



BANK ĊENTRALI TA' MALTA  
EUROSISTEMA  
CENTRAL BANK OF MALTA

## UNDERSTANDING THE MALTESE ECONOMY

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## GOVERNOR'S INTRODUCTION

Over the decades that followed Independence in 1964, the Maltese islands have witnessed fundamental changes in the financial and economic landscape, including accession to the European Union in 2004 and the subsequent adoption of the euro as the national currency in 2008.

Despite its small size and its dependence on foreign trade, Malta has managed to outperform its peers in the face of the global economic downturn. Structural adaptation has played a key role in Malta's rapid growth and its consistent resilience to external shocks.

Structural change has been visible in the labour market. Employment market imbalances that half a century ago were relieved through outward migration are now resolved by inward migration – mostly from EU countries – alleviating resource and size constraints.

Prompted by EU accession, liberalisation has intensified cross-border trade. Investment in human capital and a targeted strategy to attract foreign direct investment have opened up new service sectors. New areas of diversified activity emerged and grew, ranging from internet related activities and computer programming to aircraft maintenance. Manufacturing climbed up the value chain towards more skilled and technologically based activities with sectors such as pharmaceuticals and precision engineering growing in importance. The shift towards a service-oriented economy has increased demand for labour that in turn accommodated the rise in female participation and in inward migration.

Since its establishment in 1968, the Central Bank of Malta has ensured a solid foundation for monetary and financial stability, thereby promoting economic growth and the development of a broader range of financial services. Complementing the wide range of typical central banking activities, economic research is a major objective of the Bank. Research findings enhance the forecasting process and are essential to policy formulation. In recent years the Bank introduced incentives for published research leading to a higher volume of studies in publications and on the Bank's website.

This publication focuses on various issues relating to the Maltese economy. The articles contained in the book enrich our understanding of the Maltese economy and is a further demonstration of the Central Bank of Malta's commitment to promote and support financial and economic analysis.



Professor Josef Bonnici





## FOREWORD

Last year the Central Bank of Malta published a study of the first fifty years of Malta's macroeconomic performance since Independence. The picture that emerged was of a nation that has experienced an extraordinary rate of economic growth, with real GDP per capita growing eleven-fold since 1964, the rate of home ownership more than doubling and household bank deposits in Malta increasing by seven times after considering inflation. The Maltese economy has matured exceedingly rapidly, with cycles of inflation and unemployment becoming much less pronounced and with a consistent marked downward trend. The country's economic structure changed dramatically, with a strong shift towards services, a large rise in female participation, a smaller role for the state and a more dynamic financial sector.

This publication attempts to focus attention on the more recent evolution of the Maltese economy, particularly on developments in the first decade following EU accession. During this period, Malta outperformed the EU significantly. Malta's real GDP grew by 30.3%, as against 9.6% across the EU. Whereas in 2004 there was a 9.5 percentage point gap in the employment rate between Malta and the EU average, by 2014 this had fallen to just 2.8 percentage points. Unemployment declined in Malta from 7.2% to 5.8% during the first decade after accession, while the EU witnessed an increase from 9.3% to 10.2%. Whereas at 72% of GDP, Malta's public debt in 2004 was more than 10 percentage points higher than the EU average, a decade later, at 68.3%, it stood 18.5 percentage points lower. In the first decade after EU accession, Malta started to experience a strong net influx of foreign workers, when traditionally it has been a country of net emigration. The country's historical current account deficit turned into a strong surplus position.

Discovering the causes that could explain such a significant development in a small open economy during a period characterised by the largest economic downturn since the Great Depression requires quite some effort. This book brings together ten articles authored by nine economists of the Central Bank of Malta, focusing on the changes that have characterised the Maltese economy and which have contributed to its excellent performance in such difficult economic times.

