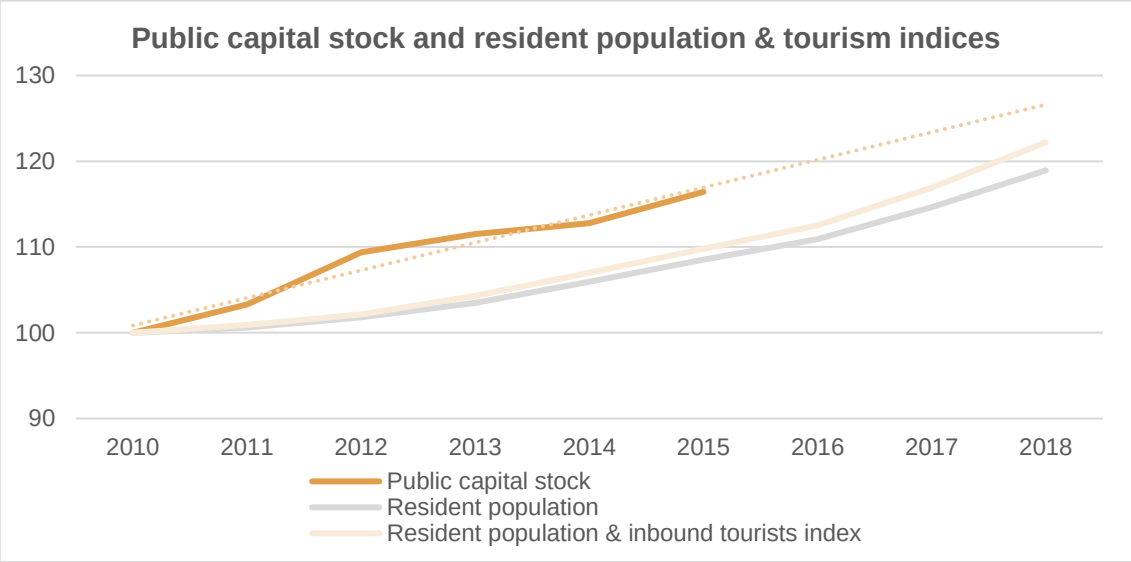
[65] GDP at nominal levels rather than at real levels has been utilised to allow the comparison with public capital stock levels which are calculated by the IMF dataset (in local currency) only on the basis of investments at nominal prices.
[66] Consideration must be also given to the fact that figures are reported in nominal figures – inflation-adjustments would further accentuate the difference in the rates)

take into account infrastructure demands from tourism activity, an apportionment of total inbound tourists is added to the total population figure in the above analysis through the formula presented below, such that a "full-year tourist equivalent" is added.

Resident & tourist demand = Total resident population + (Total nights spent by inbound tourists ÷ 365 days)

Although demands on infrastructure from a tourist differ from those of a resident, this approach provides an approximation of the combined infrastructure demands. The resulting indices show that when also taking into account the higher growth in inbound tourists, the infrastructure pressures from the accelerating demand are even more accentuated.

Figure 52: Public capital stock and resident population & tourism indices



(Data sources: IMF Investment and Capital Stock dataset 1960-2015; Eurostat, NSO, Tourism Policy for Maltese Islands 2012-2016)

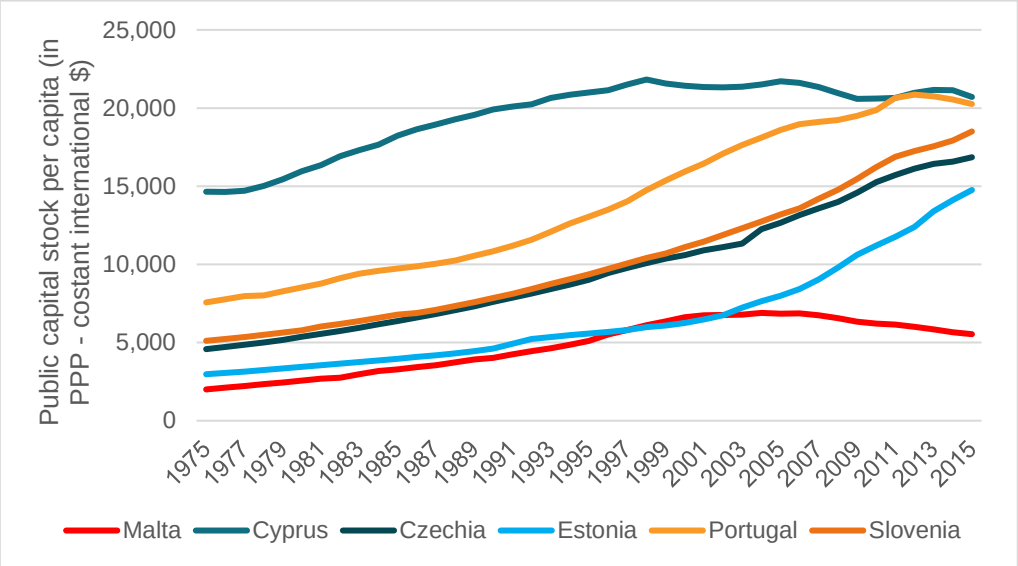
The estimations of public capital stock at real prices and Purchasing Power Parities allows the comparison of public capital stocks per capita across countries. We use this feature to compare in the figure further below the development in public capital stock per capita for Malta over the years, with that of the selected peer group of EU states. Given that the dataset figures are reported at Purchasing Power Parities, they should not be interpreted as absolute changes (i.e. growth or decline within any given country over time) since they are influenced by exchange rate movements with the dollar. They should only be referred to for insights on the gaps

evolving between countries. In view of this, a separate chart illustrating Malta's stock per capita gap difference from each target country[67] is also shown.

From the two figures it can be observed that up to the first years of the 2000s, Malta had been gradually closing the relative gap in public capital stock per capita, which however started to widen again significantly afterwards. The target countries appear to have converged in capital stock levels per capita over the years, a trend not followed by Malta in the latest years. These outcomes indicate that Malta has not invested sufficiently in infrastructure investment to close the gap with other comparable countries. The results could also reflect the limitations of the data in reflecting infrastructure-related investment, especially in the context of transformations of the Government's role in the economy. The re-widening of the gap coincides with the EU accession programme, during and after which the country entered into a period of market liberalisation and privatisation. However, this is a situation which also applied (to different extents) to four of the other comparable countries who also joined the EU in 2014. It is also pertinent to note that the only countries that registered significant population growth since the 2000s were Malta and Cyprus – the two countries which registered downturns in per capita figures (the remaining countries had marginally increasing/ declining population figures). While there could be a small state case (i.e. issue of indivisibilities), the relatively poor performance of these two countries over the last years also reflect the inability of infrastructure provision to keep up with increasing population demands (even though increase in absolute stock has also been lower) – a situation which did not apply to the other states.

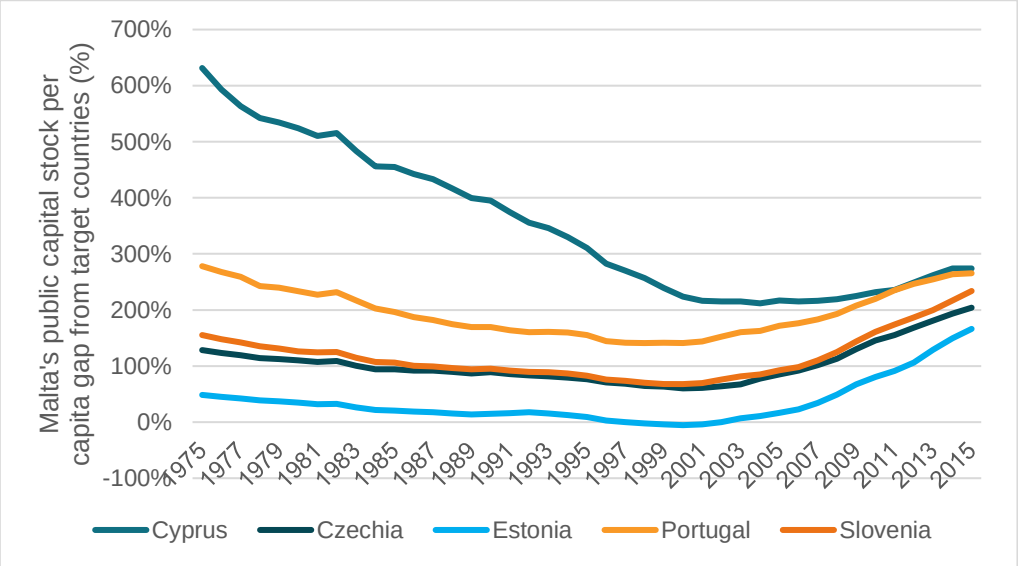
[67] = [Peer country stock per capita / Malta stock per capita] – 1)

Figure 53: Public capital stock per capita (in PPP - constant international $) - Target group comparison



(Source: IMF Investment and Capital Stock dataset (1960-2015); Eurostat)

Figure 54: Source: IMF Investment and Capital Stock dataset (1960-2015); Eurostat

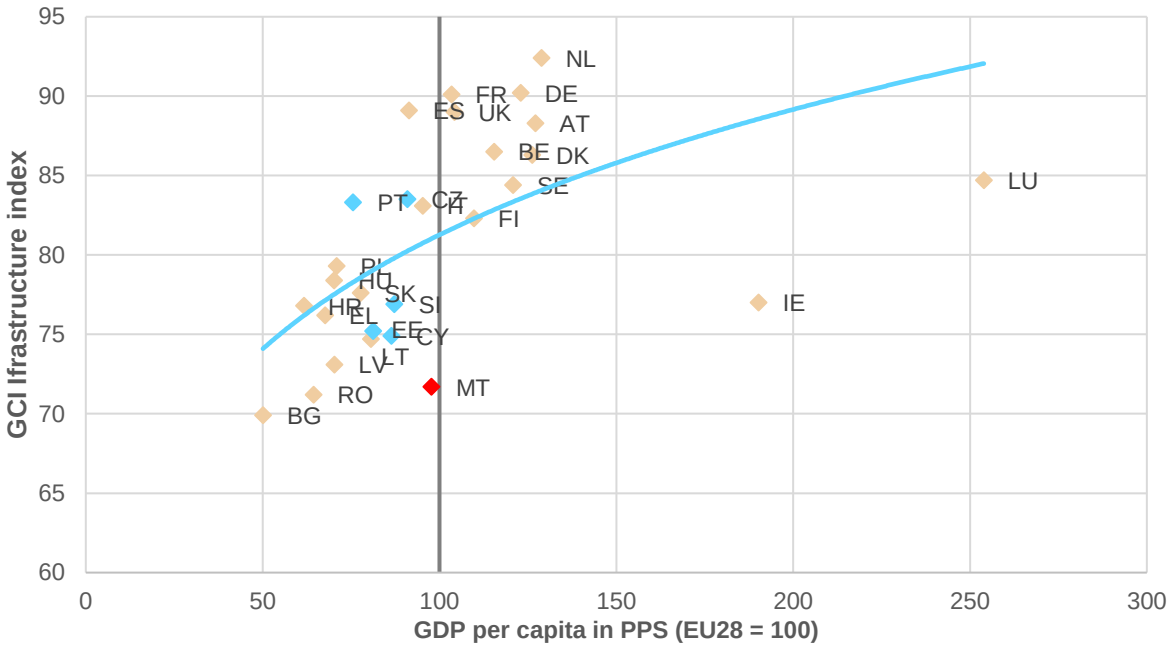


(Source: IMF Investment and Capital Stock dataset (1960-2015); Eurostat)

Infrastructure quality gap

In the analysis that follows, an EU-wide comparison of countries' infrastructure quality levels relative to their stage of development in terms of GDP per capita in Purchasing Power Standards (PPS) is presented. This type of analysis thus combines vertical and horizontal gap assessment features, assessing Malta's infrastructure quality relative to its economic development, in comparison with EU Member states.

Figure 55: GCI Infrastructure Index and GDP per capita in PPS - EU28



Sources: Global Competitiveness Report 2017-2018; Eurostat

The first evident observation from the above analysis is the clear positive correlation between the infrastructure quality index and GDP per capita, illustrated by the positively slope line of best fit. This correlation originates both from the fact that more developed countries can afford to invest more in better quality infrastructure, as well as the positive reverse effects of quality infrastructure on economic development. When taken in relation to GDP per capita, Malta's infrastructure quality is below that of other EU countries, including the target countries (coloured in yellow). Malta has worse than expected (expected on the basis of GDP per capita) infrastructure quality levels, indicating that Malta's catch-up in GDP per capita with the EU28 average was not accompanied by a similar catch-up in terms of infrastructure quality. Given that Malta's GDP catch-up was very recent and rapid, and in view that infrastructure quality is likely to respond to economic growth with a lag (as the country invests more in infrastructure following economic growth and investments are completed), monitoring future progress in this growth-infrastructure quality relationship is very relevant.

Infrastructure investment gap

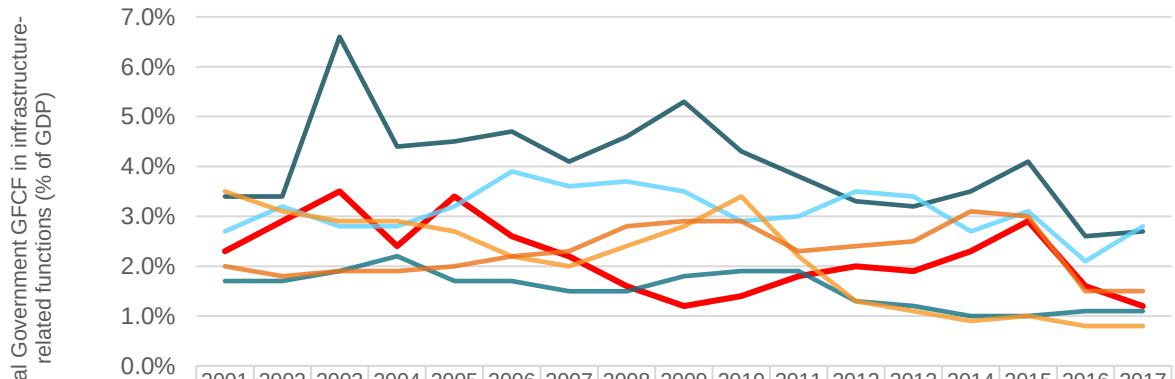
The catch-up in GDP per capita is accompanied by a catch-up in infrastructure quality levels only if an adequate proportion of this growth is translated into increased infrastructure investment. Economic growth is associated with strengthening private and public finances (through the function of fiscal automatic stabilisers), enhancing the capability of infrastructure

investment. Ultimately, investment is a requirement for sustaining the same growth. In this sub-section we augment the previously presented infrastructure investment indicators for Malta, with vertical and horizontal gap assessments utilising comparisons with historical local GDP growth (vertical) and comparisons with target countries (horizontal).

5.3 General Government GFCF in infrastructure-related functions

The figure below charts the historical evolution in General Government GFCF in the earlier identified infrastructure-related functions as a percentage of GDP, for Malta and the target countries. It allows the assessment of both within-country trends over time and cross-country comparisons.

Figure 56: General Government GFCF in infrastructure-related functions (% of GDP) - Malta and target countries



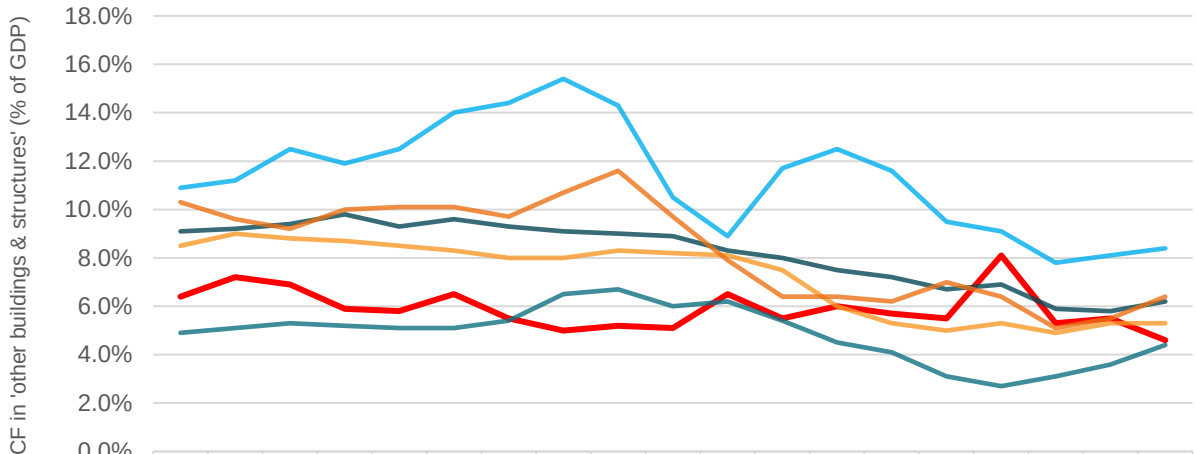
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Malta	2.3%	2.9%	3.5%	2.4%	3.4%	2.6%	2.2%	1.6%	1.2%	1.4%	1.8%	2.0%	1.9%	2.3%	2.9%	1.6%	1.2%
Cyprus	1.7%	1.7%	1.9%	2.2%	1.7%	1.7%	1.5%	1.5%	1.8%	1.9%	1.9%	1.3%	1.2%	1.0%	1.0%	1.1%	1.1%
Czechia	3.4%	3.4%	6.6%	4.4%	4.5%	4.7%	4.1%	4.6%	5.3%	4.3%	3.8%	3.3%	3.2%	3.5%	4.1%	2.6%	2.7%
Estonia	2.7%	3.2%	2.8%	2.8%	3.2%	3.9%	3.6%	3.7%	3.5%	2.9%	3.0%	3.5%	3.4%	2.7%	3.1%	2.1%	2.8%
Portugal	3.5%	3.1%	2.9%	2.9%	2.7%	2.2%	2.0%	2.4%	2.8%	3.4%	2.2%	1.3%	1.1%	0.9%	1.0%	0.8%	0.8%
Slovenia	2.0%	1.8%	1.9%	1.9%	2.0%	2.2%	2.3%	2.8%	2.9%	2.9%	2.3%	2.4%	2.5%	3.1%	3.0%	1.5%	1.5%

(Source: Eurostat)

The very volatile nature of infrastructure investment makes it difficult to extract general trends, however the series indicates that Maltese Government infrastructure investment as a percentage of GDP tended to decline over the 2004-2009 period, and then increased back up to 2015 even in the presence of high GDP growth rates (denominator effect). The share then declined in 2016 and 2017. In comparison with target countries, over the more recent years Malta generally recorded higher investment levels than Cyprus and Portugal, but less than Estonia, Czechia and Slovenia. Since this public infrastructure investment data appears to be also reflecting the extent of free-market orientation (affecting private-public investment shares) of these economies, below we also present a similar analysis based on total (public and

private) GFCF in 'other buildings and structures' which, as defined earlier, is considered as the best available proxy for total infrastructure-related investment.

Figure 57: GFCF in 'other buildings and structures (% of GDP)



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Malta	6.4%	7.2%	6.9%	5.9%	5.8%	6.5%	5.5%	5.0%	5.2%	5.1%	6.5%	5.5%	6.0%	5.7%	5.5%	8.1%	5.3%	5.5%	4.6%
Cyprus	4.9%	5.1%	5.3%	5.2%	5.1%	5.1%	5.4%	6.5%	6.7%	6.0%	6.2%	5.4%	4.5%	4.1%	3.1%	2.7%	3.1%	3.6%	4.4%
Czechia	9.1%	9.2%	9.4%	9.8%	9.3%	9.6%	9.3%	9.1%	9.0%	8.9%	8.3%	8.0%	7.5%	7.2%	6.7%	6.9%	5.9%	5.8%	6.2%
Estonia	10.9%	11.2%	12.5%	11.9%	12.5%	14.0%	14.4%	15.4%	14.3%	10.5%	8.9%	11.7%	12.5%	11.6%	9.5%	9.1%	7.8%	8.1%	8.4%
Portugal	8.5%	9.0%	8.8%	8.7%	8.5%	8.3%	8.0%	8.0%	8.3%	8.2%	8.1%	7.5%	6.0%	5.3%	5.0%	5.3%	4.9%	5.3%	5.3%
Slovenia	10.3%	9.6%	9.2%	10.0%	10.1%	10.1%	9.7%	10.7%	11.6%	9.7%	7.9%	6.4%	6.4%	6.2%	7.0%	6.4%	5.1%	5.5%	6.4%

(Source: Eurostat)

When also taking into account private investment, the share of infrastructure investment in GDP for Malta is more stable, for the most part ranging between 5% and 6% of GDP (with a one-off spike recorded in 2015 reconcilable with the aforementioned higher Government investment in that year). Malta's share of investment in GDP was generally lower than that of target countries' (with the exception of Cyprus) over the period. However, the declining shares in other countries and Malta's relatively stable share (even in the presence of high GDP growth) resulted in a closing of the investment gap with these countries such that over the latest years the proportion of investment in GDP was very similar to that of comparable nations.

Summary

The above analyses indicate that Malta has a gap to close with other comparable countries where it comes to public capital/ infrastructure stock levels, on the back of relatively lower historical Government infrastructure investment levels. Furthermore, in recent years, public capital stock has not kept pace with the rates of growth in economic activity, population and tourist arrivals implying the anticipation of greater internal strain on infrastructure in the coming years. Infrastructure related investment (GFCF) has maintained a relatively stable share

in GDP, with an apparent shift towards a greater contribution by the private sector. By maintaining this stable share, the investment gap with target countries (which have recorded declining investment shares) seems to have been bridged. Nevertheless, there is still a need for investment in infrastructure quality which remains low relative to the country's stage of economic development and to the levels recorded by comparable countries.

5.4 Closing the infrastructure gap

This sub-section presents an alternative approach towards assessing infrastructure investment needs to fill infrastructure gaps. The analysis that follows assesses infrastructure investment requirements on the basis of a sectoral review of the major infrastructural projects currently underway or in the pipeline. Planned projects and expenditures of responsible agencies over the coming years are taken as reflective of public policy makers' assessment of investment requirements to preserve, upgrade and improve the quality/ reliability of infrastructure services, to close gaps and achieve set targets (Andres et al, 2014).

A summary of the types of public infrastructural projects in the pipeline by economic sector, identified following a review of policy documents, public statements and other publicly available information is presented below. The list included below provides a summary of the major types of projects identified through a documentary research and should not be considered as exhaustive of all planned projects. Furthermore, some of the projects are only at evaluation/ study phase and their realisation may not necessarily result to be viable.

Table 22: Pipeline of major infrastructure projects (currently under construction; to be undertaken; still under discussion)

Pipeline of major infrastructure projects	
Transport	Maritime
Road network infrastructure upgrade project (€700mln project over 7 years), and fly-over projects	Breakwaters in Maltese and Gozitan ports (e.g. Marsaxlokk, Marsalforn)
Malta-Gozo tunnel	Upgrading of Mgarr Gozo port facilities
Mass Rapid Transport System	Upgrading of ferry landing sites (Sliema, Marsamxett, Cottonera)
Parking facilities/ Park & Rides	Regeneration of Valletta Grand Harbour
Waste and water management	Housing & community development
Landfill rehabilitation	Construction of new social housing units
Setting up of a Multi-Material Recovery Facility	Regeneration of dilapidated property

Pipeline of major infrastructure projects	
Infrastructure for integrated rainwater management	Provision of new residential homes for adults with disability
New reverse osmosis plant in Hondoq ir-Rummien	City/ village regeneration projects (e.g. Cottonera, Valletta, Marsaxlokk, Birzebbugia, Xlendi, Strait Street)
Retrofitting of Sant'Antnin Wastewater Treatment Plant	SME village (Gozo)
Waste incinerator	Homes for the elderly
Health	Education
Primary healthcare regional hubs	University of Malta infrastructure (e.g. Sustainable Living Complex, Trans-Disciplinary Research and Knowledge Exchange Building (TRAKE))
Medical school	New MCAST campus
New facilities at St Luke's Hospital, Karin Grech Rehabilitation Hospital, Gozo General Hospital	Student accommodation hubs
Modernisation of Mount Carmel Hospital	
New specialised healthcare and outpatient wings at MaterDei	
Culture, leisure, sports & recreation	Energy
Physical infrastructure for a Digital Tourism Platform	Gas pipeline
Regeneration and restoration of historic buildings	Additional generation capacity, from LNG to additional renewal energy sources (e.g. solar farms)
New cultural museums & artistic spaces (e.g. Malta International Contemporary Art Space; Valletta Design Cluster; National Hub for Costume, Fashion and Film)	Other
Development and enlargement of sandy beaches	Logistics hub
Motorsport racetrack	Disused quarry regeneration

Pipeline of major infrastructure projects	
Rebuilding of old university sports ground	Broadband submarine cable to mainland Europe
Large open family spaces projects, including family parks	
Urban Gardens and afforestation projects	
Other sports facilities	

The list reflects the current national priority areas in addressing the most imminent infrastructure gaps. The largest investment cost concentration is in the transport sector, notably in the upgrading of road network infrastructure in the form of the 7-year €700mln investment plan by Infrastructure Malta. In the previously reviewed infrastructure quality WEF indicators, road quality was the infrastructure component recording the highest quality deficit. The mounting pressures on road infrastructure from increased vehicular flow call for infrastructural investments to improve connectivity and reduce congestion, road accident and environmental externalities costs. The road infrastructure supply investment by itself is unlikely to be sufficient for addressing the transport bottlenecks being caused by the very rapid growth in private vehicle use, and its impact may be partially offset by further infrastructure demand that is crowded in. Hence transport demand management policies, including incentives for intermodal transport, need to accompany any transport infrastructural investments for these to have a significant quality enhancing effect.

The maritime sector has always been a key sector for the Maltese economy, and the upgrading of port facilities would further support the sector through improved port usage possibilities for commercial activities, as well as for resident intermodal transport (ferry) purposes. Infrastructures for waste and water management are taking increasing investment priority due to the pressures being faced by increasing population levels and economic activity, as well as the needs to move towards more sustainable practices that address the adverse externalities created by rising waste generation volumes and to address freshwater scarcity issues.

New social housing projects are in the pipeline with the aim of partly addressing the expanding application list resulting from the reduced availability of affordable housing due to the acceleration in housing cost escalations. The focus on city/ village regeneration projects and the development of a wider variety of cultural activity opportunities within them, reflect the need to upgrade infrastructures to improve the tourism product offering and to improve citizens' quality of life in the community. As the economy prospers, society's quality of life concerns transcend income levels and switch more towards a broader concept of well-being,

including the enjoyment of leisure activities and quality family time. In view of this, the list of infrastructural projects that would address these post-materialist concerns is extensive and can be expected to keep expanding. Investment in health and education social infrastructure to maintain high quality services in these domains has always been an investment priority in the Maltese economy.

The ever emerging needs and demands for more specialised and advanced healthcare, and the growing demand for 'further and higher' education, means that investment in new specialised facilities and in the modernisation of existing infrastructures, remain primary domains for infrastructure investment. The energy sector has already undergone a major overhaul to upgrade the sector's productivity and diversify the energy mix (new generation capacity; full transition from oil to gas). The gas pipeline is the next major project in the pipeline that further integrates Malta's energy supply with the European network, and hence enhances the security of Malta's energy supply from isolation risks. There is, however, still the need to further diversify the energy mix, in particular towards renewable energy sources, to reduce emission levels and also ease potential capacity constraints which may emerge from the ever-increasing peak demands. Solar energy remains the most practical and viable renewable energy sources, but the changing typography of the Maltese residential accommodation units implies that solar farm investments may be required for mass generation of this type of energy that contributes to the achievement of renewable energy targets. Grid scale storage may also be an opportunity to neutralise the inherent volatility of RES.

A market study on the existence of financing market failures commissioned by the Ministry for European Affairs in 2015 had estimated the infrastructure financing gap over the ensuing 5 years resulting from market failures to be in the region of €2.0bln-€2.5bln (25%-31% of 2014 GDP), excluding a large investment in a Mass Transport System such as the mono-rail. The large volume of investment needed to close infrastructure gaps raises considerations on the availability and selection of financing methods. The public nature of the majority of infrastructure investment requirements, as well as the large size and long-repayment period of these projects, imply that the majority of the infrastructure pipeline is not bankable and requires public financing.

A study by Rapa & Rapa (2019) uses a New Keynesian general equilibrium model to analyse the macro-economic effects of alternative Government financing options for public investment towards closing the public sector capital stock to output ratio gap in Malta. The research estimates that in order to close Malta's 2015 public capital stock gap with the EU average (as recorded by the IMF Investment and Capital Stock Dataset), over the long-run the investment-to-GDP ratio would have to increase such that the capital to output ratio rises by 35% in the long-run. The study finds that both the extent of output gain, as well as the drivers behind such gain, vary significantly depending on the financing options chosen by Government (still, all

financing options produce positive output/ productivity gains). Over the short-to-medium term, the largest output gains from capital investment are found to be obtained under a debt financing scenario, as it produces less distortionary effects than other internal funding options (taxation/ reduced Government expenditure). The strong and improving fiscal position enhances the viability of pursuing this option. In the longer run, within the internal financing options, the financing of capital projects through consumption taxes or reduced Government expenditure are found to produce the most output-enhancing effects (10-11% GDP growth). Substantial change in fiscal instruments would however be required to close the infrastructure gap entirely via internal funding options. Hence, the study suggests that complementing supplementing internal funding of capital projects with EU structural and cohesion funds and the funds accumulated in the National Development Social Fund (NDSF) is important to reduce the financing required from fiscal instruments and their distortionary effects (hence enhance the macro-economic returns from investment). The Malta Development Bank (MDB) facilities can also be used to address the financing gap via direct lending, as well as through co-financing with commercial banks to stimulate more funding by public and private sector entities. The MDB's stated focus in this area is on projects of national importance, particularly social infrastructure projects related to education, health, elderly care and affordable housing, as well as environment-friendly sectors such as the green economy, energy efficiency and renewable energy (MDB 2018 Annual Report).

The economic benefits that can be reaped from a boost in public investment toward addressing infrastructure gaps could be significantly enhanced if this is accompanied by an increase in investment efficiency. This would also reduce financing needs and/ or release funds for greater investment. Higher efficiency would improve the investments' contribution to both infrastructure quantity and quantity, thus fostering a greater impact on growth (IMF, 2018). In this regard, entities such as Infrastructure Malta need to play an important role by striving to pursue a holistic public investment approach that manages infrastructure investment on the basis of efficiency criteria and the various sustainable competitiveness criteria reviewed in this Report.

The review presented in this Chapter on the role of infrastructure investment in supporting the competitiveness highlight the importance of bridging infrastructure gaps. Addressing infrastructure weaknesses in terms of quantity and especially quality, would ease capacity constraints and bottlenecks on future competitiveness growth, spur investment, and sustain higher productivity growth.

5.5 Developments in the real estate market

The analysis of the relation between real estate market and sustainable competitiveness, shows how developments in this market have implications for the three dimensions (economic,

social, environmental) of sustainable competitiveness. The latest IMF Country Reports for Malta identify rising property prices resulting from rapid growth and influx of foreign workers as a lookout area for economic competitiveness and social sustainability. Excessive property price growth that is misaligned with fundamentals can have repercussions on macroeconomic and financial stability – two essential economic competitiveness elements. Even though the Reports and other related studies do not find evidence of misalignments, price developments are identified as a key monitoring area. Furthermore, concerns for social sustainability arise from reduced housing affordability for the most vulnerable segments of society. Construction activity to sustain real estate market demand, besides producing direct and indirect contributions on economic activity, also has implications on environmental sustainability through construction externalities and its potential contribution to this competitiveness dimension via resource-efficiency and renovation of buildings. This sub-section reviews recent developments in the Maltese property market in connection with these sustainable competitiveness related elements.

Property price indicators

The two main property price indicators available for Malta are the official Property Price Index (PPI) published by the National Statistics Office (NSO) and the PPI published by the Central Bank of Malta (CBM). The two indicators (both focusing exclusively on residential property types) are based on different data sources and methodologies[68]. In a recent CBM working paper, Borg et al. (2019) have also published an alternative hedonic house price index for Malta that controls and adjusts for changes in the quality and characteristics of the housing units traded utilising mortgage data.

The figures further below present the developments in the NSO and CBM property price indices over the last years (since 2000 for the CBM index and since 2005 for the NSO index, given data availabilities), in index form (2005Q1=100) and in terms of annual percentage changes. The two indicators have displayed similar property price trends over the period, with the NSO PPI typically lagging behind the CBM PPI by around one year, reflecting the timing differences between property advertisement and purchase. Property prices had increased rapidly in the early 2000s, which may have been driven by future economic prospects in connection with EU accession, and the Investment Registration Scheme that provided a tax

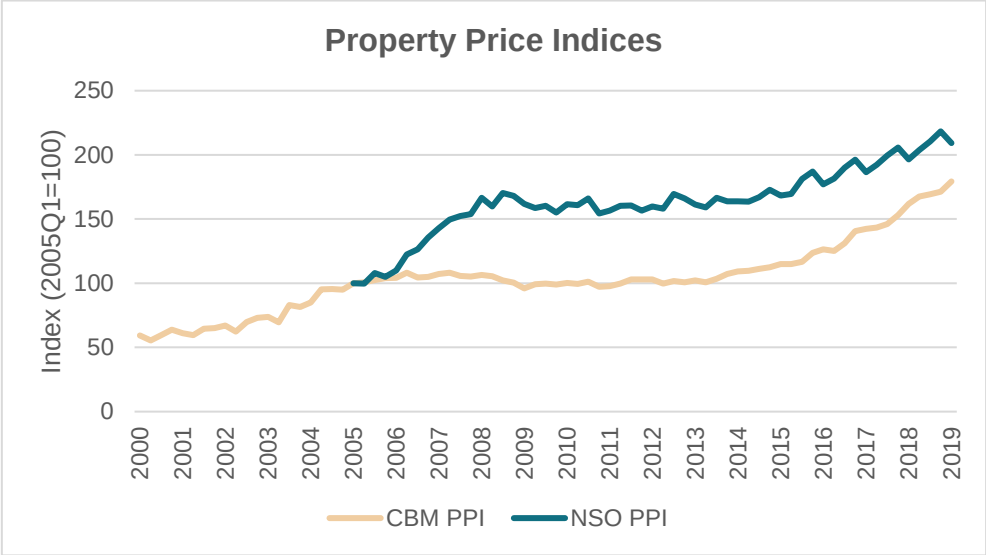
[68] The NSO PPI is calculated upon actual transaction prices from contracts reported to the Commissioner for Revenue, whilst the CBM PPI is measured based on advertised property prices on print media.

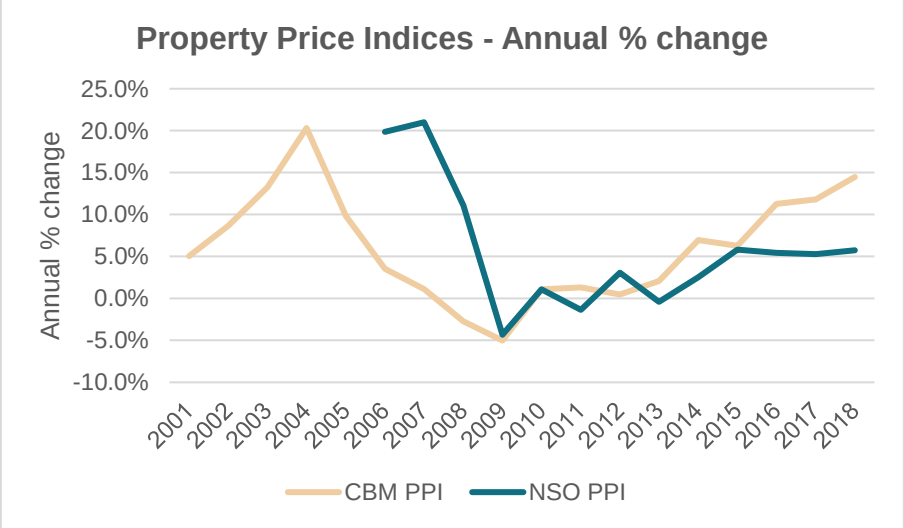
amnesty for Maltese residents on the repatriation of overseas assets which were often also invested in domestic property. The boom slowed down following 2005 until, as in other countries, price growth turned negative during the peak of the global economic recession. The contraction in prices in Malta was however moderate compared to that experienced by most other nations, with the largest drop being recorded in 2009 at 4-5% (5.0% as per CBM PPI; 4.3% as per NSO PPI). Property prices recovered following the peak of the crisis, registering low to moderate growth also on the back of lower interest rates. Since 2013-2014, house price growth accelerated significantly and maintained a strong momentum to the present day.

A number of demand and supply side fundamental factors can be associated with such rapid growth – these are further reviewed later on. Over the latest years, the acceleration in advertised property prices (CBM PPI) has been more pronounced than that in transacted prices (even after taking into account lag effects), possibly reflecting suppliers' greater bargaining power to raise asking prices due to the large surges in demand (or undersupply). Since 2014, property prices have grown at a Compounded Annual Growth Rate (CAGR) of 10.9% as per the CBM PPI and at a CAGR 5.6% according to the NSO PPI. High price growth was recorded across all property types, with the largest appreciation being in apartments. The marked increase in property asking prices was also confirmed by a recently update study by KPMG on the local property market which reported that the estimated overall growth in price level of properties increased between 20% and 25% over the period 2016-2017[69]. Whether these higher asking prices will eventually also lift transacted prices will be better reflected in upcoming transacted prices data releases.

[69] https://timesofmalta.com/articles/view/property-prices-shoot-up-25-in-one-year-study.706407 [Accessed: August 2019]

Figure 58: CBM and NSO PPI





(Sources: NSO, CBM)

In a 2019 Central Bank of Malta Working Paper, Borg et al (2019) constructed a hedonic property price index for Malta using data on mortgage contracts granted by the major lending institutions in Malta. A hedonic property price index is a quality adjusted index that takes into account also the impact of changes in the quality and characteristics of the housing units traded over the time period considered. This approach allows for the separation of the influences of changes in property composition and dwelling quality from pure price movements (Borg et al, 2019). The study calculated a range of hedonic price indices for Malta for the period 2010-2017 and found that according to these indices, growth in house prices ranged between 1.0% and 2.0% over the period 2011-2014, and rose markedly afterwards after 2015 averaging 4.5% and 7.5% peaking at between 10.1% and 11.0% in 2017. The comparison between the resulting hedonic price index with the non-quality adjusted index

based on the underlying mortgage dataset shows that the over the latter period of the sample higher growth was recorded in the hedonic index (Borg et al, 2019). The authors note that this result was primarily driven by a sharp rise in the share of foreigners in certain localities – which acts as a proxy of investment potential and the rent-likelihood of a property. Rental units tend to have lower quality characteristics than non-rental units and owner-occupied housing, and hence also tend to lead to an upward adjustment by the hedonically-adjusted house prices. While the results do not imply that foreign demand is the sole driver of house prices in Malta, its importance can be expected to be higher in particular areas of Malta (Borg et al, 2019).

Fundamental demand and supply factors

Rising house prices do not necessarily reflect overpricing/ misaligned pricing in the property market as they could reflect changes to fundamental determinants of price (i.e. demand and supply). Historical property price movements can be to some extent traced to evolving property demand and supply factors in the Maltese economy. The accelerated price appreciation recorded over the latest years has however raised some concerns on whether these rapid price increases are justified by fundamental demand and supply factors (excess demand) or are being driven by non-fundamental demand factors such as speculative activities, herd-like behaviour and/ or over-confidence. An environment of economic expansion and low interest rates that reduces borrowing costs/ credit constraints can further stimulate the non-fundamental driving mechanisms and could lead to overinflated prices.

Attention to the alignment of property prices to fundamentals is critical since a halt in demand triggered by any specific event can lead to large downward correction in prices, with the associated serious repercussions to macroeconomic and financial stability. In order to indicatively assess the alignment of local property prices to economic fundaments, the rest of this sub-section first presents a qualitative review of the various demand and supply side factors which can be associated with registered price developments.

Demand side factors

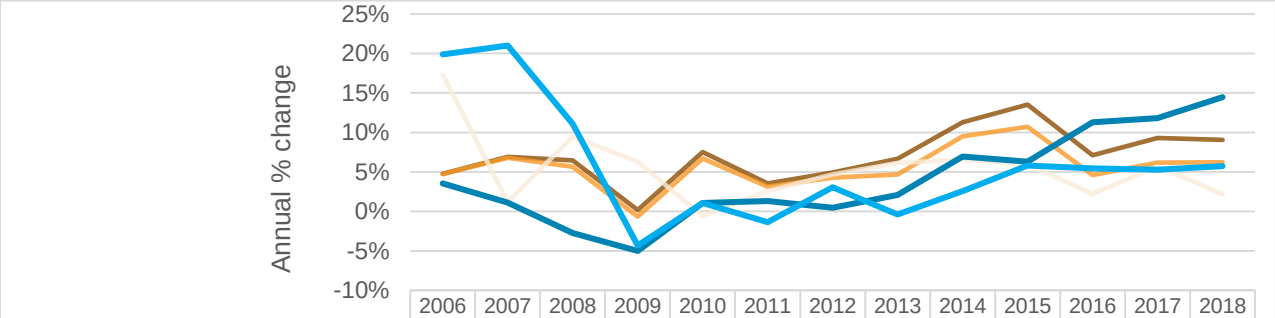
The factors which can explain the current high levels of property demand are various. The very high level of property demand in Malta has been substantiated by a recent study by Bartolo (2017) who conducted a survey among the general public to assess public opinions and attitudes towards the property market. In this study, out of the 608 respondents 75.3% expressed that they would consider buying a property in Malta in the near future. The stated reasons for this purchase consideration indicate that a substantial portion of demand is for investment purposes, besides basic needs to purchase a property.

The main demand side factors which can be associated with the recent surge in property prices are:

- Economic growth, low unemployment and rising disposable income

Buoyant economic growth that boosts household disposable income via higher paying jobs and lower unemployment expands households' credit capacity and the purchasing power to buy (higher-valued) property. To assess demand-side pressures stemming from increased economic activity and household disposable income, the below chart depicts the annual growth rates in nominal GDP, nominal GDP per capita, the mean equivalised household disposable income and the two PPIs over the 2005-2018 period. GDP is a measure of total economic activity in the area, while the GDP per capita and disposable income measures are intended to reflect additional purchasing power by individuals and households. In the absence of official data for absolute gross/net disposable income for Malta, the mean equivalised household income from the Statistics on Income and Living Conditions data and GDP per capita figures are utilised as proxy measures for income changes.

Figure 59: GDP, income and property price indices (annual % change)



	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Nominal GDP	4.7%	6.9%	6.4%	0.2%	7.5%	3.5%	4.9%	6.7%	11.3%	13.5%	7.1%	9.3%	9.0%
Nominal GDP per capita	4.7%	6.8%	5.6%	-0.7%	6.7%	3.1%	4.3%	4.7%	9.5%	10.7%	4.6%	6.2%	6.2%
Mean household equivalised net income	17.3%	1.2%	9.5%	6.3%	-0.6%	2.6%	4.7%	6.1%	6.5%	6.0%	2.2%	5.7%	2.2%
CBM PPI	3.5%	1.1%	-2.7%	-5.0%	1.1%	1.3%	0.5%	2.1%	7.0%	6.3%	11.3%	11.8%	14.5%
NSO PPI	19.9%	21.0%	11.1%	-4.3%	1.1%	-1.4%	3.1%	-0.4%	2.5%	5.8%	5.5%	5.3%	5.7%

(Sources: Eurostat, CBM)

As expected, there are evident co-movements between the economic activity (GDP) indicators and the property price indicators, reflecting the feedback mechanisms between the economic and housing cycles. While historically the growth in the property price indices has been below that in economic activity/ disposable income, since 2015, property prices as measured by the CBM PPI have increased at a relatively higher rate such that their growth has equalled and exceeded that of the economic activity/ income indicators. This indicates that a higher proportion of economic activity/ income is being directed towards the property market and/ or that prices are also being driven by other factors. The lowest divergence is with the absolute nominal GDP growth which may be considered as capturing a wider range of demand pressures. The gap between the absolute and per capita GDP indices may be considered as reflective of the additional demand pressure from population growth/ influx of foreign workers

above that from income per capita growth. The growth in the mean equivalised household income has been generally lower, possibly indicating that the recent growth in property prices may be less explained by rising income at the household level.