The first part of the book gives an overview of the Maltese economy, outlining trends and structural changes observed in recent decades. Grech, Micallef and Zerafa find that diversification, both towards new sectors as well as specific niches within established ones, has increased the flexibility and the resilience of the Maltese economy, making it less subject to industry-specific disturbances. The rise in the share of services in the first decade after EU accession was the largest observed across EU countries, with financial services, computer programming, legal and accounting services, gambling & betting and education, accounting for nearly half of the growth in value added and employment. Sectors which until 2004 were quite small, like computer programming, and gambling & betting, saw their value added grow by five to six times by 2014. The domestic labour market changed very rapidly, with an increase in female participation (of nearly twelve percentage points since the great recession) and an influx of foreign workers (who increased in the first post-accession decade from 1.7% to 10% of the workforce), complementing the changing structure of the economy and ensuring an adequate supply of labour. This influx of labour helped raise potential output growth and resulted in a surplus position in the external balance, fuelled by exports of services.

This improvement in the current account occurred despite a deterioration in competitiveness shown by aggregate cost based measures, namely relative unit labour costs (ULCs) and ULC-deflated effective exchange rates (EERs). In the second article of the book, Rapa shows that this paradox reflects the susceptibility of these indicators to changes in the composition of output. In fact, competitiveness measures based on sector ULC and EERs show that contrary to what is suggested by traditional indicators, Malta's competitiveness has not deteriorated in the last 15 years, with improvements in the industry real EERs offsetting an appreciation of the services sector real EER. Nevertheless, in the light of the recent structural changes, a long-term improvement in Malta's external competitiveness requires policies aimed at improving the quality of both labour and capital.

The second part of the publication studies the relationship between output, prices and employment in Malta. Grech and Micallef present estimates of potential output in Malta derived using an aggregate production function. Potential output in Malta slowed down significantly between the late 1990s and the early years of the last decade. After a moderate decline during the great recession, potential output gradually recovered to exceed 3% in 2014 for the first time since 2001. From a cross-country perspective, Malta has nearly consistently outperformed the average for the euro area, and whereas growth in the euro area seems to have stabilized at a lower level after 2009, potential growth in Malta has already much surpassed the growth rate experienced in the cyclical upswing before the crisis.

In the following chapter, Micallef looks at the output-unemployment nexus in Malta and different measures of structural unemployment (NAIRU), focusing in particular on the post-crisis period. The relationship between output and unemployment is relatively weak in Malta compared with other EU economies, although the link has become more pronounced in recent years, possibly reflecting the growing share of services in total output. Empirical estimates suggest that the rate of output growth consistent with a stable unemployment rate is around 2%, with an Okun's coefficient of slightly less than 0.2. Over the course of the business cycle, the output-unemployment relationship appears to be more pronounced during recessions. Various estimates suggest that Malta's NAIRU has been on a downward trend over the past decade and that the 2009 crisis had no permanent impact on NAIRU.

In a contribution on the Phillips relationship, Gatt confirms these structural changes, finding that the slope of the Phillips curve has flattened over time, implying that the link between inflation and economic activity has weakened. On the other hand, the study finds a progressive increase in the importance of import price shocks in driving consumer price inflation in Malta. These developments have been observed in other countries and in the case of Malta they are driven by more stable inflation relative to the past, positive structural changes in the labour market as well as the effects of globalization.

Inflation dynamics in Malta are further studied in the third part of the book. Micallef and Ellul focus on the underlying patterns and determinants of inflation in Malta, with particular emphasis on inflation persistence and differentials compared to the euro area. They find that inflation persistence is moderate, as domestic inflation has a tendency to return relatively quickly to its long-term mean. Inflation averaged 2.5% per annum between 1997 and 2014, around 0.6 percentage points higher than in the euro area. These differentials are even more relevant in the context of a monetary union where country-specific shocks cannot be corrected by monetary and exchange rate policies but through structural reforms and relative price and wage adjustments. Model based decomposition of inflation differentials points to the predominance of cost-push shocks, suggesting that market structures and the role of mark-ups along the distribution chain are key to understand the relatively high inflation in Malta.

In the second article of this part, Gatt discusses the role of core inflation in analysing underlying inflation developments and presents a set of estimates of core inflation for Malta. These estimates, derived using different methodologies, are highly correlated and reveal clear cyclical dynamics in the path of inflation. Further tests show that these measures of core inflation have some predictive power with respect to future headline inflation. The article then analyses developments in inflation in Malta and finds an element of gradual convergence with euro area inflation, together with a downward trajectory in trend inflation from 3% in the late 1990s to under 2% in recent years. Improved competition in the goods market as well as favourable supply-side factors affecting the labour market both contributed to these developments.