- Demographic changes and tourism

Population growth which has been primarily driven by the influx of foreign workers is a key component of demand for local property. JobsPlus data records that the number of employed foreign nationals as at December 2018 stood at 55,280, more than five times the level recorded in in 2010 (10,687). This growth in the foreign worker (and their family members) population is an upward demand-pull factor on property prices, as it enhances direct purchase demand and the rental investment potential/ viability. Particular upward demand pressures are therefore exerted in the rental market and in regions in proximity of main hubs for fast growing sectors with high foreign national employment levels. A heavy reliance of property market growth/ stability (or of segments of it such as regional segments/ rental market segment) on foreign labour population can have significant sustainability implications in view of the transient nature of this form of demand. A recent study (Borg, 2019) found that a quarter of foreigners engaged in the Maltese labour market exit within the first year of engagement, and around half exit between one and two years later.

Furthermore, social and demographic changes in the Maltese society are also impacting the property market. Changes in the traditional family nucleus, brought about, for instance, by the introduction of divorce or the increase in single-parent families raises the demand for housing (Micallef, 2016). An ageing population is also expected to be increasing activity in the real estate market, as the elderly seek to move into smaller accommodation units.

The rising number of inbound tourist arrivals is another important property demand factor for localities that tend to be popular with tourists. An important channel through which tourist arrivals influence property prices is the growing sharing economy in the tourist accommodation sector. The surging demand for tourist private accommodation (short-term rental) can be expected to produce similar property market impacts as those discussed above in relation to the rental demand by foreign workers.

- Low interest rates and portfolio rebalancing

The prevailing low interest rate environment resulting from the accommodative monetary policy stance pursued by the European Central Bank (ECB) to aid economic recovery is a contributory factor towards portfolio rebalancing by investors into the property market. The low interest rate environment reduces house purchase financing costs and lowers the yields from alternative investment opportunities. The risk-return profile of property investment (actual and perceived) becomes more attractive in a low interest rate environment. From the survey responses in the previously referred to study by Bartolo (2017) on the reasons for

considering property purchase, it emerged that a large number of respondents consider purchasing property for investment and rental purposes, besides for more basic demands. In fact, 83.1% of all the respondents stated the belief that property is a good investment in Malta mainly due to high demand and price appreciation and a good return on investment and risk compared to alternative investment options. These stated beliefs indicate that investment demand is a major driver of property demand. This investment demand could be driven by the consideration of economic fundamental factors, but also by excessively optimistic/ confident expectations on the investment opportunities influenced by social and behavioural factors.

- Government policies

In addition to the above factors, property demand has also been boosted by targeted Government policies aimed at stimulating the property market. Measures in this category include a 2014 investment registration scheme (asset repatriation programme), the stamp duty exemptions for first-time and second-time buyers and a capital gains tax reform in 2015 that introduced a final withholding tax system based on the value of the property. The Individual Investor Programme (IIP) has also affected the demand for high-end properties by targeted high net worth individuals. In the 2019 IMF Country Report for Malta it is stated that local authorities view the impact of these Government related measures as marginal (IMF, 2019).

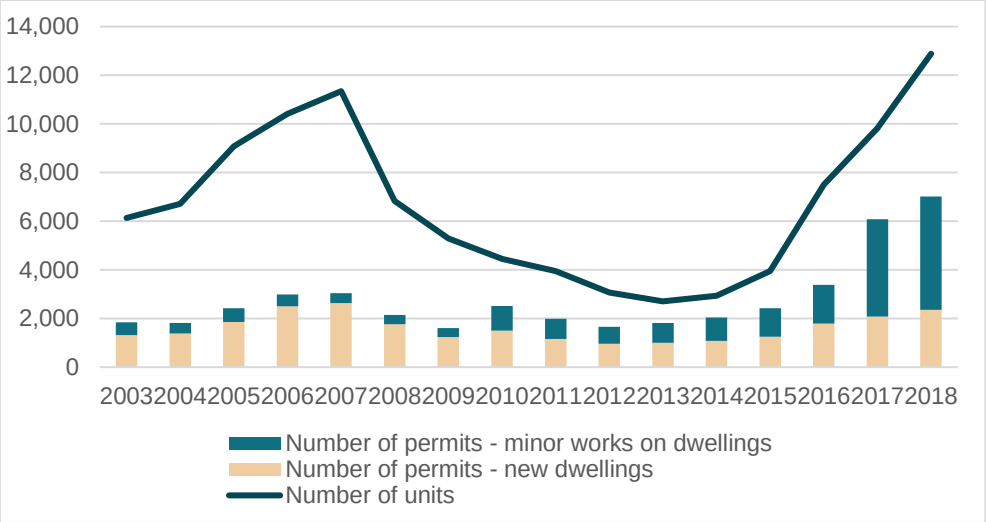
Supply side factors

Limitations or delays in the response of property supply to the upswing in property demand create a wedge between property demand and supply. Hence supply-side factors can also be fundamental factors that explain the recent surge in property prices. In the very short-run, the property supply response is inelastic given the planning and construction times involved, and hence delayed supply responses are expected in the short-run. Furthermore, locally, supply can also be expected to be inelastic over the medium to long term in view of the natural space limitations for expansion. In this regard, land use and planning regulations are policy tools which influence the property stock response.

In order to gauge supply response, the below figure shows the number of development permits issued by the Planning Authority. It can be observed that supply has generally responded to periods of increased demand and public authority polices. The rise in development permits in 2006-2007 followed the rise in demand from EU accession and the asset repatriation programme and was encouraged by the Malta Environment and Planning Authority 2016 rationalisation exercise that relaxed height limitations and included parcels of land in development zones (Micallef, 2016). The more recent rise in development permits follows demand pressures and consists mostly (as in the 2016-2017 period) of the construction of

multi-unit dwellings, mainly apartments. In fact, permits for apartments (new/ minor works) increased from 2,221 units in 2014 to 11,211 in 2018. Over the last three years, the growth in permit issuance was mostly concentrated in permits for minor works on dwellings, possibly reflecting the need to alter building structures to accommodate changing demands or in line with the sanctioning scheme for previously illegal/ unregistered works.

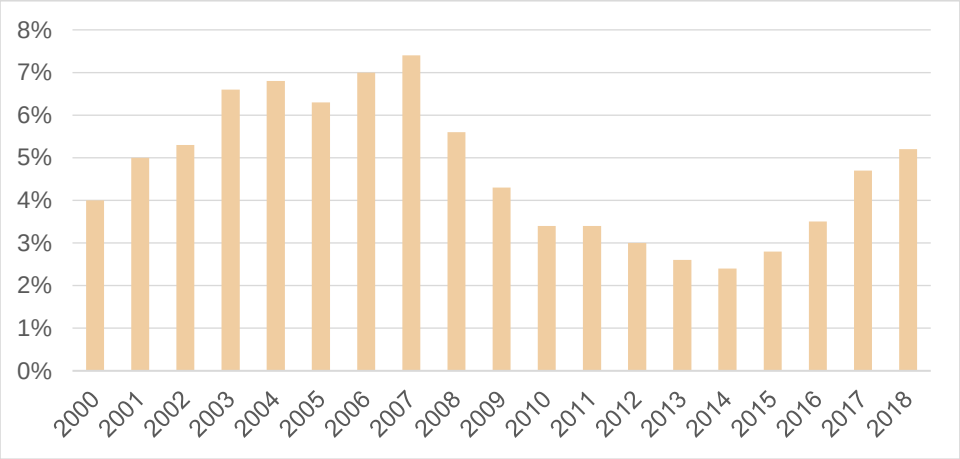
Figure 60: Development permits



(Source: Central Bank of Malta)

The dwelling investment-to-GDP ratio is a supply-side indicator which can be used to assess the potential overheating of the property market. A housing sector that accounts for an increasing/ high percentage of GDP relative to historical trends can imply a state of overheating (Micallef, 2016). From the other end, a declining share of dwelling investment may indicate that demand growth is surpassing that in supply, which reduces the availability of (affordable) housing. The evolution of this ratio over the 2000-2018 period for Malta is presented in the next figure. The trends in this supply indicator mirror those for development permits – dwelling investment has been taking a greater share of economic activity over the last years and in 2018 (5.2%) has exceeded the average over the entire period (4.7%) which included both peaks and throughs. For comparison with the other comparable countries identified in this Report, the ratios for these stood as follows in 2018: Cyprus: 7.1%; Czechia: 4.0%; Portugal: 3.1%; Slovenia: 2.1%; EU28: 5.0%.

Figure 61: Dwelling investment (% of GDP)



(Source: Eurostat)

Construction costs are another factor which influence property supply. The study by Micallef (2016) had found that over the 2009-2015 period the property-price to construction ratio had remained aligned to the long run historical trend, with an upward drift in 2015. The high property price growth since then would suggest that construction costs have risen relatively less. Recent regulations that require higher standards in different construction-related areas can be expected to influence both supply and demand sides of the construction sector.

When assessing the stock of property supply, consideration must be also given to the fact that vacant properties, especially those in a dilapidated state, do not really exert supply pressure on the market. The renovation and 're-introduction' of these properties onto the market constitutes a source of property supply that may ease demand pressures whilst requiring lower levels of investments and externalities. The only data source on vacant property is the national NSO Census, the latest of which was carried out in 2011[70]. This data is therefore quite dated, and hence limited evidence-based considerations can be applied in this regard.

[70] The 2011 NSO Census had recorded 31.7% of dwellings (71,080 dwellings) are unoccupied. Of these unoccupied dwellings, 29,848 were for seasonal/ secondary use whilst 41,232 (58%) were completely vacant. Furthermore, c. 7,000 (c. 10%) of the unoccupied dwellings were in need of moderate/ serious repairs or in a dilapidated state. Malta had recorded amongst the highest unoccupied dwellings rate in the EU, alongside other countries with geographic characteristics which lend themselves to a high volume of property for secondary/ summer uses, such as Greece, Croatia, Portugal, and Cyprus.

Demand and supply

The above qualitative analysis indicates that the recent rapid growth in property prices is originating from strong demand pressures via various economic and demographic channels that exceed the actual (and possible) supply response due to physical capacity and timing constraints. Prices can be expected to stabilise, should demand slow down to meet the supply or supply catch-up with demand[71]. The impacts of different demand and supply side factors are however surrounded by a degree of uncertainty, and the speed and dynamics of adjustment are difficult to determine[72].

Studies on property price alignment

While the above review of demand and supply factors sketches the economic fundamentals which may explain the recently registered high property price increases, it is difficult to discern a clear indication of the quantum of their respective impacts (and the impact of their interactions) and the extent to which registered property prices are aligned to these economic fundamentals. A more comprehensive examination of the alignment in property prices can be obtained through analysis techniques combining these factors. As part of its ongoing macroeconomic analysis, the CBM calculates a house price misalignment index to provide an indication of the evolution of house prices against fundamentals (utilising five indicators covering demand, supply and system-wide factors). The latest publishing of this index in the 2018 CBM Annual Report, shows that house prices were slightly above the level consistent with fundamentals in 2018Q3. The extent of misalignment in house prices is however found to be modest, particularly when compared to that recorded in the pre-crisis housing boom (CBM, 2018). Continuous monitoring of property price alignment to fundamentals is an essential instrument in identifying sustainability threats which may be emerging from the market.

Property affordability and the real estate market

The rapid property price growth over the latter years has raised property affordability and social sustainability concerns. Fast-rising property prices and rents driven by the high property demand are intensifying affordability concerns for vulnerable households. In the survey on

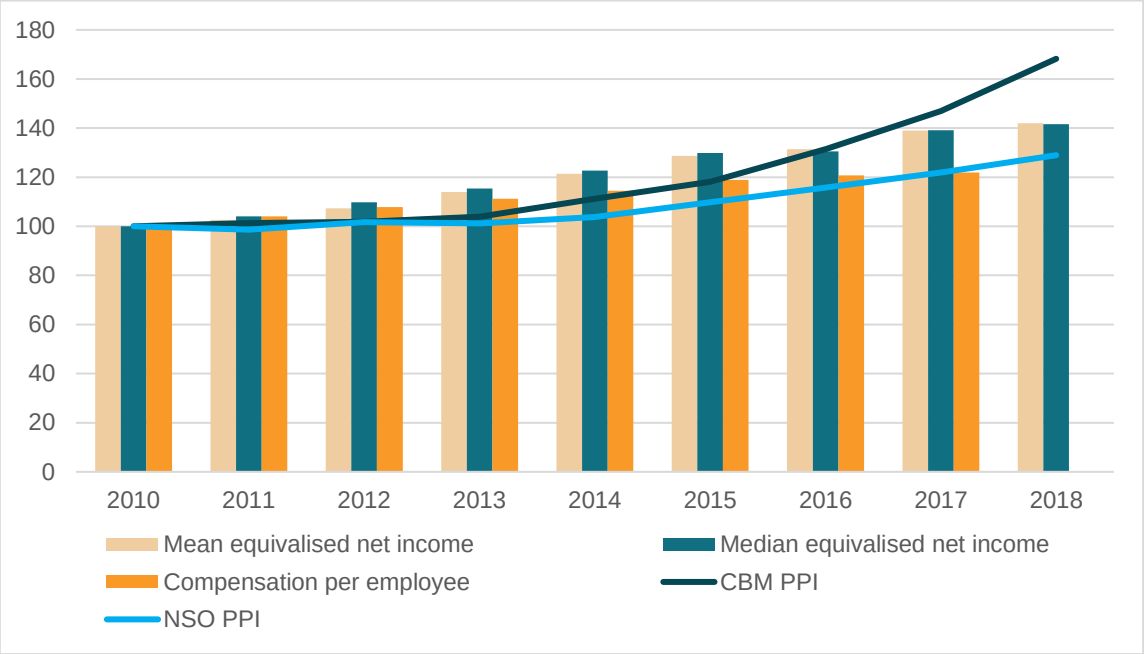
[71] https://www.independent.com.mt/articles/2019-07-15/local-news/Property-market-Speed-dynamics-of-price-stabilization-challenging-to-determine-economist-6736210894
[72] Ibid

property market perceptions conducted by Bartolo (2017) amongst the general public, 50.3% out of the 606 respondents stated a belief that property in Malta is not affordable (21.0% believe it is affordable; 28.7% not sure).

An indicator typically used for the purposes of assessing households' purchasing power in buying a new residence is the property price to income per capita ratio. In the absence of official national accounts data for disposable income in Malta, we hereby present this form of assessment using data on the mean and median equivalised household disposable income from the Survey of Income and Living Conditions (SILC) published by the NSO[73] and data on compensation per employee (source: CBM) as indicators of property purchasing power. These indicators are compared with the two main PPIs for Malta in the chart below. The comparison shows that mean and median household disposable income underwent a very similar trajectory, and thus do not provide indications of major imbalances in the income growth. Compensation per employee on the other hand recorded a lower growth, indicating that household disposable income is to some extent also being driven by greater employment participation amongst household members. Compensation per employee is also affected by workforce composition. While recorded growth in income was higher than that for the property indicators up to 2014, the opposite was observed since 2015. Over the whole 2010-2018 period the indicators grew at the following compounded annual growth rates (CAGRs): Mean/ Median equivalised household disposable income: 4.4%-4.5%; Compensation per employee: 2.9%; CBM PPI: 6.7%; NSO PPI: 3.2%. The rise in advertised property price index which tends to respond quicker to market conditions was pronouncedly above that in household disposable income over the most recent years, supporting the reason for mounting concerns on housing affordability and constraints for individuals to secure credit for house purchase.

[73] The equivalised disposable income is the total income of a household, after tax and other deductions, that is available for spending or saving, divided by the number of household members converted into equalised adults; household members are equalised or made equivalent by weighting each according to their age.
While the SILC disposable income data may not fully reflective of property purchasing power as it is conducted amongst households which are already house owners/ tenants, it is considered as a relevant indicator of general income developments for prospective buyers at a household level.

Figure 62: Property price indices to household income comparison



(Sources: Eurostat, NSO, CBM)

Decreasing property purchase affordability, especially amongst first-time buyers, has led to considerable public debate on the rental market. Although home ownership remains high among the local population, the private rental market has grown on the back of an increasing number of individuals being priced out from the property market, stronger individualistic trends among the local population and high migratory flows towards Malta. In line with the experiences of foreign urban cities, the rental market must now also be considered as a medium-to-long term housing option.

The local rental market has however been traditionally afflicted by a problem of lack of supply (Parliamentary Secretariat for Social Accommodation, 2018). The introduction of the 15% flat tax rate on rental income option for both residential and commercial rental purposes has to some extent helped in boosting the market and alleviating the supply shortage problem (even though this may have amplified the housing cycle from the demand side as well). On the other hand, the changing tourism patterns towards private accommodation stays may be exacerbating the problem of supply for residents as certain owners opt for short-term touristic lets rather than longer-term residential lets. The residential rental market has also been held back by a regulatory framework which has not adapted to changing social needs and expectations. The rental market reform expected to come into force by January of next year through the enactment of the Private Residential Leases Act seeks to promote the development of the residential private rental sector by strengthening the markets' regulatory

framework. As at the date of this report, this Act is still being discussed by local fora and Parliament.

As in the property ownership market, the currently widening wedge between demand and supply is driving up rental costs. Rent increases and the wider range of rental seekers put 'traditional' renter categories, such as lower-income-earners and welfare dependants, into increased affordability difficulties (Parliamentary Secretariat for Social Accommodation, 2018). The increasing shortage of social housing units indicates that affordability concerns are still mounting. In 2018, 116 social housing properties were allocated by the Housing Authority compared to the 286 applications received during the same period, extending the list of pending applications to 3,172[74]. In addressing this shortage, funds from the NDSF will be used to finance 1,000 new social housing units in different localities across Malta, whilst an additional 500 units will be constructed through financing by the National Development Bank. In the context of intensifying property affordability concerns from both the ownership and tenancy market, boosting the supply of social/ affordable housing for the more vulnerable segments of society should remain a key public policy priority in the coming years. Accelerated delivery of social housing and Government measures that increase the availability of social housing units to low-income groups would mitigate the impact of rising house prices on those who have become excluded from the real estate market.

Rising rental costs also produce spillover effects on business costs directly through commercial rent costs and indirectly through heightened employee requests for salary increases. This is particularly applicable in the current context of a highly competitive and mobile labour market. Rental costs place upward pressure on the entire wage structure. Rising rental costs can therefore impact the cost competitiveness of the economy. The increasing share of foreign workforce (who mostly opt to rent) in the total worker population (especially in sectors with local labour supply shortages), implies that the influence of rental costs as a cost-push factor becomes more pronounced. Furthermore, if rental costs increase in such a manner that the higher cost of living induces greater foreign worker turnover, this places a burden on the productivity of companies that need to continually employ and retrain new staff.

[74] https://timesofmalta.com/articles/view/116-social-housing-units-allocated-last-year-286-applications-were.708628

The property market and the macro-economy

This sub-section further expands on the channels through which developments in the real estate market and property pricing have an influence on the performance and stability of the macroeconomy and the financial system and seeks to relate them more closely to recent developments in the Maltese real estate market.

Developments in the real estate market and property prices are important for the assessment of the overall business cycle. Studies typically associate a close interconnection between the housing and economic cycle, with house prices generally leading developments in the real economy. Rising house prices, reflecting increased real estate market activity, can lead positive as well as negative business cycle developments in direct and indirect ways.

- Real estate services and construction activity in a booming property market contribute directly to economic activity via their value-added contribution. In 2018, real estate activities and construction directly accounted for 4.9% (2011: 6.2%) and 3.7% (2011: 4.7%) of total Gross Value Added (GVA) generated in the economy, respectively. Although the absolute nominal GVA produced by these sectors has continuously increased over the recent years, their share in total GVA has tended to decline as the economy has gradually diversified into other economic sectors. These sectors also provide a wider contribution to economic activity through indirect (spillover effects on other industries) and induced effects (additional economic activity induced from higher incomes in the sector).
- The correlation between house prices and the business cycle also arises indirectly from the fact that property prices are often forward-looking. In the current context of high economic growth, positive expectations on future economic activity movements in a booming economy affect the return expectations on property, stimulating activity in the property market and raising property asset prices. This additional activity is however also driven by unstable expectations, besides market fundamentals. The reverse can occur for a contracting economy.
- Another indirect channel operating in the property market–macroeconomy feedback mechanism relates to wealth effects. Given the high local home-ownership rate, the Household Main Residence is the most important household asset accounting for c. 48% of households' total assets (Georgakopoulos, 2019). Hence, strong wealth effects can be expected to result from house price movements, which in turn affect consumption and economic activity, for example through the easing of credit constraints and financial accelerator mechanisms.

Therefore, the real estate market is a pro-cyclical market and a major amplifier of boom-bust business cycles. In the period preceding the financial crisis, booming house prices in some countries were accompanied by rising private sector indebtedness and unsustainable growth in the construction industry. In the subsequent bust, the drop in house prices reduced

collateral values, leading to an increase in non-performing loans, a weakening in the banks' balance sheet and a decline in credit growth (Micallef, 2016). These experiences indicate that monitoring the soundness of household and bank balance sheets, and their exposure to the property market, is a key monitoring area for the identification of potential risks to macroeconomic and financial stability.

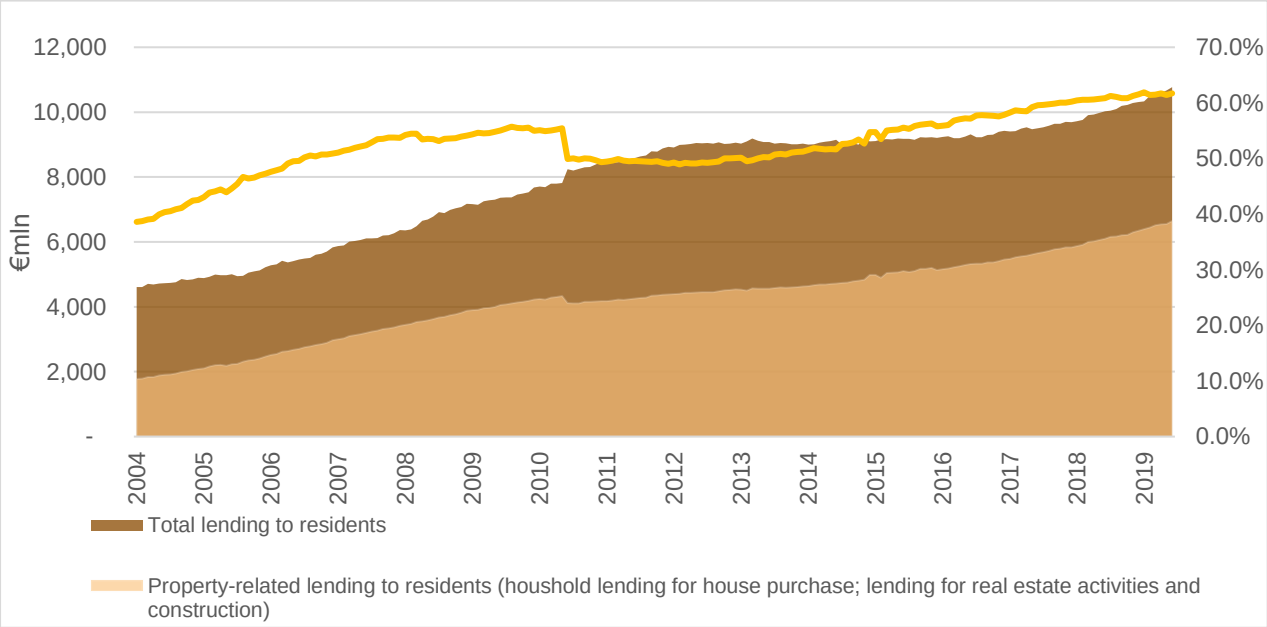
In connection with household balance sheets, the results of the three waves of the Household Finance and Consumption Survey (HFCS) held so far have shown that the average value of households' real assets (of which the major part is composed of real estate) have grown by around 25% over the 2010-2016 period (Georgakopoulos, 2019). The results from the same Survey have shown that the average value of household liabilities has grown by circa 60% over the 2010-2016 period. This is largely reflected by an increase in mortgage debt which is the main component of household liabilities averaging a share of c. 83% in total liabilities over the same period. Overall, average net wealth has still however increased by c. 24% in mean terms, and c. 15% in median terms. The relatively high financial wealth and low share of population with mortgages and negative equity mean that household balance sheets are generally sound, and act as mitigating factors against the risk of a sharp contraction in house prices (IMF, 2018). However, the strong increases in mortgage lending has raised household debt above the historical average to around 110 percent of gross disposable income (IMF, 2018). An increasing mortgage debt to income ratio is a risk indicator that indicates that households may become increasingly dependent on rising house prices to service their debt.

Similarly, looking at the banking system's balance sheet components and its exposure to the property market provides a better understanding of the relationship between the property market (and property price) cycle and financial stability considerations. For a financial system heavily exposed to the property market, a drop in property prices would reduce collateral values and raise non-performing loans that weaken the banks' balance sheet and lead to a decline in the extension of credit towards the financing of economic activity – a harsh reality experienced by several European countries during the financial crisis. During the financial crisis the Maltese financial system proved to be fairly resilient to the global financial crisis contagion, owing to the robustness of the banking system and the only modest contraction experienced in property prices (which are two interrelated elements).

The buoyant economic conditions experienced since then have re-strengthened bank asset quality, even though legacy corporate non-performing loans (NPLs) in the construction and real estate activities remain elevated (IMF, 2018). The persistent growth in property market activity and real estate appreciation may be, however, building up stability risks in the financial system. Bank credit growth remains primarily driven by mortgages, such that the concentration of property-related loans in the bank lending portfolio is continuously rising. This trend is illustrated in the below chart, which compares the outstanding loan amounts of Monetary

Financial Institutions for property-related economic activities to total resident lending since 2004. As expected, the movements in this share are closely aligned to the state of the property market, highlighting the close relation between the property market cycle and banks' exposure to this sector. It is visible that except for the period following the economic crisis characterised by a slowdown in the property market, the share of resident property-related lending in total resident lending has gradually increased throughout the period, reaching almost 62% in mid-2019 (Lending for house purchase: 48%; Real estate activities: 8%; Construction: 5%). Apart from thriving activity in the property market, this observation is also driven by the increased utilisation of non-bank (secondary market) financing by the non-financial corporate sector.

Figure 63: Share of property-related lending to residents



(Source: Central Bank of Malta)

The increasing exposure of domestic banks' lending portfolios to property-related loans increases their vulnerability to possible property market shocks. As the concentration of property-related loans increases, the adverse impacts of any shocks that reduce house price valuations (collateral) on banks' balance sheets also rise. If this is accompanied by a situation of rising interest rates and/or a broader economic slowdown/ increase in unemployment that affect borrowers' repayment capacity (especially low income households'), the financial stability distress is more accentuated. The reduction in credit growth that would be experienced as banks repair their balance sheets would feed into the macroeconomy (e.g. lower investment and consumption financing) with adverse short-term and long-term economic consequences. Local banks' strong capital and liquidity positions, conservative lending and collateral valuation practices, and a small fraction of buy-to-let loans are identified as characteristics of the Maltese banking system that mitigate the risks relating to property

market exposure (IMF, 2018). At the same time, one needs to consider the potential impact of the marked increase in real-estate related corporate bond issues for retail consumption, which have replaced some of the traditional bank lending. The cause of such an increase in unclear – have banks reached real estate exposure limits? Do banks lack the risk appetite to back some of the project in question? Is pricing more attractive for the corporate in question? Is excess liquidity in the retail market leading to such lower pricing?

The high and increasing concentration of property-market-related loans in the banking systems' lending portfolio indicate a build-up of financial system exposure to real estate risks. A recently published Directive by the Central Bank of Malta which came into force from July 2019 – Directive No 16: Regulation on Borrower-Based Measures – aims at pre-empting this potential build-up of risks. The Directive's measures set limits on the loan-to-value at origination (LTV-O), debt-service-to-income at origination (DSTI-O) and maturities for domestic residential real estate loans, by category of borrower (measures depend on whether the borrower is a first-time buyer or purchasing a primary residence). The objective of the Directive's measures is to strengthen the resilience of lenders and borrowers against the potential build-up of vulnerabilities stemming from the real estate market[75]. This macroprudential policy[76] are expected to address the build-up of vulnerabilities in the residential real estate market that occur in the upswing phase of the housing/ financial cycle and strengthen the resilience of bank and household balance sheets to potential reversals in the property market conditions and to potential interest rate rises.

Another potential channel through which excessive property price and housing cost growth can erode the competitiveness of the economy is through a general increase in consumer prices. There are two potential channels through which this can occur. Higher demand in the economy accelerated by rising real estate wealth can lead to the bidding up of the prices of goods and services. More importantly, housing costs (e.g. mortgage costs, rental costs) raise workers' cost of living, who will increasingly demand pay increases to keep their real wage level (or growth) intact. Ultimately, this would lead to reduced profit margins (that restricts investment potential) for local businesses if they have to absorb the wage inflation costs in

[75] https://www.centralbankmalta.org/borrower-based-measures [Accessed: August 2019]

[76] The Directive is an example of the implementation of targeted macroprudential policies – a set of policies that seek to address the build-up of potential imbalances in a particular market segment (real estate market), while constraining to a minimum the impacts on other market segments (e.g. the alternative of raising interest rates would affect all sectors of the economy)

view of competition in the market, cost-push inflation if these costs are passed onto consumers, or higher labour turnover (talent loss) costs if these wage demands cannot be satisfied. This year's Wage Inflation Survey published by the Malta Employers Association (MEA) revealed that 45% of employers in Malta felt under pressure to pay higher wages across all their employees. The increase in rental and property prices was the second most widely cited reason (by 21% of respondents, after labour market shortages at 57%) for wage inflation pressures. In the same survey, 74% of the employer respondents claimed that rising labour costs are affecting their company's competitiveness. Some of the employers' comments on this matter reveal that rising payroll costs have become a critical issue for some local businesses, especially for those competing for manpower with international companies, and for those who have to absorb the costs due to market competition or are unable to counter unit labour cost increases with enhanced productivity.

Excessive growth in property prices may also lead to distortive misallocation of resources from productive sectors in the economy to the non-tradable sector, which in part explains the weak productivity growth experienced by some countries after the financial crisis (Micallef, 2016). Furthermore, rising labour costs (which are not countered by productivity improvements) and higher cost of living resulting from housing/ general price inflation can diminish Malta's general competitiveness and FDI attractiveness. Whilst the general consumer price inflation in Malta had remained relatively low and stable at around 1% over 2013-2016, over the last two years this has crept up to 1.7% in 2018 (similarly to the EU and Euro Area average). The ramp-up in the inflation rate results from the expected transmission of higher economic activity into wage inflation and eventually into consumer price inflation. However, while Malta's economic growth was above that of the EU average, the inflation measures are very similar, potentially suggesting that not all inflationary pressures from the added economic activity have passed through the transmission mechanism stages. In line with some of the comments expressed by employers, some of the wage inflation pressures might have been absorbed by business. It should however also be noted that typically there are considerable lags (of an uncertain timing) across these transmission stages and hence inflationary results might still have to be fully reflected/ materialised. This points to extra caution in monitoring general inflationary pressures that might arise from the property market and which could lead to competitiveness deteriorations.

5.6 Concluding summary and policy recommendations

Concluding summary

Sustainable competitiveness

The concept of sustainable competitiveness reviewed in this Chapter suggests that a long-term and holistic view towards assessing economic competitiveness needs to be adopted. A comprehensive assessment of competitiveness sustainability requires complementing assessments of current economic/ financial performance with considerations on the development of the underlying economic capacity to sustain future competitiveness over the long-term and of corresponding developments in the social and environmental domains that can determine the future competitiveness path. The strong growth in aggregate demand and economic activity being experienced by the Maltese economy raises considerations on whether this is exceeding the economic, environmental and social capacity in such a manner that it can be harmful to future competitiveness sustainability.

The infrastructure market and sustainable competitiveness

The rapid economic growth is mounting pressures on infrastructures and intensifying infrastructure gaps which can act as bottlenecks on future productivity and social welfare. The lack of sufficient national infrastructure can seriously hamper growth or make it difficult to maintain a position in international markets if the supply of infrastructure services falls short of what is needed to support economic expansion and ensure that the system is competitive enough.

This Chapter's analyses indicate that Malta holds infrastructural gaps in terms of both stock levels and infrastructure quality. The horizontal (cross-country) infrastructure gap indicators have generally shown that, although in certain areas gaps with other comparable states have generally been gradually reduced in relative terms, significant gaps still persist especially in terms of public capital stock levels and the quality of certain infrastructures, most notably of road infrastructure (with recent road projects not yet featuring in data publications). The vertical (internal) gap indicators show that growing demands and pressures on infrastructure, stemming mostly from the high economic and population growth, imply the necessity of sustained infrastructure investment to overcome potential bottlenecks on economic growth. Sustaining and building upon the increased level of public and private infrastructure investment registered over the latest years, accompanied by improved investment efficiency that delivers further infrastructural quality improvements, are the means to closing these gaps.

The real estate market and sustainable competitiveness

In the real estate market, the strong property demand and market activity, originating from various fronts, is leading to strong property price appreciations and rising housing costs which

pose challenges to the sustenance of the country's cost competitiveness, social inclusion and environmental sustainability.

The strong property price appreciation observed in the real estate market over the latest years can be loosely traced to demand and supply economic fundamental factors (primarily demand factors resulting from rapid economic growth, influx of foreign workers and supportive Government policy) and latest analyses have indicated only modest overvaluations relative to these fundamentals. Nevertheless, the continued rapid rise in property prices requires continuous monitoring for market overheating that can result to be detrimental to future competitiveness sustainability. Corrections to property price misalignments, if any, could be harmful to competitiveness through potential macroeconomic and financial instability repercussions that may arise. Rising property costs raise social sustainability concerns regarding housing affordability and social exclusion from the property market. Furthermore, they raise wage inflation pressures on local enterprises that have to be absorbed by business profits or higher consumer inflation, both of which can be detrimental to national competitiveness. In the environmental dimension, the sustainability of construction activity required to sustain the buoyant property demand requires careful consideration.

Policy towards sustainable competitiveness

These emerging challenges can be best addressed through policy responses guided by a vision for a sustainable model of competitiveness growth. A policymaking process, driven by collaboration between the policymaking bodies, the social partners and other involved stakeholders, would be in a better position to integrate the various facets of competitiveness sustainability. In this regard, the next concluding sub-section provides a summary of the policy insights which have been discerned from the performed analyses.

5.7 Policy recommendations

Infrastructure

Public infrastructure investment

The presence of private market failures imply that public infrastructure investment will maintain an essential role in bridging horizontal infrastructure gaps and ensuring that infrastructure stock levels can sustain the growing demand for infrastructure service demands (vertical gaps). Bridging these gaps and alleviating infrastructure capacity constraints, therefore, require a continued investment effort by Government with fiscal policy further rebalancing Government expenditure towards infrastructure investment. For maximum efficiency and effectiveness in Government infrastructure investment policy, it is recommended that the following factors are considered:

- Recommendation 5.1: Evaluating and strengthening the framework for public investment management, including through the consideration of well-defined project appraisal and selection criteria and more holistic public investment management.
    - A large pipeline of infrastructure projects points to the need of well-defined project selection and prioritisation criteria. Sustainable competitiveness concepts advocate project selection processes that look for quality projects that can provide tangible results that are economically, environmentally and socially sustainable. Project evaluation should be founded upon the trade-off between fiscal costs and the social returns/ costs expected to be attained over all the three dimensions (economic, social, environmental impacts). In this regard, the social viability of all major infrastructure projects (including those not supported by EU funds) should be scrutinised by the undertaking of economic Cost-Benefit Analyses, Social Impact Assessments and Environmental Impact Assessments.
    - In this regard, the IMF Fiscal Transparency Evaluation Report for Malta also recommends: (i) disclosing the value of total obligations under each multi-annual project; (ii) publishing results of cost-benefit analyses conducted for major projects; (iii) undertaking a PIMA. The latter is a diagnostic tool developed by the IMF that evaluates the strengths and weakness of public investment management situations in all three phases of the project cycle (planning, allocation, and implementation). Such an assessment would assist in further enhancing the efficiency with which infrastructure investment is undertaken.
    - This would also assist in guiding the management of a large pipeline of infrastructure projects to avoid unwarranted stimulus and capacity constraints. While currently there is a large pipeline of infrastructure projects to address infrastructural needs, this needs to be carefully managed to avoid unwarranted stimulus that creates capacity constraints in the construction sector that could lead to cost inflation and displace activity elsewhere in the economy.
    - Strengthening the management framework also entails moving towards more holistic public investment management and removing overlapping policy responsibilities. This would contribute to better project planning, implementation and investment efficiency. The creation of the new entity responsible for the management, implementation and maintenance of public infrastructure, Infrastructure Malta, has been an important step towards this direction, especially in connection with the holistic implementation of the €700 million road network upgrade investment. The gradual assumption of further responsibilities by the Agency for infrastructure projects in other sectors could also provide more integrated cross-sectoral planning and implementation of infrastructure upgrades, based on the assessment of national requirements/ priorities. This increased role needs to be matched with further capacity building and corporate governance processes at this Agency.

- Recommendation 5.2: Boosting maintenance spending to make the most out of existing infrastructure. Frequent maintenance reduces capital depreciation, prevents the costs of operation and reconstruction from escalating and extends the lifetime of infrastructure. Maintenance interventions can often achieve desired results in a less intrusive manner (and lower environmental/ social externalities) and hence result to be more economically cost-effective. Hence, the social returns of planned new infrastructure projects should always be considered against the returns from less drastic interventions such as maintenance spending on existing infrastructure or minor interventions that allow more efficient/ leaner/ alternative uses of existing infrastructure, to achieve the most effective balance between the two intervention options. This should be undertaken, as a minimum, in the Options Analysis of the CBA referred to above.

- Recommendation 5.3: The feasibility of market-based instruments in alleviating infrastructure gaps should be analysed by public authorities. Infrastructure gaps arise from the inability of infrastructural services supply to keep up with rising demand. The closure of such gaps need not necessarily occur entirely through a rapid acceleration in infrastructure supply that catches up with demand. In cases where such a supply rise would occur with a significant lag, be constrained by natural limitations or would produce significant adverse sustainability spillover effects, considerate demand-side management policies can accompany infrastructure provision policies to mitigate gaps. Market-based instruments can the most effective tools in influencing demand-side pressures. Related to this idea, the contribution of infrastructure projects towards easing constraints/ gaps should not only be based on the increase in infrastructural services supply, but also on the extent to which the demand pressures on infrastructure are contained.

- Recommendation 5.4: Ensuring that the infrastructure project pipeline can be financially sustained over the medium to long term by solidifying the strong Government fiscal position and by the efficient utilisation of funds from the EU structural and cohesion funds and the National Development Social Fund (NDSF).
    - The maintenance of a prudent structural (cyclically-adjusted) fiscal balance robust to changes in potentially transitory inflows and future public health and pension financing cost pressures, is important for the implementation viability of required infrastructure upgrades and to ensure that the largest macro-economic gains from infrastructure investment can be attained. The positive long-run gains from public infrastructure investment depend significantly on the fiscal tools used by Government to finance the investment outlays. Maintaining an improving fiscal position with a declining debt-to-GDP ratio would give Government fiscal space to finance infrastructure investment through debt-borrowing rather than more distortionary fiscal (tax) instruments, without raising public debt sustainability concerns that would raise interest rates and crowd-out private investment.
    - To supplement the internal funding of infrastructure projects, efforts should be directed towards maintaining the achieved high absorption rate (95%) of EU Structural and Cohesion funds, and towards ameliorating planning that can improve

the implementation of projects co-financed by EU funds. Furthermore, as the funds within the NDSF accumulate, the ways in which this increasing capacity could be effectively deployed to finance infrastructural projects in line with the Fund's mandate, would have to be further explored, planned and clearly communicated/ monitored.

Crowding-in private infrastructure investment

The public financing constraints towards closing the infrastructure gap could be significantly eased by crowding in private investment. Facilitating the ability and viability of the private sector to participate in infrastructure investment could largely help in closing the gap with reduced fiscal constraints. Public infrastructure investment itself which can crowd-in private investment in view of the complementary nature of infrastructure services and the potential reduction in the costs of doing business. It is believed that private investment could be further supported through:

- Recommendation 5.5: Exploring further opportunities for infrastructure investment through Private-Public-Partnerships (PPPs). PPPs can potentially benefit from more efficient construction, more innovation and an optimisation of full life-cycle cost, thus further reducing the fiscal impact. Through Projects Malta, PPP infrastructure investment for projects which are well-suited for these type of ventures could be further explored. At the same time, the balance of any PPP arrangements should never be skewed towards the private operator, but keep the public good as a first priority. There are various PPP guidelines/ principles which can be observed in this regard, as well as lessons learnt from past PPP arrangements.

- Recommendation 5.6: Addressing private market financing failures and the disconnect between investor/ saver liquidity (in financial institutions or capital markets) and infrastructural projects that need capital funding. Strengthening the pipeline of infrastructural projects suitable for private investment (with private return) and easing structural barriers for financing are important measures in this regard. With regards to the latter, the Malta Development Bank (MDB) can play a key catalyst role in mobilising private liquidity towards local infrastructure development by encouraging institutions to participate in syndicated loans, providing guarantees or co-financing projects with credit institutions, besides by direct project-lending.

Developing statistical infrastructure indicators

- Recommendation 5.7: Development of a well-defined statistical framework for the evaluation of infrastructure investments, that supports research and policy in the area. While this Report has sought to critically review publicly available indicators of infrastructure stock, quality and investment levels to assess for infrastructure gaps, the lack of a clear statistical classification for infrastructure in the system of national accounts

to some extent limited the ability to perform a complete assessment. In this regard, the development by the local statistics authority of a well-defined statistical framework for the measurement of infrastructure investment tailored to the local context, would enable more precise assessments, as well as continuous monitoring of infrastructure investment by the public and private sectors. This would also support the carrying out of local-specific studies focused on infrastructure developments that would provide further analyses. Such studies would be highly relevant in the context of observed increased infrastructural pressures and would better guide policy in targeting specific infrastructural gaps.

The real estate market

- Recommendation 5.8: Ensuring that Government policy incentives do not contribute to market overheating. Government policies have generally been very supportive to the property market and have been a major contributor towards demand in the market. Caution needs to be taken in ensuring that Government policy incentives do not overamplify the housing cycle and contribute to overheating in the market. Any policy measure should be clearly communicated in terms of its duration (i.e. to remove expectation that it is always going to be extended), while an impact assessment of its removal should also be undertaken after at least a year of its inception.

- Recommendation 5.9: Comprehensive assessment and measures towards addressing the affordable/ social housing issue. The policy concern towards affordability and avoiding social exclusion in the market should be given further priority. The provision of affordable/ social housing should remain one of the top short-term priority actions, as the list of social housing pending applications keep on rising. The timely delivery of the social housing units in the pipeline should address part of the demand-supply mismatch in the short to medium-run. A holistic plan that coordinates current and new measures to address the issue from its affordability roots is however required for a medium to long-term solution prioritising social inclusion/ equity and sustainability.

- Recommendation 5.10: Collection of more regular and detailed data on the property market to support evidence-based policy making. This can be performed for various property market domains including:

    - General property market: The recurrent availability and analysis of more disaggregated data (for instance by locality; property features) on the property market would assist in better assessing the property market impacts on affordability, inequalities and gentrification across geographical regions and social strata. This also permits more detailed assessments of property price alignment with fundamentals.
    - Vacant property: The issue of vacant property remains unaddressed. The escalating property demand is primarily being met through the construction of new units. It is unclear if part of this demand could potentially be met by the reintroduction of

completely vacant/ abandoned property into the market's 'property supply', with reduced external impacts. More recent data is hence needed in this field.

- Rental market: The current lack of quantitative rental market data collection restricts the depth of market development assessments which can be undertaken. The requirement for the registration of every rent contract expected to be introduced by the reformed rent laws, should be considered as an opportunity to collect and analyse market information that would help policies/ regulations in remaining up to speed with market developments.

Sustainable infrastructure and real estate construction

- Recommendation 5.11: Efforts to overcome barriers and promote the diffusion of environmentally sustainable construction activities. Enhanced environmental sustainability in construction through improved building energy performance and resource efficiency in the use of products for the construction of buildings and infrastructures, can go a long way in supporting competitiveness sustainability. The construction sector could contribute to sustainable competitiveness by increasing its activity in areas such as resource-efficient buildings and the renovation of buildings and infrastructures (EC, 2012). The opportunities and barriers for innovation in resource-efficient buildings have been reviewed in Chapter 4 of this report. A critical mass has yet to be reached in this area, but the contribution potential remains significant. Malta's commitment to develop a long-term renovation strategy to support the renovation of the national stock of residential and non-residential buildings, both public and private, is also an opportunity for addressing infrastructure, real estate and environmental sustainability requirements for sustainable competitiveness in an integral way.

CHAPTER 6: ASSESSMENT AND PRIORITISATION OF POLICY RECOMMENDATIONS

6 ASSESSMENT OF POLICY RECOMMENDATIONS

This chapter brings together 42 policy recommendations that were derived from the four thematic areas[77] developed in this report as the policy measures to be taken forward. The chapter proposes a scheme for confirmation and prioritisation of these measures in a manner which reinforces the complementarities and addresses potential trade-offs. This chapter therefore addresses the Terms of Reference as approved by the Productivity Board which state that the last chapter of the report *"subjects the recommended policy options derived from the previous chapters to a cost-benefit approach with the aim of identifying the complementarities and trade-offs between them".*

To this effect, the chapter adopts an approach involving a Multi-Criteria Decision Analysis (MCDA) which a standard tool in cost-benefit studies. This technique thereby derives the priority to be assigned to each policy recommendation by considering its contribution and risks according to a number of decision criteria.

Section 6.1 of this Chapter delves into the MCDA methodology used to evaluate the policy recommendations in terms of their Effectiveness, Implementability and Future-proofing. Four judgment criteria are considered under Effectiveness, two under Implementability and one under Future Proofing. Section 6.2 presents the results stemming from the analysis, thereby allowing the policy maker to consider the contribution of each recommendation. The last section provides some concluding remarks.

[77] The thematic areas explored in this report are Meso-Level Productivity, Human Capital, Research and Innovation and Infrastructure and Real Estate. The policy recommendations made under each thematic area are reproduced in Annex I.

6.1 Multi-Criteria Decision Analysis Methodology

Setting up the MCDA Framework

The basic idea of a Multi-Criteria Decision Analysis (MCDA) is to evaluate the performance of different policies with respect to criteria that capture the key dimensions of the decision-making problem. Indeed, the **criteria** considered in this MCDA are to reflect the key needs of the Maltese economy, which needs have been identified as outlined below.

- **Better synergies between sectors -** Improved input-output, innovation and external economies of scope and scale between the different sectors operating in Malta
- **A more balanced approach to investment –** A balanced pattern of investment including productive, human, environmental, climate mainstreaming, social and institutional capital
- **Countercyclicality –** Moderation of the impact of cyclical fluctuations due to the business cycle, particularly following the strong expansion in aggregate demand characterising the Maltese economy in recent years
- **Socio-demographic balance –** Filling gaps related to demographic imbalances, social cohesion and inequality
- **Potential for mobilisation of social and civil actors –** Potential for the involvement and enhancement of collaborative action between social and civil actors
- **Ability to attract public and private financial resources –** Attraction of the necessary financial and other resources for implementation
- **Futureproofing** – Potential for the benefits to be sustained over the longer term

Table 6.1: Criteria

	Criteria	Explanation of Criteria	Weights
Effectiveness	Better synergies between sectors	To what extent does the measure facilitate synergies between different sectors of economic activity?	11%
	A more balanced approach to investment	To what extent does the measure promote a balanced pattern of investment between productive, human, environmental, climate mainstreaming, social and institutional capital?	11%

	Countercyclicality	To what extent does the measure moderate the impact of cyclical fluctuations due to the business cycle in an economy?	11%
	Socio-demographic balance	To what extent does the measure contribute to address demographic imbalances, promote a cohesive social fabric and mainstream equality issues?	11%
Implementability	Potential for mobilisation of social and civil actors	To what extent does the measure require and promote the collaborative action between social and civil actors?	20%
	Ability to attract public and private financial resources	To what extent would the measure be able to attract the necessary financial and other resources to enable its implementation?	20%
Future Proofing	Futureproofing	To what extent are the benefits of the measure likely to be sustained over the longer term?	15%

As depicted in ***Table 6.1*** the criteria are categorised under three key aspects, namely:

- **Effectiveness:** a measure of the extent to which an intervention achieves its objectives. In this case, the degree of effectiveness of a policy is determined by considering the extent of its contribution towards achieving better synergies between sectors, a more balanced approach to investment, countercyclicality and a socio-demographic balance.

- **Implementability:** a measure of the extent to which a policy is easily implementable. This is interpreted in terms of the ability of the policy to mobilise social and civil actors and to attract public and private financial resources.

- **Futureproofing:** as indicated in the Table, this considers the extent to which the benefits emanating from the policy are sustained over the longer term. For a policy measure to be future proof, it has to

be effective and implementable. Against this background, this criterion captures both of these elements together.

Each of these criteria are assigned a weight to reflect their relative importance. The criteria related to effectiveness are assigned the largest proportion with an aggregate weighting of 45% such that each individual criterion carries a weight of around 11%. As for the criteria related to implementability, an overall weighting of 40% is assigned, thus attributing a 20% weight to each individual criterion. The degree of effectiveness and implementability of a policy are considered to be more or less equally important for that policy to be feasible, with a slight bias towards effectiveness. Finally, future proofing is assigned a weight of 15%.

The next step in setting up the MCDA is to establish a scoring system which would express the contribution or otherwise of each policy to the above criteria. The scoring system used in this study takes the form of a Likert scale ranging from 1 to 5. This scoring method considers not only the expected return or the contribution of the policy to the criterion concerned but also any potential adverse risks which the policy might pose to that criterion. Indeed, the scores are interpreted as shown in *Table 6.2*.

Table 6.2: Scoring Method

Score	Interpretation
1	Adverse risks that are not easily mitigated
2	Potential adverse risks which can be mitigated through careful attention to design and implementation
3	Neutral
4	Potential for important contribution to criterion, but requires careful attention design and implementation
5	Important contribution to criterion

In deriving the Effectiveness, Implementability and Total scores, a geometric weighting method was applied such that a low score is brought down even further to reflect the fact that a weak score (1 and 2) reduces the average more than a strong score (4 and 5) would contribute.

In order to produce a system of ranking, priority was given to the Implementability of the policy recommendations. Giving precedence to the most easy-to-accomplish policies is justified since the Maltese economy is at a stage where it is performing well and it does not appear to be in dire need of specific reforms. Therefore, it makes sense to implement first and foremost the measures which are in a more advanced state of readiness. Against this background, time frames are an important consideration in choosing between policy alternatives. Using this approach, measures which can be implemented in the short-term are prioritized.

The second filter used in ranking the set of policy recommendations presented in this report is future proofing. This is based on the notion that the state of readiness for the implementation of measures as a prioritisation factor should be balanced by the need for results to be sustained over the long term, rather than being merely of a short-lived nature. In other words, if the policy does not translate in benefits which are sustainable over the long-term, its relevance is diminished. Finally, the Effectiveness of the policy measures is considered. This came last since by default the policy measures presented in this report have been deemed to be effective.

Following this ranking process, recommendations were categorized into six groups, across the different thematic areas. Policy recommendations presented in the first group are considered to be the most implementable, offer the most future proofing and are the most effective. On the contrary, policy measures ranked in the last category are considered to be the slowest or most difficult to implement, are relatively week in terms of their future proofing and are the least effective. Detailed results are presented in Section 6.2 of this report.

Applying the MCDA

This section aims to provide an application of the above methodology by presenting an example of one policy recommendation from each thematic area.

Thematic Area 1: Meso-Level Productivity

Policy recommendation: Support the creation of clusters that bring together enterprises from different sectors. This should contribute to higher economic resilience since it encourages cooperation and the sharing of knowledge, while still allowing for diversification and specialisation.

This policy recommendation has the primary aim of contributing to higher cooperation between different economic sectors in the Maltese economy. Against this background, this measure has been awarded a score of 5 in the criterion related to 'Better Synergies between sectors'. In turn, the collaboration between sectors is expected to lead to social and civil actors to work together, hence a score of 5 was also attributed to the 'Potential for Mobilisation of Social and Civil Actors'.

A score of 4 was awarded to the criteria related to the 'Ability to attract Funding' and 'Future-Proofing' of the policy measure. This is justified in view of the fact that there are already funding instruments which are dedicated to encouraging clustering activity (ex: in the maritime sector) so there appears to be good chance of obtaining finance in this regard. Furthermore, the benefits of this measure are expected to be sustained over the long-term since knowledge-sharing among sectors could scale up innovation, hence contributing to higher potential output.

This policy measure is expected to have a neutral impact with respect to achieving a 'More Balanced Approach to Investment' and 'Socio-Demographic Balance'. Based on this assumption, a score of 3 was attributed to these criteria. Finally, this measure achieved a score of 2 when it comes to 'Countercyclicality', implying that there is potential for adverse risks which can however be mitigated if the measure is carefully designed and implemented. Indeed, higher interconnectedness between sectors could potentially give rise to higher systemic risks.

Thematic Area 2: Human Capital

Policy recommendation: Social integration at the place of work is to be ensured. This could include developing a Centre to educate foreigners coming over to Malta about regulations and work practices.

This measure provides an important contribution to the promotion of a cohesive social fabric hence a score of 5 was provided to the criteria on Socio-Demographic Balance. A score of 4 was awarded to the criteria in Future Proofing, Funding, More Balanced Approach to Investment and Mobilisation of social and civil actors. If carefully designed, this measure could contribute to higher retainment of foreign workers, allowing the country to benefit from more experienced workers. Social integration policies (ex: learning of Maltese as a foreign language) are already being pushed forward, hence this measure is likely to attract the necessary funding. This measure also represents an investment in the human and social capital of the country allowing for a balanced approach to investment. The involvement of social partners is promoted and collaborative action is needed to ensure that this measure is properly implemented. A score of 3 in synergies across sectors is awarded since the effect of this measure on the criteria is considered to be neutral. Countercyclicality is awarded a score of 1 due to the adverse risk that cannot easily be mitigated whereby the social integration of migrants will preclude them from leaving Malta in the case of an economic downturn.

Thematic Area 3: Research and Innovation

Policy recommendation: Developing a comprehensive monitoring system which enables a more quantitative/ objective evaluation of innovation outputs and impacts, for example through a set of monitorable indicators.

Policy makers are increasingly seeking for policy measures to be backed up by rigorously established objective evidence. Against this background, the development of a monitoring system which facilitates the evaluation of innovation outputs and impacts is considered to have an important contribution for the achievement of a 'More Balanced Approach to Investment' and 'Future-Proofing'. Indeed, this policy is awarded a score of 5 in respect of these criteria since R&I monitoring provides indications and guidance for policy within the area, including innovation requirements and the developed monitoring system can serve a long-standing function for innovation evaluation. Furthermore, this measure requires relatively lower resource investments and hence is awarded a score of 5 when it comes to its 'Ability to attract Funding'.

A score of 3 was assigned to this measure when it comes to creating 'Better synergies between sectors, countercyclicality and socio-demographic balance since no significant impacts in these domains are

expected from the measure. Finally, this measure was awarded a score of 2 in terms of its 'Potential for Mobilisation of Social and Civil actors'. This is justified in light of the fact that the development of the monitoring system requires the collaboration and information provision by a wide range of stakeholders, thereby limiting the implementability of this measure.

Thematic Area 4: Infrastructure and the Real Estate Market

Policy recommendation: Boosting infrastructure maintenance spending to make the most out of existing infrastructure.

This measure under the area of Infrastructure and Real Estate is considered to have an important contribution to the achievement of a 'More Balanced Approach to Investment' and hence awarded a score of 5. This is because maintenance interventions can often achieve infrastructure improvement requirements with lower environmental and social externalities (relative to alternative new projects that achieve same/ lower results). Furthermore, its lower financing requirements can free up financial resources for other forms of productive investments required by the economy. Substantial long-term benefits can be achieved from the implementation of this measure as it extends the lifetime of infrastructure. The relatively lower capital expenditure requirements of this measure ensure that it is more sustainable over the longer-term and hence the measure scores 5 in 'Future-Proofing'. The measure Is not viewed to have any direct impacts in terms of creating 'Better Synergies between Sectors', achieving higher 'Countercyclicality', 'Socio-Demographic Balance' and 'Mobilisation of Social and Civil actors', hence a score of 3 was assigned. Finally, while maintenance spending imposes lower financing requirements, it is less suited to attract EU and private sector funding over new infrastructural projects. For this reason, the measure is attributed with a score of 2 when it comes to its 'Ability to attract Funding'.

6.2 Results

Based on the methodology described above, this sub-section presents the results in terms of policy recommendation groupings. Specifically, six groups are being presented, based on two classifications:

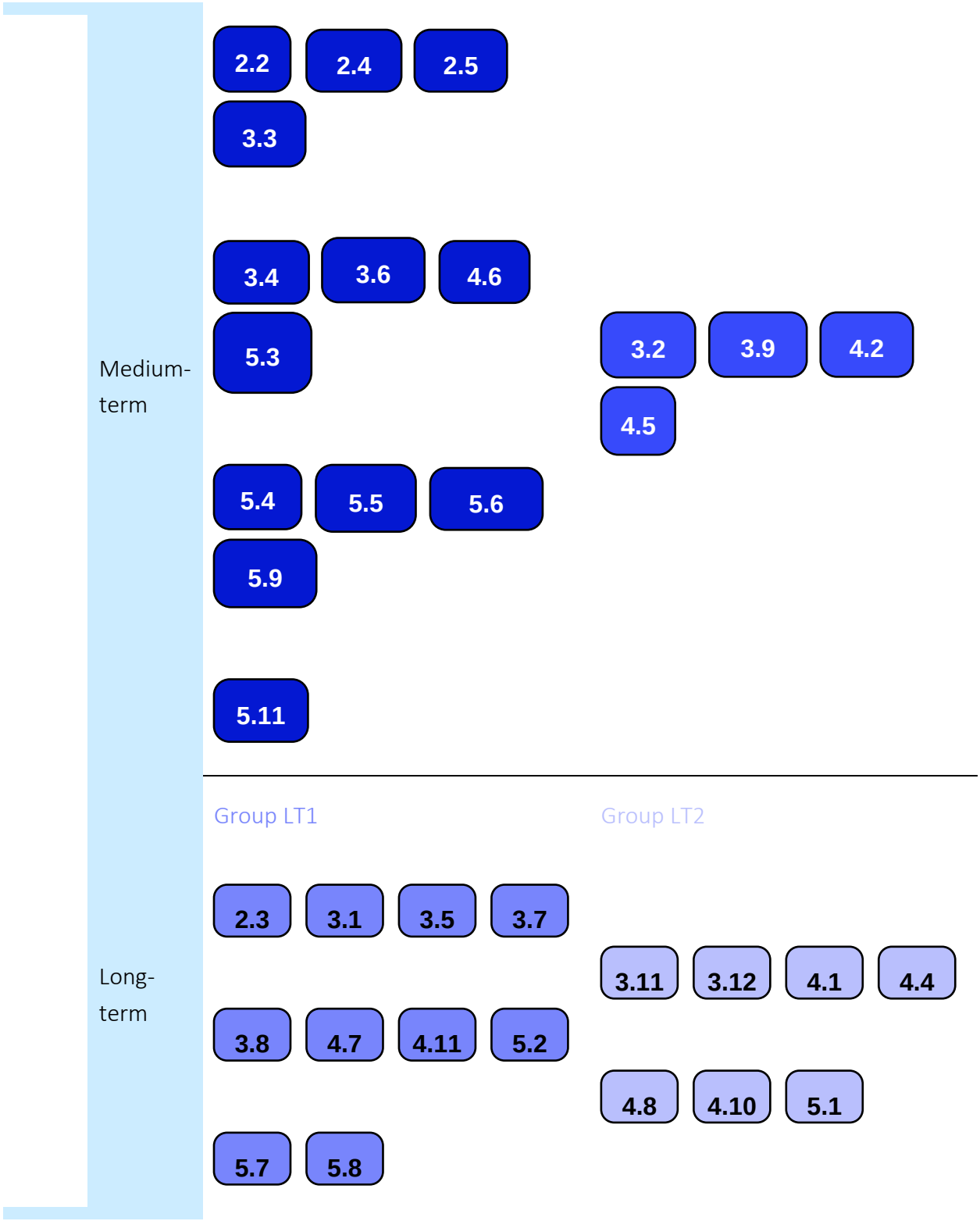
1. Implementability horizon – the implementation timeframe has been split according to whether the policy recommendation is of a short-term, medium-term or long-term nature; and

2. Future-proofing – the extent to which any benefits emanating from the policy are sustained over the longer term.

The table below presents the key summary of the policy recommendations falling under each of these six groups. This table makes reference to each policy recommendations by number – subsequent tables go into each group in more detail, while the Annex to this report provides detailed information on each policy recommendation, including its separate scoring per dimension/ criterion.

Table 6.3: Summary of results

Implementability Horizon	Future-proofing of benefits: Very Strong	Future-proofing of benefits: Strong
Short-term	Group ST1: 2.7, 3.10, 5.10	Group ST2: 2.1, 2.6, 3.13, 4.3, 4.9
	Group MT1	Group MT2


Medium-term
2.2
2.4
2.5
3.3
3.4
3.6
4.6
5.3
3.2
3.9
4.2
4.5
5.4
5.5
5.6
5.9
5.11
Group LT1
Group LT2
Long-term
2.3
3.1
3.5
3.7
3.11
3.12
4.1
4.4
3.8
4.7
4.11
5.2
4.8
4.10
5.1
5.7
5.8

The six groups are individually dealt with in the tables below, which include information on each recommendation falling within the respective group, as well as a group general overview.

Table 6.4: Group ST1

Group ST1: Short-term measures with very strongly future-proofed benefits	
2.7	Publish a more disaggregated sectoral productivity data, including at firm level, to assist policymakers in adequately understanding and benchmarking Malta's productivity performance against international competitors and driving informed policy decisions.
3.10	Make use of European Social Funds to tackle in-work poverty.
5.10	Collection of more regular and detailed data on the property market to support evidence-based policy making
Overview of recommendations: Immediate policy attention should be directed towards the more frequent and detailed gathering of data/ information in key economic domains such as sectoral productivity and the real estate market. The effectiveness of future policy rests heavily on the availability of such data which permits informed and evidence-based policy making and prevents mis-directed policy. In view of the rise in the absolute number of persons at risk of in-work poverty, the European Social Fund represents an opportunity which can be tapped in the short-run for assisting workers in overcoming this risk and preventing the spread of this phenomenon.	

Table 6.5: Group ST2

Group ST2: Short-term measures with strongly future-proofed benefits	
2.1	Support the creation of clusters that bring together enterprises from different sectors. This should contribute to higher economic resilience since it encourages cooperation and the sharing of knowledge, while still allowing for diversification and specialisation.

2.6 The NPB is to engage with the European Commission, OECD and other international productivity bodies to exchange best practice. Furthermore, it is to continue analysing challenges to productivity and put forward policy measures which could address them.

3.13 Marketing campaigns are to be strengthened to ensure that present and potential employees are aware of the opportunities arising in different sectors, including those currently precluded because of gender stereotypes.

4.3 Introduction of targeted funding mechanisms that address research gaps, such as research funds with no requirement for industry participation. R&I funding and support measures specifically targeting the development of technologies that address priority areas such as the environment and climate change should be evaluated.

4.9 Tapping more into opportunities for international R&D collaboration and seeking to further reinforce international, multilateral and bilateral collaboration.

Overview of recommendations: In the short-run, policy should also look at opportunities for relatively minimalist policy interventions and resource re-organisations that provide significant long-term contributions.

Table 6.6: Group MT1

Group MT1: Medium-term measures with very strongly future-proofed benefits

2.2 Set up educational programmes to address the demand for new skills in highly productive sectors.

2.4 Support human capital creation and improvement in low productivity services sectors exposed to international competition.

2.5 Low productivity sectors should benefit from interlinkages with other sectors with the aid of technology.

3.3 Further encourage apprenticeships to ensure that young people especially low achievers have the opportunity to obtain the necessary qualifications, while applying the skills acquired in practice with the assistance of experts.

3.4 Efforts need to be sustained in terms of encouraging participation by low-skilled employees in adult learning, through incentives targeted especially at those persons that have precarious jobs. Career guidance and information about training and funding opportunities should be available to this category of workers.

3.6 Ensure equal opportunities amongst priority categories of workers, including females (addressing the gender pay gap), older workers and workers with a disability.

4.6 Stronger public investment in RDI to facilitate innovation creation and diffusion.

5.3 Increased use of market-based instruments (led by public authorities) to alleviate infrastructure gaps.

5.4 Ensuring infrastructure project pipeline can be financially sustained over the medium to long term by solidifying Government's fiscal position and through efficient utilisation of funds from the EU structural & cohesion funds, and the NDSF.

5.5 Exploring further opportunities for infrastructure investment through PPPs

5.6 Addressing private market financing failures and the disconnect between investor/ saver liquidity (in financial institutions or capital markets) and infrastructural projects that need capital funding

5.9 Comprehensive assessment and measures towards addressing the affordable/ social housing issue.

5.11 Efforts to overcome barriers and promote the diffusion of environmentally sustainable construction activities

Overview of recommendations: The resulting list of recommended measures within this category indicates the areas where policy focus is being recommended over measures which hold medium-term implementability in view of their prior planning and gestation required, but whose timely addressing generates very strong long-term benefits.

Measures that aim at developing human capital and upgrading workforce skill levels feature as a key priority. Policy should aim at directing human capital development towards the necessities of the economy as shaped by the economy's productivity developments and evolving skill requirements. In the context of strong economic growth and labour demand, measures that support workforce employability and the full utilisation of workforce potential should feature prominently.

Malta's significant infrastructure gaps warrant sustained investment over the medium-term. While the strong current fiscal position allows space for high short-term Government investment in the area, medium-term solutions that address/ manage these gaps via demand-side management (market-based instruments) and re-balancing of financing towards private funding (PPPs; addressing market failures) should be evaluated.

The drive for sustainable competitiveness over the three sustainability dimensions could be sustained by some of the above indicated measures. Stronger R&I investment by Government would provide an effective and long-term contribution towards sustaining economic competitiveness and productivity. Some of the major sustainability challenges currently emerge from the real estate market. In this regard, measures towards safeguarding housing affordability and promoting environmentally sustainable construction activities are two key areas in managing the social and environmental sustainability issues arising from the market.

Table 6.7: Group MT2

Group MT2: Medium-term measures with strongly future-proofed benefits

3.2	Social inclusion of immigrants within the education system needs to be further encouraged. Adequate support facilities for students with a migrant background are required to facilitate their transition into a new environment
3.9	Social integration at the place of work is to be ensured. This could include developing a Centre to educate foreigners coming over to Malta about regulations and work practices.
4.2	Further streamlining, simplification and clarification of funding mechanisms.
4.5	Evaluating the possibility of further developing the capacity of existing innovation hubs and setting up sectoral specific innovation hubs (e.g. Digital innovation hubs).

Overview of recommendations: The list of recommended measures falling within the MT2 category relate to measures which hold implementability in the medium-term, at the same time as holding strong long-term benefits.

Specifically, the measures can be regrouped into measures aimed at social inclusion/ integration, and R&D measures. In the former case, migrant inclusion/ integration is being recommended at two key points, that is, within the educational system, and at the workplace. In the latter sub-grouping, two R&D measures are being recommended in relation to innovation hubs (existing and new), as well as existing funding mechanism. There is clearly a link between the two, in that funding mechanisms can be utilised for the innovation hubs to be considered.

Table 6.8: Group LT1

Group LT1: Long-term measures with very strongly future-proofed benefits	
2.3	Intensify the efforts directed at strengthening the regulatory framework as well as anti-money laundering with respect to high productivity sectors exposed to international competition.

3.1 Intensify the efforts directed at reducing the Early School Leaving (ESL) rate. In particular, the low average test scores observed in secondary school level need to be tackled since disparities between the very good achievers and the low ones is bringing down the average score. In view of this challenge, a rigorous investigation of such disparities is to be undertaken with the aim of implementing specific actions that are tailor made to help relatively low achievers.

3.5 Adopt a holistic approach whereby the creation of skills is mainstreamed within each element of economic and social development policies in Malta.

3.7 Continue to sustain work-life balance to ensure longer working lives, which address not only the facilities but also the culture in the workforce.

3.8 Ensure that Malta remains an attractive place to live and work to retain migrant workers as well as the local population. To this end, factors such as the cost of living, in particular the affordability of property for rent and the quality of life are to be monitored so that the necessary actions are taken.

4.7 Support for other non-R&D forms of innovation. In certain areas, the limited local resources are unable to support the full R&D cycle. Other non-R&D forms of innovation investments (design, process, organisational and market innovation) can also be key inputs for innovation outcomes, and hence should also be adequately supported.

4.11 Developing a comprehensive monitoring system which enables a more quantitative/ objective evaluation of innovation outputs and impacts, for example through a set of monitorable indicators.

5.2 Boosting infrastructure maintenance spending to make the most out of existing infrastructure.

5.7 Development of a well-defined statistical framework for the evaluation of infrastructure investments that supports research and policy in the area

5.8 Ensuring that Government policy incentives do not contribute to property market overheating

Overview of recommendations: The LT1 group, which is comprised of measures holding a longer-term implementability and very strong long-term benefits, includes 10 measures in different policy areas.

Firstly, strengthening the regulatory framework is seen as a key long-term policy measure to ensure sectorial competitiveness.

Secondly, the educational system also requires a long-term view, to reduce the ESL rate, and to mainstream the creation of skills within each element of economic and social development policies in Malta. In terms of the workforce, there is also a long-term requirement to sustain work-life balance.

Thirdly, R&D is another area which requires a long-term approach – in this regard, policy measures that support other non-R&D forms of innovation and a comprehensive R&D monitoring system are being envisaged.

In terms of infrastructure, longer-term approaches include policy measures to boost maintenance spending, and a well-defined statistical framework for the evaluation of infrastructure investments that supports research and policy in the area. At the same time, Government policy incentives need to be vetted so as not to contribute to any property market imbalances.

Finally, all the above measures need to be seen in the light of a key principle – that is, that Malta remains an attractive place to live and work to retain both the local population and migrant workers.

Table 6.9: Group LT2

Group LT2: Long-term measures with strongly future-proofed benefits

3.11	Introduce mechanisms which favour higher procyclicality of wages and salaries.
3.12	Workplaces should consider introducing the concept of mentoring as well as a knowledge-transfer programme
4.1	Marketing campaigns are to be strengthened to ensure that present and potential employees are aware of the opportunities arising in different sectors, including those currently precluded because of gender stereotypes.
4.4	Facilitating access to finance for SMEs for innovative activities. Financing facilities for SMEs and collaboration schemes with retail banks that improve access to finance for SMEs should assist in spurring innovation amongst the smaller local enterprises
4.8	Further investigating the avenues for public-private partnerships in R&I
4.10	Strengthening R&I academia-business linkages. Efforts should be directed towards directing research to focus on the fields required by business enterprise as well as towards incentivising enterprises (by providing necessary resources and mitigating risks) to venture into innovation opportunities identified from research.
5.1	Evaluating and strengthening the framework for public infrastructure investment management, including through the consideration of well-defined project appraisal and selection criteria and more holistic public investment management. The social viability of all major infrastructure projects should be scrutinised by the undertaking of economic Cost-Benefit Analyses, Social Impact Assessments and Environmental Impact Assessments.

Overview of recommendations: This group also comprises longer-term policy measures with strong benefits that are likely to endure.

In relation to the workplace, policy measures being recommended under this group include mechanisms that favour higher procyclicality of wages and salaries, mentoring initiatives, and knowledge-transfer programmes.

When it comes to R&D, campaigns should be undertaken to inform of opportunities in different sectors, for all genders. SME access to finance, PPPs and academia-business linkages are other key areas to incentivise innovation.

The framework for public infrastructure investment management requires a long-term approach, to ensure well-defined project appraisal and selection criteria.

6.3 Concluding Remarks

This first annual report of the newly set-up Malta National Productivity Board provides a review of local developments in competitiveness and productivity and a meso-level analysis of such productivity and related policy recommendations. Recommendations are put forward in relation to human capital, research and innovation and the development of new sectors, infrastructure and real estate. The 42 policy recommendations thus derived are assessed through an MCDA, to prioritise measures against criteria related to Effectiveness, Implementability and Futureproofing. As a result of this analysis, the measures were categorised into six groups, depending on their Implementability horizon, and futureproofing element.

Through this annual report, the National Productivity Board is putting forward these policy measures as recommendations to be looked into locally by the respective authorities and social partners/ stakeholders. Subsequent annual reports will look into the progress of those policy measures that would have been taken forward, as well as the effect of changing national priorities on these recommendations.

7 REFERENCES

Andres, L., Biller, D., & Schwartz, J. (2014). The infrastructure gap and decentralization. (Working Paper 14-06). International Center for Public Policy, Georgia State University.

Atoyan, R., Benedek, D., Cabezon, E., Cipollone, G., & Minaine, J. (2018). Public infrastructure in the western balkans: Opportunities and challenges. International Monetary Fund.

Attard S. (2018). The evolution of Malta's tourism product over recent years. Article published in the Central Bank of Malta Quarterly Review 2018:4, pp. 41-55.

Available at: https://jobsplus.gov.mt/resources/publication-statistics-mt-mt-en-gb/labour-market-information/foreigners-data#title1.1

Azzopardi-Muscat N, Buttigieg S, Calleja N, Merkur S (2017). Malta: Health system review. Health Systems in Transition, 2017; 19(1):1–137.

Bartolo, D. (2016). Malta's digital economy: Developing connectivity for a small EU member state. (Unpublished Masters in Business Administration at the Faculty of Economics, Management and Accountancy), University of Malta.

Bartolo, V. (2017). The property price bubble in Malta - what will happen? (Unpublished Degree of Bachelor of Commerce (Honours) in Banking and Finance). University of Malta,

Bilbao-Osorio, B., & Rückert, E. (2018). Innovation, productivity, jobs and inequality (Science, Research and Innovation Performance of the EU 2018), European Commission.

Borg, A., 2019. In-work poverty in Malta, Brussels: European Social Polcy Network (ESPN).

Borg, I. (2019). The length of stay of foreign workers in Malta. (Policy Note).Central Bank of Malta.

Borg, I., 2019. The Length of Stay of Foreign Workers in Malta, Malta: Central Bank of Malta.

Borg, I., Darmanin, J., & Ellul, R. (2019). Hedonic house price indices for Malta: A mortgage-based approach. (Working Paper (WP/02/2019)).Central Bank of Malta.

Burkhardt, K., & Martino, R. (2018). Framework conditions for innovation (Science, Research and Innovation Performance in the EU 2018), European Commission.

Camilleri, S. J., & Falzon, J. (2013). The challenges of productivity growth in the small island states of Europe: A critical look at Malta and Cyprus. Island Studies, 8(1), 131-164.

Cassar, I. P., Vella, K., & Buttigieg, S. (2016). Understanding the economic contribution of tourism in Malta: A literature review. Mediterranean Journal of Social Sciences, 7(6) doi:10.5901/mjss.2016.v7n6p49

Central Bank of Malta. (2017). The household finance and consumption survey 2013 - salient results for Malta. Central Bank of Malta Quarterly Review, 1, 23-27.

Correia, A., Deiss, R., & Lally, D. (2018). Investment in R&I and other intangible assets (Science, Research and Innovation Performance in the EU), European Commission.

Corrigan, G., Crotti, R., Drzeniek, M., & Serin, C. (2014). Assessing progress toward sustainable competitiveness. (The Global Competitiveness Report 2014–2015).World Economic Forum.

Cutajar, C. Z. (2017). The determinants behind innovative capability. A study of indigenous manufacturing SME's in a small island economy. (Unpublished Executive Masters of Business Administration), University of Malta.

EC. (2012). Strategy for the sustainable competitiveness of the construction sector and its enterprises. (Communication from the Commission to the European Parliament and Council). Brussels: European Commission.

Ellul, R., 2018. Forecasting unemployment rates in Malta: A labour market flows approach, Malta: Central Bank of Malta.

ESPON. (2018). ESPON bridges: Balanced regional development in areas with geographic specificities. (Interim report, Annex - Case Studies).

European Commission (2017). The economic rationale for public R&I funding and its impact. (Policy Brief Series). Retrieved from https://ri-links2ua.eu/object/document/326/attach/KI0117050ENN_002.pdf .

European Commission, 2016. Gender Equality and Work-Life Balance, Brussels: European Commission.

European Commission, 2018. Labour Taxation & Inclusive Growth, Brussels: European Commission.

European Commission, 2019. Country Report Malta 2019, Brussels: European Commission.

European Commission, 2019. Taxation Trends in the European Union 2019, Brussels: European Commission.

European Commission. (2018). Science, research and innovation performance of the EU 2018: Strengthening the foundations for Europe's future. Directorate-General for Research and Innovation. Retrieved from https://ec.europa.eu/info/sites/info/files/rec-17-015-srip-report2018_mep-web-20180228.pdf

European Commission. (2019a). Peer review: Maltese research and innovation system. Directorate-General for Research and Innovation. Retrieved from https://rio.jrc.ec.europa.eu/en/file/12748/download?token=ZFZRzMnV

European Commission. (2019b). Digital economy and society index (DESI): 2019 - Country Report Malta. Retrieved from https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=59907

European Commission. (2019c). Country Report Malta 2019 (Commission Staff Working Document). Retrieved from https://ec.europa.eu/info/sites/info/files/file_import/2019-european-semester-country-report-malta_en.pdf

Farrugia, D. (2016). The prospects of M-tourism within the Maltese context – perspectives of tourists. (Unpublished Degree of Bachelor of Arts with Honours in Tourism Studies), University of Malta.

Farrugia, R. E. (2017). Research and innovation: The opportunities and challenges of SMEs in Malta. (Unpublished, Master in Accountancy Degree at the Faculty of Economics, Management and Accountancy), University of Malta.

Fazlioglu, B., Dalgic, B., & Yereli, A. B. (2016). The effect of innovation on productivity: Evidence from Turkish manufacturing firms, Hacettepe University: TOBB Economics and Technology University, Hacettepe University. Retrieved from https://mpra.ub.uni-muenchen.de/75773/

Gatt, D., & Yousif, C. (2018). Malta policy action plan report: "promotion of near zero CO_2 emission buildings due to energy use". Institute for Sustainable Energy, University of Malta. Retrieved from https://www.interregeurope.eu/fileadmin/user_upload/tx_tevprojects/library/file_1532067997.pdf

Georgakopoulos, I. (2019). Income and wealth inequality in Malta: Evidence from micro data. (Working Paper (WP/03/2019)).Central Bank of Malta.

Goodhart, C., & Hofmann, B. (2007). House prices and the macroeconomy. Great Britain: Oxford University Press.

Grech, A. G., 2015. The Evolution of the Maltese Economy since Independence, Malta: Central Bank of Malta.

Grech, A. G., 2016. The Possible Impact of Pension Age Changes on Malta's Potential Output , Malta: Central Bank of Malta.

Hall, B. H. (2011). Innovation and productivity (Working paper). Cambridge: National Bureau of Economic Research.

Hall, B. H., Mairesse, J., & Mohnen, P. (2009). Measuring the returns to R&D. (Working Paper 15622). Cambridge: National Bureau of Economic Research. Retrieved from http://www.nber.org/papers/w15622

IMF. (2018). IMF country report 2018: Malta. (Staff Report for the 2017 Article IV Consultation). Retrieved from https://www.imf.org/~/media/Files/Publications/CR/2018/cr1819.ashx

IMF. (2018b). Malta: Technical assistance report - fiscal transparency evaluation. International Monetary Fund, Fiscal Affairs Department. Retrieved from https://www.imf.org/~/media/Files/Publications/CR/2018/cr18284.ashx

IMF. (2019). IMF country report 2019: Malta. (Staff Report for the 2019 Article IV Consultation).International Monetary Fund. Retrieved from https://www.imf.org/~/media/Files/Publications/CR/2019/1MLTEA2019001.ashx

Jobsplus, 2018. jobsplus.gov.mt. [Online]

Jobsplus, National Commission for Further and Higher Education and Malta Enterprise, 2016. National Employee Skills Survey, Malta: Jobsplus.

Karbowski et al. (2017): Poland. Competitiveness Report 2017. Internationalization and Poland's Competitive Position, ISBN 978-83-8030-161-0, SGH Publishing House, SGH Warsaw School of Economics, Warsaw, http://kolegia.sgh.waw.pl/pl/KGS/struktura/IGS-KGS/publikacje/Documents/Report_Poland %202017.pdf

López, H. (2004), Macroeconomics and Inequality. The World Bank Research Workshop.

Macdonald, R. (2008), An Examination of Public Capital's Role in Production. Economic Analysis Research Paper Series. No. 50. Ottawa: Statistics Canada

Martin, L., & Nguyen-Thi, T. U. (2015). The relationship between innovation and productivity based on R&D and ICT use, Revue Économique, 66(6), 1105-1130.

MCA (2019). 5G Demand and Future Business Models: Towards a Feasible 5G Deployment, Malta Communications Authority, Discussion paper and survey, MCA/C/19-3617

MCST (2011). National strategy for health research & innovation, Malta Council for Science & Technology. Retrieved from https://rio.jrc.ec.europa.eu/en/file/7363/download?token=2MYIdvgP

MCST (2014). National research and innovation strategy 2020, Malta Council for Science and Technology. Retrieved from http://mcst.gov.mt/wp-content/uploads/2017/02/National-RI-Strategy-2020-June-2014.pdf

MEA. (2019). Wage inflation survey 2019. Malta Employers' Association.

MFSA (2019). MFSA FinTech strategy: Harnessing innovation through technology. Malta Financial Services Authority. Retrieved from https://www.mfsa.com.mt/wp-content/uploads/2019/05/MFSA-Fintech-Strategy.pdf

Micallef, B. (2016). Property price misalignment with fundamentals in malta. (Working Paper - WP/03/2016).Cental Bank of Malta.

Ministry for Finance (2019). Malta National Reform Programme. Retrieved from https://ec.europa.eu/info/sites/info/files/2019-european-semester-national-reform-programme-malta_en.pdf

Ministry for Finance. (2017). Pre-budget document 2018: Upgrading Malta's infrastructure.

Mohnen, P., Polder, M., & van Leewen, G. (2018). R&D, ICT and productivity (Science, Research and Innovation Performance in the EU 2018), European Commission.

MSDECC. (2014). Aquaculture strategy for the maltese islands: Towards sustainability 2014-2025. Ministry for Sustainable Development, Environment and Climate Change.

OECD/Eurostat (2018), Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation, 4th Edition, The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing, Paris/Eurostat, Luxembourg. https://doi.org/10.1787/9789264304604-en

Palei, T. (2015). Assessing the impact of infrastructure on economic growth and global competitiveness. Procedia Economics and Finance, 23, 168-175.

Parliamentary Secretariat for Social Accommodation. (2018). Renting as a housing alternative. (White Paper).

Perrotti, Daniel and Ricardo J. Sánchez (2011), "La brecha de infraestructura en América Latina y el Caribe", Recursos naturales e Infraestructura Series No. 153, United Nations publication, Santiago, Chile, July.

Rapa, A. M., 2019. A cohort approach to project the labour participation rate in Malta , Malta: Central Bank of Malta.

Rapa, N., & Rapa, A. M. (2019). The macroeconomic effects of closing the public sector capital gap in Malta. (Policy Note).Central Bank of Malta.

Saviotti, P. P., & Pyka, A. (2004). Economic development by the creation of new sectors. Journal of Evolutionary Economics, 14, 1-35. doi:10.1007/s00191-003-0179-3

Scottish Government (2018). (2018). Exploring the economic rationale for infrastructure investment. Office of the Chief Economic Adviser Scottish Government. Retrieved from https://www.gov.scot/publications/exploring-economic-rationale-infrastructure-investment/

SolAbility. (2017). The global sustainable competitiveness report 2017. SolAbility.

Vella, C. (2016). An analysis of total factor productivity and its determinants in Malta. (Unpublished Degree of Bachelor of Commerce (Honours) in Economics), University of Malta

World Bank Group, 2018. The Human Capital Project, Washington, DC: World Bank.

World Economic Forum (2016). The global information technology report 2016: Innovating in the digital economy

World Economic Forum. (2018). The global competitiveness report 2018. (Insight Report). Retrieved from http://www3.weforum.org/docs/GCR2018/05FullReport/TheGlobalCompetitivenessReport2018.pdf

Annex 1

Human Capital Composite Index Methodology

ANNEX1 - HUMAN CAPITAL COMPOSITE INDEX METHODOLOGY

As explained in the main report, the human capital composite index considers both the volume and quality aspects of human capital. The volume index of human capital captures the indicators presented in Table A. 1. The performance of each country with respect to these indicators is considered to influence the quantity of human capital that is available to the country concerned, such that it is assumed that:

- the higher the attractiveness to immigration, the higher the human capital volume
- the higher the average expected population growth, the higher the human capital volume
- the higher the female participation, the higher the human capital volume
- the higher the duration of working life, the higher the human capital volume
- the higher the implicit tax on labour, the lower the human capital volume and
- the higher the percentage of employees working from home, the higher the human capital volume

Table A. 1: Human Capital Volume Indicators

Country	2007-2012	2012-2017	2007-2012	2007-2012	2007-2012	2007-2012
	Indicators					
	Attractiveness to Immigration	Average Expected Population Growth	Female Participation	Duration of Working Life (years)	Implicit Tax on Labour	Percentage of employees working from home
Malta	0.030	0.016	0.397	30.23	0.22	0.059
Estonia	-0.014	-0.001	0.641	35.80	0.35	0.097
Czechia	0.021	0.001	0.572	33.92	0.39	0.071
Portugal	-0.001	-0.004	0.609	36.93	0.25	0.072
Slovenia	0.023	0.001	0.624	33.92	0.35	0.135
Cyprus	0.103	-0.001	0.620	36.58	0.23	0.014
Austria	0.020	0.007	0.653	35.95	0.42	0.212
Netherlands	0.009	0.003	0.683	38.82	0.32	0.108
Sweden	0.034	0.009	0.711	40.08	0.40	0.228
Denmark	0.019	0.005	0.719	39.58	0.34	0.328
Iceland	-0.007	0.010	0.779	44.80		

Country	2013-2018	2018-2030	2013-2018	2013-2018	2013-2017	2013-2018
	Indicators					
	Attractiveness to Immigration	Average Expected Population Growth	Female Participation	Duration of Working Life (years)	Implicit Tax on Labour	Percentage of employees working from home
Malta	0.147	0.018	0.544	34.17	0.23	0.063
Estonia	0.010	0.000	0.686	37.60	0.34	0.152
Czechia	0.012	0.001	0.635	35.43	0.40	0.085
Portugal	-0.007	-0.002	0.621	37.17	0.29	0.143
Slovenia	0.009	0.000	0.627	34.70	0.36	0.183
Cyprus	-0.014	0.010	0.599	36.43	0.25	0.027
Austria	0.045	0.005	0.676	36.97	0.42	0.219
Netherlands	0.021	0.003	0.701	39.95	0.32	0.295
Sweden	0.054	0.010	0.743	41.35	0.39	0.303
Denmark	0.029	0.005	0.711	39.53	0.34	0.313
Iceland	0.070	0.009	0.819	46.50		

*yellow cells indicate missing data

In order to capture the dynamics of the human capital volume in a single metric, an arithmetic weighted index[78] was calculated. This involved translating the indicators presented above into standardised values whereby the indicator values for attractiveness to immigration, average expected population growth, female participation, duration of working life and percentage of employees working from home were standardised as follows:

$$\text{Standardised Value} = \frac{(Indicator\ Value - Minimum\ Indicator\ Value\ in\ Range)}{(Maximum\ Indicator\ Value\ in\ Range - Minimum\ Indicator\ Value\ in\ Range)}$$

For example, in obtaining the standardised indicator value for the attractiveness to immigration indicator for Malta (2007 to 2012), the following calculation was affected:

$$\text{Standardised Value} = \frac{(0.03-(-0.014))}{(0.103-(-0.014))} = 0.371$$

In this manner, a value of 1 was assigned to the highest value and a value of 0 was assigned to the lowest value for these indicators. In contrast, for the implicit tax on labour, the following formula was used for standardisation:

$$\text{Standardised Value} = \frac{(Maximum\ Indicator\ Value\ in\ Range - Indicator\ Value)}{(Maximum\ Indicator\ Value\ in\ Range - Minimum\ Indicator\ Value\ in\ Range)}$$

[78] An arithmetic weighted index has been used since, in the context of human capital measurement, it is justified to compensate a bad performance in one indicator with a good performance in another.

For example, working out the standardised value of this indicator for Malta in the first period (2007-2012), involves the following calculation:

$$\text{Standardised Value} = \frac{(0.42-0.22)}{(0.42-0.22)} = 1.000$$

In view of the fact that Malta had the lowest implicit tax rate on labour during this period, the standardised value amounts to 1. Conversely, the country associated with the highest implicit tax on labour among the countries considered is assigned a standardised value of 0. The standardised value for each of the indicators are presented in Table A. 2.

Table A. 2: Human Capital Volume Standardised Indicators

Country	2007-2012 Standardised					
	Attractiveness to Immigration	Average Expected Population Growth	Female Participation	Duration of Working Life (years)	Implicit Tax on Labour	Percentage of employees working from home
Malta	0.371	1.000	0.000	0.000	1.000	0.180
Estonia	0.000	0.125	0.638	0.382	0.337	0.295
Czechia	0.294	0.243	0.459	0.253	0.131	0.217
Portugal	0.108	0.000	0.555	0.460	0.828	0.218
Slovenia	0.314	0.227	0.595	0.253	0.319	0.411
Cyprus	1.000	0.115	0.584	0.436	0.942	0.044
Austria	0.285	0.538	0.671	0.392	0.000	0.644
Netherlands	0.193	0.357	0.748	0.589	0.495	0.329
Sweden	0.412	0.623	0.822	0.676	0.098	0.695
Denmark	0.285	0.432	0.843	0.642	0.366	1.000
Iceland	0.056	0.661	1.000	1.000		
Country	**2013-2018 Standardised**					
	Attractiveness to Immigration	Average Expected Population Growth	Female Participation	Duration of Working Life (years)	Implicit Tax on Labour	Percentage of employees working from home
Malta	1.000	1.000	0.000	0.000	1.000	0.125
Estonia	0.146	0.110	0.515	0.278	0.410	0.438
Czechia	0.160	0.156	0.331	0.103	0.136	0.201
Portugal	0.047	0.000	0.281	0.243	0.668	0.405
Slovenia	0.141	0.134	0.302	0.043	0.339	0.544
Cyprus	0.000	0.625	0.200	0.184	0.893	0.000
Austria	0.367	0.343	0.479	0.227	0.000	0.669
Netherlands	0.217	0.243	0.571	0.469	0.505	0.938
Sweden	0.420	0.619	0.724	0.582	0.141	0.964
Denmark	0.268	0.361	0.606	0.435	0.422	1.000
Iceland	0.518	0.576	1.000	1.000		

In expressing these indicators in a single index for each country, weights were applied to each indicator. Each indicator was weighted equally. In the case of missing indicator values, the weight for that indicator is distributed equally across the rest of the indicators. The weights used are presented in the table below.

Table A. 3: Weights applied to Standardised Indicator Values

Country	Weights					
	Attractiveness to Immigration	Average Expected Population Growth	Female Participation	Duration of Working Life (years)	Implicit Tax on Labour	Percentage of employees working from home
Malta	0.167	0.167	0.167	0.167	0.167	0.167
Estonia	0.167	0.167	0.167	0.167	0.167	0.167
Czechia	0.167	0.167	0.167	0.167	0.167	0.167
Portugal	0.167	0.167	0.167	0.167	0.167	0.167
Slovenia	0.167	0.167	0.167	0.167	0.167	0.167
Cyprus	0.167	0.167	0.167	0.167	0.167	0.167
Austria	0.167	0.167	0.167	0.167	0.167	0.167
Netherlands	0.167	0.167	0.167	0.167	0.167	0.167
Sweden	0.167	0.167	0.167	0.167	0.167	0.167
Denmark	0.167	0.167	0.167	0.167	0.167	0.167
Iceland	0.250	0.250	0.250	0.250	0.250	0.250

Finally, the human capital volume index for each country was determined by multiplying each indicator with its respective weight and adding the resulting values. When taking the sum product of the standardised indicator values and their weights, the human capital volume index presented in was derived.

Table A. 4: Human Capital Volume Index

Country	Composite Volume Index
	First period
Malta	0.425
Estonia	0.296
Czechia	0.266
Portugal	0.362
Slovenia	0.353
Cyprus	0.520
Austria	0.422
Netherlands	0.452
Sweden	0.554
Denmark	0.595
Iceland	0.679

Country	Composite Volume Index
	Second period
Malta	0.521
Estonia	0.316
Czechia	0.181
Portugal	0.274
Slovenia	0.250
Cyprus	0.317
Austria	0.347
Netherlands	0.490
Sweden	0.575
Denmark	0.515
Iceland	0.774

A similar approach was adopted with respect to the quality aspect of human capital. In this case, the indicators considered are the World Bank Human Capital Index which largely focuses on the schooling aspect as well as the adult participation in learning. Indeed, it is assumed that:

- the higher the World Bank HCI, the higher the quality of human capital and
- the higher the adult participation in training, the higher the quality of human capital

The indicator values for each country are presented in the table below.

Table A. 5: Human Capital Quality Indicators

Country	2007-2012 Indicators	2012 Indicators	Country	2013-2018 Indicators	2017 Indicators
	Adult Participation in Learning	World Bank Human Capital Index		Adult Participation in Learning	World Bank Human Capital Index
Malta	0.064	0.700	Malta	0.087	0.701
Estonia	0.105	0.755	Estonia	0.149	0.747
Czechia	0.086	0.757	Czechia	0.092	0.782
Portugal	0.073	0.732	Portugal	0.098	0.776
Slovenia	0.151	0.755	Slovenia	0.119	0.788
Cyprus	0.082	0.689	Cyprus	0.071	0.751
Austria	0.136	0.768	Austria	0.148	0.793
Netherlands	0.170	0.798	Netherlands	0.187	0.800
Sweden	0.235	0.743	Sweden	0.294	0.800
Denmark	0.312	0.752	Denmark	0.288	0.774
Iceland	0.262	0.733	Iceland	0.251	0.740

These indicators were standardised using the formula shown below:

$$\text{Standardised Value} = \frac{(Indicator\ Value - Minimum\ Indicator\ Value\ in\ Range)}{(Maximum\ Indicator\ Value\ in\ Range - Minimum\ Indicator\ Value\ in\ Range)}$$

The resulting standardised values are indicated in

Table A. 6. The next step in deriving the Human Capital Quality Index involved attributing weights to each of these indicators. The weights were assigned on the basis of the hours of training or learning in an individual's lifetime associated with schooling, which is reflected through the World Bank HCI, as opposed

to adult learning. Against this background, the World Bank HCI was assigned a higher weight of 0.76 since it is associated with a higher number of hours in training. As for the Adult Participation in Learning, this was assigned a weight of 0.24.

Table A. 6: Human Capital Quality Standardised Indicators

Country	2007-2012 Standardised	2012 Standardised
	Adult Participation in Learning	World Bank Human Capital Index
Malta	0.205	0.878
Estonia	0.337	0.946
Czechia	0.276	0.949
Portugal	0.234	0.918
Slovenia	0.484	0.946
Cyprus	0.264	0.864
Austria	0.437	0.962
Netherlands	0.546	1.000
Sweden	0.754	0.932
Denmark	1.000	0.942
Iceland	0.841	0.919

Country	2013-2018 Standardised	2017
	Adult Participation in Learning	World Bank Human Capital Index
Malta	0.295	0.876
Estonia	0.506	0.934
Czechia	0.313	0.977
Portugal	0.333	0.970
Slovenia	0.406	0.984
Cyprus	0.240	0.939
Austria	0.503	0.991
Netherlands	0.636	0.999
Sweden	1.000	1.000
Denmark	0.980	0.968
Iceland	0.854	0.925

The Human Capital Quality Index was derived by multiplying the human capital indicators with their respective weights. The results for each country are reproduced in

Table A. 7: Human Capital Quality Index

Country	Composite Quality Index	Country	Composite Quality Index
	First period		Second Period
Malta	0.717	Malta	0.737
Estonia	0.800	Estonia	0.831
Czechia	0.788	Czechia	0.818
Portugal	0.754	Portugal	0.817
Slovenia	0.835	Slovenia	0.845
Cyprus	0.720	Cyprus	0.771
Austria	0.836	Austria	0.874
Netherlands	0.891	Netherlands	0.912
Sweden	0.889	Sweden	1.000
Denmark	0.956	Denmark	0.970
Iceland	0.900	Iceland	0.908

Finally, the total human capital composite index reflects the average of the human capital volume and quality indices. The results for each period considered in this study are presented in Table A. 8.

Table A. 8: Total Human Capital Composite Index

2007-2012

Country	Volume Index	Quality Index	Human Capital Composite Index	
Malta	0.425	0.717	**0.571**	
Estonia	0.296	0.800	0.548	Comparison Group Average - **0.569**
Czechia	0.266	0.788	0.527	
Portugal	0.362	0.754	0.558	
Slovenia	0.353	0.835	0.594	
Cyprus	0.520	0.720	0.620	
Austria	0.422	0.836	0.629	Target Group Average - **0.717**
Netherlands	0.452	0.891	0.672	
Sweden	0.554	0.889	0.722	
Denmark	0.595	0.956	0.775	
Iceland	0.679	0.900	0.790	

2013-2018

Country	Volume Index	Quality Index	Human Capital Composite Index	
Malta	0.521	0.737	**0.629**	
Estonia	0.316	0.831	0.574	Comparison Group Average - **0.542**
Czechia	0.181	0.818	0.499	
Portugal	0.274	0.817	0.546	
Slovenia	0.250	0.845	0.548	
Cyprus	0.317	0.771	0.544	
Austria	0.347	0.874	0.611	Target Group Average - **0.737**
Netherlands	0.490	0.912	0.701	
Sweden	0.575	1.000	0.787	
Denmark	0.515	0.970	0.743	
Iceland	0.774	0.908	0.841	

Annex 2

Policy Recommendations – Evaluation

ANNEX 2 - POLICY RECOMMENDATIONS - EVALUATION

Table A.1: Detailed Evaluation

Criteria	Effectiveness				Implementabilty		
	Synergies between Sectors	Balanced Approach to Investment	Counter-cyclicality	Socio-Demographic Balance	Mobilisation of Social and Civil Actors	Ability to attract Financial Resources	Future-proofing
Policy & Classification	Scores & Scoring summary						
Meso-level productivity							
2.1 – ST2: Support the creation of clusters that bring together enterprises from different sectors. This should contribute to higher economic resilience since it encourages cooperation and the sharing of knowledge,	5	3	2	3	5	4	4
	Score of 5 in Better Synergies between sectors and Mobilisation of Social and Civil Actors: implementing this measure would directly contribute to higher cooperation between sectors, which in turn requires different social and civil actors to work together. Score of 4 in Funding and Future-Proofing: There are already funding instruments which are dedicated to clustering activity (ex: in the maritime sector) so there appears to be good chance of obtaining finance in this regard. The benefits of this measure are expected to be sustained over the long-term since knowledge-sharing among sectors could scale up innovation, hence contributing to higher potential output. Score of 3 in More Balanced Approach to Investment and Socio-Demographic Balance: while this measure does not compromise these objectives, it is not considered to be a direct contributor towards their achievement. Score of 2 in Countercyclicality: higher interconnectedness between sectors could potentially give rise to higher systemic risks. Hence careful attention is required to the design and implementation of such clusters.						

Criteria	Effectiveness				Implementabilty		
	Synergies between Sectors	Balanced Approach to Investment	Counter-cyclicality	Socio-Demographic Balance	Mobilisation of Social and Civil Actors	Ability to attract Financial Resources	Future-proofing
Policy & Classification	Scores & Scoring summary						
while still allowing for diversification and specialisation.							
2.2 – MT1:	2	4	4	3	3	5	5
Set up educational programmes to address the demand for new skills in highly productive sectors.	Score of 5 in Funding and Future-Proofing: this measure should serve to make the best use of existing human capital resources by providing them with skills which will provide long-term benefits. When it comes to funding, efforts are already being directed towards the provision of scholarships and educational programmes focused on 'new' economic sectors, such as blockchain and artificial intelligence. In view of the unexplored potential of such sectors, investment in these fields should contribute to future-proofing Malta's economic model. Score of 4 in Countercyclicality and More Balanced Approach to Investment: educational programmes are countercyclical since there is more time for them during an economic downturn. Educational programmes also offer a more balanced approach to investment due to higher production and improved human capital. Score of 3 in Socio-Demographic Balance and Mobilisation of Social and Civil Actors: this measure does not directly contribute to these objectives. Score of 2 in Better synergies between sectors: this measure leads to more specialised skills which in itself may reduce synergies between sectors.						
2.3 – LT1:	4	3	4	3	3	4	5

Criteria	Effectiveness				Implementabilty		
	Synergies between Sectors	Balanced Approach to Investment	Counter-cyclicality	Socio-Demographic Balance	Mobilisation of Social and Civil Actors	Ability to attract Financial Resources	Future-proofing
Policy & Classification	Scores & Scoring summary						
Intensify the efforts directed at strengthening the regulatory framework as well as anti-money laundering with respect to high productivity sectors exposed to international competition.	Score of 5 in Future-proofing: A strong regulatory framework should contribute to future-proofing the soundness and stability of important economic sectors like the financial services and gaming sectors. Score of 4 in Better Synergies, Countercyclicality and Funding: If carefully designed, this measure could contribute to encouraging 'traditional' sectors to collaborate with 'new' industries. Regulation also should serve to increase the shock-absorption capacity of important sectors and hence the economy. In view of the recommendations put forward by international organisations like IMF, the importance of this recommendation is undisputed and hence it is likely to attract the sufficient public funding. Score of 3 in More Balanced Approach to Investment, Socio-Demographic Balance and Mobilisation of actors: while this measure does not compromise these objectives, it does not provide any direct benefits towards their achievement.						
2.4 – MT1:	5	4	4	3	4	4	5
Support human capital creation and improvement in low productivity services sectors	Score of 5 in Future-proofing and Better Synergies: this measure focuses on investing in higher human capital, which in turn should boost the productive potential of the economy, thereby leading to benefits which can be sustained over the longer term. If the human capital creation in low productive sectors involves interlinkages between sectors such as the tourism and wholesale sector, this measure would facilitate synergies between sectors. . A score of 4 in More Balanced Approach to Investment, Countercyclicality, Mobilisation of actors and Funding: If						

Criteria	Effectiveness				Implementabilty		
	Synergies between Sectors	Balanced Approach to Investment	Counter-cyclicality	Socio-Demographic Balance	Mobilisation of Social and Civil Actors	Ability to attract Financial Resources	Future-proofing
Policy & Classification	Scores & Scoring summary						
exposed to international competition.	carefully designed and implemented, this measure should contribute to a more balanced investment since targets convergence between low and high productive sectors. In this context, it also equips sectors which appear to be lagging behind in terms of productivity with a higher quality workforce. It also promote collaborative action between social and civil actors and is likely to attract funding. Score of 3 in Socio-Demographic Balance: no direct benefits in this regard						
2.5 – MT1:	5	4	4	2	4	4	5
Low productivity sectors should benefit from interlinkages with other sectors with the aid of technology.	Score of 5 in Future-proofing and Better Synergies :this measure contributes to better synergies as it's bringing together traditional and new industries through technology. Through technology such firms will reap higher value added activity which will be of benefit in the longer term. A score of 4 in More Balanced Approach to Investment, Countercyclicality, Mobilisation of actors and Funding: If carefully designed and implemented, this measure should contribute to a more balanced investment since it facilitates the convergence of low productive sectors to high productive sectors. It also allows relatively low productivity sectors to be more resilient to a potential negative shock. It also promotes collaborative action between social and civil actors and is likely to attract funding. Score of 3 in Socio-Demographic Balance: no direct benefits in this regard. Score of 2 in Socio-Demographic Balance: the use of technology in traditional sectors may require the use of more skilled labour - this could have adverse risks in terms of certain low skilled workers finding it more difficult to integrate in such sectors.						
2.6 – ST2:	3	3	3	3	4	5	4

Criteria	Effectiveness				Implementabilty		
	Synergies between Sectors	Balanced Approach to Investment	Counter-cyclicality	Socio-Demographic Balance	Mobilisation of Social and Civil Actors	Ability to attract Financial Resources	Future-proofing
Policy & Classification	Scores & Scoring summary						
The NPB is to engage with the European Commission, OECD and other international productivity bodies to exchange best practice.	Score of 5 in Funding: this measure is aimed at ensuring available funds are tapped and makes a case for funding through the drawing up of recommendations. Score of 4 for mobilisation of actors and Future-proofing: the Board brings together social and civil actors by design, and is likely to be sustained over the longer term since this is an EU Commission requirement. Score of 3s for rest: NPB is considered to be neutral on these criteria.						
2.7 – ST1:	3	3	3	3	4	5	5
Publish a more disaggregated sectoral productivity data, including at firm level.	Score of 5 for Funding and Future-proofing: new/ better data is a process that can attract funding, and is aimed at having future-proof evidence-based policy recommendations. Score of 4 for mobilisation of actors: A collective effort would be needed to ensure such data compilation. Score of 3s for rest: The publication of data, benchmarking and putting forward policy decisions is considered to have a neutral effect in the other areas, unless policy recommendations are implemented.						
Human capital							
	3	4	4	5	3	4	5

Criteria	Effectiveness				Implementabilty		
	Synergies between Sectors	Balanced Approach to Investment	Counter-cyclicality	Socio-Demographic Balance	Mobilisation of Social and Civil Actors	Ability to attract Financial Resources	Future-proofing
Policy & Classification	Scores & Scoring summary						
3.1 – LT1: Intensify the efforts directed at reducing the Early School Leaving (ESL) rate. In particular, the low average test scores observed in secondary school level need to be tackled since disparities between the very good achievers and the low ones is bringing down the average score. In view of this	Score of 5 for Future Proofing and Socio-Demographic balance: assessing disparities between students in an attempt to reduce the ESL rate should translate in long-term benefits in terms of integration of more people in the workforce and better skilled employees. Against this background, this also contributes to the achievement of a socio-demographic balance. Score of 4 in balanced approach, countercyclicality and funding: in view of the fact that this measure has featured as a CSR more than once, it is likely to be a priority area for investment by the public sector, aimed at having a more balanced approach to investment, and to ensure countercyclicality. Score of 3 in better synergies and mobilisation of actors: no direct benefits from this measure.						

Criteria	Effectiveness				Implementabilty		
	Synergies between Sectors	Balanced Approach to Investment	Counter-cyclicality	Socio-Demographic Balance	Mobilisation of Social and Civil Actors	Ability to attract Financial Resources	Future-proofing
Policy & Classification	Scores & Scoring summary						
challenge, a rigorous investigation of such disparities is to be undertaken with the aim of implementing specific actions that are tailor made to help relatively low achievers.							
3.2 – MT2: Social inclusion of immigrants within the education system needs to be further encouraged.	3	4	2	5	4	4	4
	Score of 5 in Socio-Demograhic Balance: by integrating immigrants in the education system, this measure promotes a more cohesive social fabric. Score of 4 in More Balanced approach to investment, mobilisation of actor, funding and future-proofing: through this measure, one should be making the best use of existing resources, hence contributing to a more balanced approach to investment. This is because immigrants currently residing in Malta would be equipped with better skills to address labour demand. In view of the importance of immigrant workers for the						

Criteria	Effectiveness				Implementabilty		
	Synergies between Sectors	Balanced Approach to Investment	Counter-cyclicality	Socio-Demographic Balance	Mobilisation of Social and Civil Actors	Ability to attract Financial Resources	Future-proofing
Policy & Classification	Scores & Scoring summary						
Adequate support facilities for students with a migrant background are required to facilitate their transition into a new environment	further development and growth of the business economy, this measure should have an important contribution to mobilising social actors. This measure should also attract sufficient funding. Overall, this measure is aimed at future-proofing the envisaged benefits. Score of 3 in Better Synergies: neutral impact for this objective. Score of 2 in counter-cylicality: there could be adverse risks in terms of counter-cyclicality adjustments, but such risks can be mitigated.						
3.3 – MT1: Further encourage apprenticeships to ensure that young people especially low achievers have the opportunity to obtain the	3	4	4	5	4	4	5
	Score of 5 for Future Proofing and Socio-Demographic balance: encouraging apprenticeships should translate in long-term benefits in terms of integrating more people in the workforce and better skilled employees. Against this background, this also contributes to the achievement of a socio-demographic balance. Score of 4 in Funding, Mobilisation of Actors, More Balanced Approach and Countercyclicality: this measure is likely to attract sufficient funding from both the private and the public sector. It is important that industry, employer organizations and academia come together such that each party will also benefit from this collaboration. The measure also contributes to a more efficient use of existing human resources, and						

Criteria	Effectiveness				Implementabilty		
	Synergies between Sectors	Balanced Approach to Investment	Counter-cyclicality	Socio-Demographic Balance	Mobilisation of Social and Civil Actors	Ability to attract Financial Resources	Future-proofing
Policy & Classification	Scores & Scoring summary						
necessary qualifications, while applying the skills acquired in practice with the assistance of experts.	achieving objectives related to counter-cyclicality. Score of 3 in better synergies: no direct benefits from this measure.						
3.4 – MT1: Efforts need to be sustained in terms of encouraging participation by low-skilled employees in adult learning, through incentives targeted especially at those persons that have precarious	3	4	4	5	4	4	5
	Score of 5 for Future Proofing and Socio-Demographic balance: encouraging apprenticeships should translate in long-term benefits in terms of integrating more people in the workforce and better skilled employees. Against this background, this also contributes to the achievement of a socio-demographic balance. Score of 4 in Funding, Mobilisation of Actors, Countercyclicality and More Balanced Approach: this measure is likely to attract sufficient funding from both the private and the public sector. It is important that industry, employer organizations and academia come together such that each party will also benefit from this collaboration. In terms of the countercyclicality objective, adult participation in learning should lead to higher skills by mature workers, which in turn should provide them with a higher ability to maintain their standard of living in an economic downturn scenario. Through this measure, a more efficient use of existing human resources is made. Score of 3 in better synergies: no direct benefits from this measure.						

Criteria	Effectiveness				Implementabilty		
	Synergies between Sectors	Balanced Approach to Investment	Counter-cyclicality	Socio-Demographic Balance	Mobilisation of Social and Civil Actors	Ability to attract Financial Resources	Future-proofing
Policy & Classification	Scores & Scoring summary						
jobs. Career guidance and information about training and funding opportunities should be available to this category of workers.							
3.5 – LT1: Adopt a holistic approach whereby the creation of skills is mainstreamed within each element of economic and social development policies in Malta.	3	5	4	3	3	4	5
	Score of 5 for balanced approach and Future Proofing: having an investment policy which gives due consideration to human capital requirements contributes to the sustainability of such investments. through higher investment in human capital, higher foreign direct investment can be attracted to Malta. Score of 4 for countercyclicality and funding: This measure appears to be a priority area since funds are being dedicated to scholarships and educational programmes in certain fields of study such as blockchain and AI. Having a more skilled workforce should contribute to moderating the impact of possible economic downturns. Score of 3 in Better synergies between sectors, socio-demographic balance and mobilisation of actors: no direct contribution towards these objectives.						

Criteria	Effectiveness				Implementabilty		
	Synergies between Sectors	Balanced Approach to Investment	Counter-cyclicality	Socio-Demographic Balance	Mobilisation of Social and Civil Actors	Ability to attract Financial Resources	Future-proofing
Policy & Classification	Scores & Scoring summary						
3.6 – MT1: Ensure equal opportunities amongst priority categories of workers, including females (addressing the gender pay gap), older workers and workers with a disability.	3	4	3	5	4	4	5
	Score of 5 to Socio-Demographic Balance and Future Proofing: this measure represents an important contribution to mainstreaming equality issues. By ensuring equal opportunities for priority categories of workers, higher participation rates are likely to be achieved. This contributes to boosting the productive potential of the country, hence translating into long-term economic benefits. Score of 4 in Funding, Potential for Mobilisation and More Balanced Approach to Investment: this recommendation is likely to be implementable in terms of its ability to attract the necessary funding, in terms of mobilising different social and civil actors, as well as to achieve a more balanced approach to investment. Score of 3 in Better Synergies and Countercyclicality: no direct benefits towards these objectives.						
	3	4	3	5	3	4	5

Criteria	Effectiveness				Implementabilty		
	Synergies between Sectors	Balanced Approach to Investment	Counter-cyclicality	Socio-Demographic Balance	Mobilisation of Social and Civil Actors	Ability to attract Financial Resources	Future-proofing
Policy & Classification	Scores & Scoring summary						
3.7 – LT1: Continue to sustain work-life balance to ensure longer working lives, which address not only the facilities but also the culture in the workforce.	Score of 5 in Future Proofing and Socio-Demographic Balance: encouraging longer working lives represents an increase in the human capital resource of the country which in turn expands the potential of the economy to develop further. Demographic imbalances are addressed since it tackles the issue of ageing population by encouraging more people to remain in the workforce. Score of 4 in More Balanced Approach and Funding: this measures seeks to address the higher demand for workers in the labour market by investing in its existing human resources. Enabling longer working lives is crucial for employers who value the experience that ageing workers bring to their jobs. These workers continue to enjoy relatively higher incomes. Against this background, this measure is likely to attract the necessary funding. Score of 3 for Mobilisation of actors, Better synergies and Counter-cyclicality: neutral impact in relation to these objectives.						
3.8 – LT1: Ensure that Malta remains an attractive place to live and work to retain migrant workers as well as the local population. To	3	5	3	3	3	4	5
	Score of 5 in Future Proofing and More Balanced Approach to Investment: a consideration of the environment and quality of life aspects ensures a balanced approach to investment while addressing the concerns on the retainment of migrant workers. Score of 4 in Funding: this is already being identified as a priority area in policy-making and hence is likely to be able to attract the necessary funding. Score of 3 in Mobilisation of Actors, Socio-Demographic Balance, Better Synergies and Counter-Cyclicality: no direct benefits towards these objectives.						

Criteria	Effectiveness				Implementabilty		
	Synergies between Sectors	Balanced Approach to Investment	Counter-cyclicality	Socio-Demographic Balance	Mobilisation of Social and Civil Actors	Ability to attract Financial Resources	Future-proofing
Policy & Classification	Scores & Scoring summary						
this end, factors such as the cost of living, in particular the affordability of property for rent and the quality of life are to be monitored so that the necessary actions are taken.							

3.9 – MT2: Social integration at the place of work is to be ensured.This could include developing a Centre to educate foreigners coming over to Malta about regulations and work practices.	3	4	1	5	4	4	4
	Score of 5 in Socio-Demographic Balance: this measure represents an important contribution to promoting a cohesive social fabric. Score of 4 in Future Proofing, Funding, More Balanced Approach to Investment and Mobilisation: if carefully designed, this measure could contribute to higher retainment of foreign workers, allowing the country to benefit from more experienced workers. Social integration policies (ex: learning of Maltese as a foreign language) are already being pushed forward, hence this measure is likely to attract the necessary funding. This measure also represents an investment in the human and social capital of the countr, and can act as a way of mobilising key actors. Score of 3 in Better Synergies: no direct impact in this regard. Score of 1 for Countercyclicality: social integration might actually have a negative effect on counter-cyclicality, in that it inhibits the workforce to automatically adjustment during economic downturns.						
3.10 – ST1: Make use of European Social Funds to tackle in-work poverty.	3	3	4	4	4	5	5
	Employer direct incentives could contribute to alleviate in-work poverty by compensating employers who offer training opportunities to their workforce, including training during working hours. Thus, this measure is attractive for the attraction of EU funds to enable its implementation. Hence a score of 5 was awarded. The reduction of in-work poverty is considered to have an intergenerational effect, hence the criterion of future proofing has been awarded a 5 due to the contribution of this measure within the longer term. A score of 4 is awarded to the collaboration of social partners which is important for the success of this measure. A score of 4 is also awarded to socio-demographic balances and counter-cyclicality since social cohesion is improved, and such funds could act as automatic stabilisers during economic downturns. A score of 3 is awarded to the other criteria since there is a neutral effect.						
3.11 – LT2: Introduce mechanisms which favour higher procyclicality of	3	3	5	3	2	3	4
	A score of 5 was awarded to countercyclical since this mechanism is designed to alleviate the risk of an upward pressure on wages at a time when a cyclical downturn is surfacing. Against this background, mechanisms that reduce this risk are encouraged. Performance bonuses given to workers during times when						

wages and salaries.	the firm is doing well pose a much lower threat than permanent increases in wages which may not be sustainable under an economic downturn scenario. Long term benefits are expected to be obtained hence a score of 4 is obtained for future proofing. Score of 3 is awarded to synergies, balanced investment, socio demographic imbalances and attraction of funds due to a neutral effect. A score of 2 is obtained for potential to mobilize social partners due to resistence which could pose a risk to industrial relations.						
3.12 – LT2: Workplaces should consider introducing the concept of mentoring as well as a knowledge-transfer programme.	3	3	3	5	3	3	4
	Score of 5 awarded for Socio-Demographic balance since measure introduces a concept which helps to transfer experience from older to younger workers. The benefits of knowledger transfer are considered to provide important benefits of a long term nature which was awarded a 4. A score of 3 was awarded to improved synergies, balanced growth, countercyclical, actor mobilisation and funding since this measure has a neutral effect on these criteria.						
3.13 – ST2: Marketing campaigns are to be strengthened to ensure that present and potential employees are aware of the opportunities arising in different sectors, including those currently precluded because of gender stereotypes.	3	4	3	5	4	5	4
	Score of 5 for Socio-Demographic balance and ability to attract funds since measure contributes to enhanced gender equality which can easily attract financial and other resources, such as ESF funding. Score of 4 for Mobilisation of social and civil actors, future proofing and a More Balanced investment Approach, since measure brings together social and civil actors. Increased gender equality also provides a number of economic benefits in the long term, including a better investment balance. A score of 3 in Improved synergies and countercyclical: while this measure does not compromise these objectives, it is not considered to be a direct contributor towards their achievement.						

Research & Innovation							
4.1 – LT2: Greater leadership role by Government in promoting R&I through institutional reforms and closer co-ordination across R&I policy making entities. Reforms could include the formation of a R&I 'Core Group', a new subcommittee to address RDI issues, an upgraded role of MCST, and the establishment of an independent Consultative Forum.	5	5	4	3	4	3	4
	Score of 5 in More Synergies between sectors and more balanced approach to investment: The implementation of this measure would contribute towards a more co-ordinated and synergistic effort towards the promotion of R&I in the economy by the public sector, and avoiding the risk of over-fragmentation of policy implementation. A more balanced approach towards R&I investment can be achieved by more co-ordinated policy action with a holistic vision of investment requirements. A Consultative Forum would mobilise civil action towards R&I, with the right approachability channels and the avoidance of over-centralisation. The measure represents an important investment in instiutional capital. Score of 4 in Potential for mobilisation, countercyclicality, Future-proofing: The economic benefits of a stronger drive for R&I supported by this measure would generate short-term (counteryclicability) and especially longer-term economic benefits (Future proofing). Score of 3 in Socio-Demographic Balance and Funding: The measure does not directly contribute to socio-demographic balance and does not hold greater funding ability above other measures.						
4.2 – MT2: Further streamlining, simplification and clarification of funding mechanisms.	4	3	4	3	5	3	4
	Score of 5 in Potential mobilisation: This measure would further encourage collaborative actions between social and civil actors, as the funding take-up opportunities are promoted and facilitated by this measure. Score of 4 in better synergies between sectors, countercyclicality and future proofing. Likewise, the improvements to funding mechanisms can encourage the exploration for cross-sectoral R&I opportunites that can benefit from such funding. The higher funding absorption rates facilitated by this measure, and associated higher R&I, contributes countercyclicability benefits and longer-term economic benefits. However, continuous effort to apply this measure to changing funding						

	instruments is required. Score of 3 in more balanced approach to investment, socio-demographic balance and funding: This measure is not directly related to these factors.						
4.3 – ST2: Introduction of targeted funding mechanisms that address research gaps, such as research funds with no requirement for industry participation. R&I funding and support measures specifically targeting the development of technologies that address priority areas such as the environment and climate change should be evaluated.	2	5	3	3	5	4	4
	Score of 5 in more balanced approach to investment and mobilisation of actors: The promotion of further research is expected to generate stronger knowledge on how investment can better balance between economic, social and environmental objectives and assist in the development of technologies that address priority areas. The academic and research community is expected to be strongly mobile in exploiting more research funding opportunities. Score of 4 in funding and future-proofing. Research funding is one of the priorities within the EU R&I agenda, and benefits can be sustained over the long-term in view of research knowledge accumulation. Score of 3 in countercyclicality and socio-demographic balance: The measure does not have substantial impacts in these araes. Score of 2 in better synergies between sectors: This measure holds the risk of amplifying the disconnect between research and industry, and reserch can overlook the synergistic realities within industyr.						
Recommendation 4.4 – LT2: Facilitating access to finance for SMEs for innovative	5	4	4	3	3	3	4
	Score of 5 in Better synergies between sectors: The implementation of this measure would enhance the productive and innovative capacity of local SMEs and their ability to better utilise synergies between them (e.g. joint SME funding and innovation) as well as with larger eneterprises. Score of 4 in more balanced						

activities. Financing facilities for SMEs and collaboration schemes with retail banks that improve access to finance for SMEs should assist in spurring innovation amongst the smaller local enterprises	approach to investment, countercyclicality and future-proofing. Faciliated access to finance to SMEs would enhance their innovation productive capacity - this would positively contribute in these domains. Score of 3 in socio-demographic balance, mobilisation and funding - The measure is not primarily directed towards the socio-demographic balance objective. In terms of funding, the MDB can play an important enabling role but the mobilisation of private sector funds for this objective remains difficult.						
	5	4	2	3	5	3	4
4.5 – MT2: Evaluating the possibility of further developing the capacity of existing innovation hubs and setting up sectoral specific innovation hubs (e.g. Digital innovation hubs).	Score of 5 in better synergies between sectors and mobilisation: Innovation hubs and sector spe assist in the integration of innovation activities, including emerging technologies, into different economic sectors. By their nature they also support the mobilisation of actors towards innovative activities. Score of 4 in more balanced approach to investment and future-proofing: Innovation hubs support more prodcutive investments, including investments geared towards sustainability priorities. Score of 3 in socio-demographic balance and funding: The measure is not expected to have major impacts in these areas. While very high benefits can be obtained from the innovation promotion offered by sectoral specific hubs, this has to be measured against the risk of potential volatilities in these sectors. Also, in view of this, a score of 2 is asigned for countercyclicality in view of the risks of over-specialisation.						
4.6 – MT1: Stronger public investment in RDI to facilitate innovation creation and diffusion.	3	5	4	3	4	4	5
	Score of 5 in more balanced approach to investment and future-proofing: This measure represents a re-balancing of public investment towards R&I. This addresses historical under-investment in this fundamental economic area, as exemplified by the distance from EU targets. The benefits would be sustained over the longer-term. Score of 4 in countercyclicality, mobilisation potential,						

	funding: Enhancements to productive potential of the economy by R&I investment can contribute to countering any negative supply-side shocks to the economy. Innovation demonstration projects can be effective in mobilising private investment. The current strong fiscal position allows for further investment in the area. Score of 3 in better synergies between sectors, socio-demographic balance: The measure is not specifically aimed for these objectives.						
4.7 – LT1: Support also for non-R&D forms of innovation. In certain areas, the limited local resources are unable to support the full R&D cycle. Other non-R&D forms of innovation investments (design, process, organisational and market innovation) can also be key inputs for innovation outcomes, and hence should also be adequately supported.	3	4	4	3	4	4	5
	Score of 5 for future-proofing - The demand for this type of measure, and the associated benefits, can be expected to persist over the longer-term. Score of 4 for balanced approach to investment, countercyclicality, mobilisation potential and funding: Measures of this type facilitate further investment re-balancing towards innovative acrivities, and mobilise ennterprises which cannot support the full R&D cycle to utilise support measures. These form of support measures can attract (smaller scale) funding, but need to be carefully administered. Score of 3 for better synergies between sectors and socio-demographic benefits: The measure is not expected to have particular effects in these areas.						
4.8 – LT2: Further investigating the avenues for public-private partnerships in	4	4	4	3	5	2	4
	Score of 5 in Potential mobilisation: This measure aims at fostering greater collaboration between the public and private sector, such as for example through partnership schemes between businesses and universities. Score of 4 in						

R&I. This involves further investigating the suitability and relevance of current instruments in promoting R&I public-private-partnerships and address shortcomings. Intersectoral mobility schemes, such as the Knowledge Transfer Partnership (KTP), if properly designed, is a relevant option in the Maltese context.	better synergies between sectors, balanced approach to investment, countercyclicality and future-proofing: Collaborative partnerships between public and private R&I actors can, over the longer-term, sustain economic benefits in these areas arising from higher innovative and encompassing innovative activity. Score of 3 for socio-demographic balance: The measure is not specifically aimed to provide a major contributioon in this area. Score of 2 for ability to attract public funding: Compared to other measures, thiis measure could be less able to attract financial resources for implementation.						
4.9 – ST2: Tapping more into opportunities for international R&D collaboration and seeking to further reinforce international, multilateral and bilateral collaboration.	5	4	2	3	4	5	4
	Score of 5 in better synergies between sectors and funding: This could be greatly facilitated by this measure via the exposure to international knowledge and practices in cross-sectoral innovation, including with sectors which are still emerging in the local economy but are more at an advanced stage in other countries. EU support frameworks for international R&D are in place. Score of 4 in more balanced approach to investment, mobilisation potential, and future-proofing: Over the medium to long-term, the measure is envisigioned to promote greater investment re-balancing towards R&D by concerned parties. Score of 3 for socio-demographic balance: neutral effect of this measure in relation to this objective. Score of 2 for countercyclicality: The utilisation and						

	benefits of this measure can be expected to be strongly influenced by international business cycle developments.						
4.10 – LT2: Strengthening R&I academia-business linkages. Efforts should be directed towards directing research to focus on the fields required by business enterprise as well as towards incentivising enterprises (by providing necessary resources and mitigating risks) to venture into innovation opportunities identified from research.	4	5	3	3	3	3	4
	Score of 5 for balanced approach to investment: In bridging the disconnect between academia and business, business investment can be more reflective and considerate of research findings related to the investments' outcomes. Furthermore, the translation of research findings into productive investments is facilitated. Score of 4 in better synergies between sectors and future-proofing: Research can venture into the examination of potential sectoral synergies of interest within the industry. From the other end, industyr can leverage existing research knowledge that can be applied in cross-sectoral projects. Score of 3 in countercyclicality, socio-demographic balance, mobilisation potential and funding: This measure is not envisigioned to have particular impacts in these areas.						
4.11 – LT1: Developing a comprehensive monitoring system which enables a more quantitative/ objective evaluation of innovation outputs	3	5	3	3	2	5	5
	Score of 5 for more balanced investment, future-proofing and funding: R&I monitoring provides indications and guidance for policy within the area, including innovation requirements. The developed monitoring system can serve a long-standing function (and fine-tuned) for innovation evaluation. This measure requires relatively lower resource investments and hence can be more easily implemented in this regard. Score of 3 for better synergies between sectors, countercyclicality and socio-demographic balance: No significant						

and impacts, for example through a set of monitorable indicators.	impacts in these domains expected from the measure. Score of 2 in mobilisation potential: The development of the monitoring system requires the collaboration and information provision by a wide range of stakeholders, limiting the implementability of this measure.						
Infrastructure & the Real Estate Market							
5.1 – LT2: Evaluating and strengthening the framework for public infrastructure investment management, including through the consideration of well-defined project appraisal and selection criteria and more holistic public investment management. The social viability of all major infrastructure projects should be scrutinised by the undertaking of economic Cost-Benefit Analyses, Social Impact Assessments and Environmental	3	5	3	4	2	3	4
	Score of 5 for more balanced approach to investment: This implementation of this measure ensures that infrastructure project evaluation and selection is performed in closer alignment to the sustainable competitiveness requirements of the economy and that economic, environment and social sustainability considerations are evaluated in the public investment management framework. Score of 4 in socio-demographic balance and future proofing: Social sustainability and considerations would be more strongly embedded in the public infrastructure management framework, promoting greater socio-demographic balance. The framework changes would also serve as a basis (with further framework strengthening and solidification) for the management of futre infrrastructure projects. Score of 3 in better synergies between sectors, countercyclicality, and funding: The measure is not directly related or addressed to these factors. Score of 2 in mobilisation potential: The measure would require significant collaboration between a number of concerned parties and would require the consideration of conflicting conclusions in the different project evaluation dimensions and the evaluation of difficult trade-offs.						

Impact Assessments.							
5.2 – LT1: Boosting infrastructure maintenance spending to make the most out of existing infrastructure.	3	5	3	3	3	2	5
	Score of 5 in more balanced approach to investment and future-proofing: Maintenance interventions can often achieve infrastructure improvement requirements with lower environmental and social externalitities (relative to alternative new projects that achieve same/ lower results) and its lower financing requirements can free up financial resources for other forms of productive investments required by the economy. Substantial long-term benefits can be achieved from the implementation of this measure as it extends the lifetime of infrastructure. Furthermore, the relatively lower capital expenditure requirements of this measure ensures that it is more sustainable over the longer-term. Score of 3 in better synergies betwen sectors, countercyclicality, socio-demographic balance and mobilisation potential: The measure is not viewed to have direct impacts in these domains. Score of 2 in funding: While maintenance spending imposes lower financing requirements, it is less suited to attract EU and private sector funding over new infastructural projects.						
5.3 – MT1: Increased use of market-based instruments (led by public authorities) to alleviate infrastructure gaps.	4	3	4	3	4	4	5
	Score of 5 in future-proofing: Market-based instruments apply market discipline to ensure sustainable decision-making that looks at future outlook. Score of 4 for better synergies, counter-cyclicality, mobilisation and funding: since market-based instruments utiilise market discipline to ensure projects are only in place if benefits can be reaped, and is intended to mobilise actors and funds. Score of 3 for socio-demographic and balanced investment since this measure is neutral to these domains.						
5.4 – MT1: Ensuring infrastructure project pipeline	4	4	4	4	4	4	5
	Score of 5 for future-proofing: By default, policy measure targets financial sustainability, and has hence long-term implications. Score of 4 for rest given that better fiscal balance will create a more stable environment, and use of EU/						

can be financially sustained over the medium to long term by solidifying Government's fiscal position and through efficient utilisation of funds from the EU structural & cohesion funds, and the NDSF.	NDSF funds is by default linked to a better balance/ more holistic approach in targeted areas (with targeted areas/ objectives acting as the management and monitoring tool). Policy measure is therefore aimed at achieving intended objectives/ is implementable, but needs to be carefully managed.						
5.5 – MT1: Exploring further opportunities for infrastructure investment through PPPs	4	4	4	3	4	4	5
	Score of 5 for future-proofing: Through PPPs, public funds crowd-in private investment, creating a long-term ecosystem. Score of 4 for others (except socio-demographic balance) given that PPPs can be framed to achieve intended targets, but need to be careful managed at the outset and during their lifetime. Score of 3 for socio-demographic balance due to lack of applicability of this domain.						
5.6 – MT1: Addressing private market financing failures and the disconnect between investor/ saver liquidity (in financial institutions or capital markets) and infrastructural projects that need capital funding	4	4	4	3	4	4	5
	Similar to above 5.5 measure: Score of 5 for future-proofing: Through entities such as the MDB, public funds crowd-in private investment (including commercial banks), creating a long-term ecosystem. Score of 4 for others (except socio-demographic balance) given that such funding will be provided against set targets, and would be careful managed at the outset and during the monitoring stage. Score of 3 for socio-demographic balance due to lack of applicability of this domain.						
	3	5	3	3	3	3	5

5.7 – LT1: Development of a well-defined statistical framework for the evaluation of infrastructure investments that supports research and policy in the area	Score of 5 for future-proofing and more balanced investment: policy measure is intended to provide the information for research and policy, and thus targets areas relating to sustainability and efficiency in infrastructure spend, for long-term benefits. Score of 3 for rest given their lack of applicability to this domain.						
5.8 – LT1: Ensuring that Government policy incentives do not contribute to property market overheating	3	5	5	3	3	3	5
	Score of 5 for balanced investment, countercyclicality and future-proofing: policy measure is intended to ensure a sustainable growth trajectory of the real estate market. Score of 3 for rest due to their lack of applicability.						
5.9 – MT1: Comprehensive assessment and measures towards addressing the affordable/ social housing issue.	4	4	5	5	4	4	5
	Score of 5 for socio-demographic balance, countercyclicality and future-proofing: policy measure addressed at reducing imbalances, assisting vulnerable groups during economic hardship periods, and thus ensuring long-term benefits. Score of 4 for rest given that any measures falling under this policy will have benefits/ can be implemented, but need to be carefully managed.						
5.10 – ST1: Collection of more regular and detailed data on the property market to support evidence-based policy making	3	5	3	3	4	5	5
	Score of 5 for better balanced investment, future-proofing and funding: policy measure relates to having more/ better data for policy- and decision-making, and is hence targeted at these two domains. Score of 4 for mobilisation of actors since the co-operation of all actors is needed for such data to be compiled. Score of 3 for the rest due to their lack of applicability in terms of this policy measure.						

5.11 – MT1: Efforts to overcome barriers and promote the diffusion of environmentally sustainable construction activities	4	4	4	3	4	4	5
	Score of 5 for future-proofing: policy measure aimed at sustainable construction activities, and hence benefits are more likely to be sustained in the long-term. Score of 4 for others (except socio-demographic balance) given that this policy measure can achieve the intended objectives/ is implementable, but needs to be carefully managed. Score of 3 for socio-demographic balance due to its lack of applicability.						