The publication then turns to the role of the financial system, focusing on money and the transmission mechanism in Malta. In the first article, Grech studies the demand for currency in Malta in the light of the fact that despite a significant decline in its relative importance, cash payments are used nearly double as much as in the EU. He argues that the presence of a large tourism sector is likely to be boosting demand beyond what one would expect. That said, there is scope for policies which could lead to lower demand for notes, such as measures to facilitate the use of electronic means of payment, including for instance, modified bank charges particularly on smaller operators in the retail and tourism sectors.

## Foreword

The pass-through from the interest rates set by the monetary authority to bank lending and deposit rates in Malta is studied by Micallef, Rapa and Gauci. They find evidence of incomplete pass-through, both in the short and long run, and also a reduction in the interest rate pass-through when the financial crisis period is included in the sample for deposit rates as well as for lending rates charged to non-financial corporations (NFCs). The long-run pass-through to household lending rates, however, was hardly affected. Focusing on lending rates charged to NFCs, the estimated pass-through for Malta is one of the lowest in the euro area. The sluggish pass-through both for small and large business loans, and the relatively high borrowing costs for domestic NFCs, could adversely affect the borrowing and investment decisions of firms, notably SMEs, for which bank lending constitutes an important funding source. The pass-through for household mortgage loans, as well as consumer credit, is broadly in line with the median for the euro area countries. The pass-through for deposit rates was higher for NFCs than households, although there were indications of a slight decline in recent years. The latter behaviour is, however, not restricted solely to Malta but is observed in almost all euro area countries, being especially pronounced in stressed economies. Structural features of the banking sector and the balance sheets of credit institutions and of borrowing firms influence the strength and degree of interest rate pass-through.

The final part of this publication looks at the role of Government, focusing on the size of the fiscal multiplier, a topic that has generated considerable academic and policy debate since the great recession. Micallef, Grech and Borg employ three approaches to estimate fiscal multipliers in Malta: a structural vector-autoregression model, the Central Bank of Malta's macro-econometric model and a calibrated large-scale dynamic stochastic general equilibrium model. The results indicate that first-year multiplier estimates for government spending range between 0.73 and 0.93, whereas for taxation, the range is between 0.03 and 0.30. These are relatively small estimates compared with larger economies, possibly reflecting Malta's greater propensity to import, which results in a higher demand leakage. The results suggest that a fiscal adjustment strategy based on a combination of expenditure and tax measures may have a lower short-run cost compared with purely expenditure-based consolidation. Moreover, to be growth friendly, the strategy should aim to minimise these short-run negative effects by being coherent, credible and well communicated so as to properly shape expectations.

These ten articles provide a succinct overview of the particular characteristics of the Maltese economy, and provide several insights on why it has tended to outperform neighbouring economies. The story of the Maltese economy is one of consistent and gradual change. It is a story of an economy that has become more flexible and hence better able to use its limited resources. During successive decades the Maltese economy has reinvented itself and adapted to changing circumstances, on the back of a positive and dynamic economic framework developed through the concerted actions of the main economic stakeholders. This provides an excellent foundation from which to address challenges, such as the ageing transition and the continued rise of emerging economies, which will be affecting the Maltese economy in the coming decades.



**Aaron G. Grech**  
Editor



# **PART I**

## **AN OVERVIEW OF THE MALTESE ECONOMY IN RECENT DECADES**



# DIVERSIFICATION AND STRUCTURAL CHANGES IN THE MALTESE ECONOMY

Aaron G. Grech, Brian Micallef and Sandra Zerafa<sup>1</sup>

*This article takes a long term perspective on the performance of the Maltese economy, outlining trends and structural changes observed in recent decades. Diversification, both towards new sectors as well as specific niches within established ones, has increased the flexibility and the resilience of the economy, making it less subject to industry-specific disturbances. The domestic labour market has changed very rapidly, with an increase in female participation and an influx of foreign workers, complementing the changing structure of the economy and ensuring an adequate supply of labour. This resulted in Malta registering one of the best economic performances in the euro area after the crisis, with a surplus position in the external balance and a historically low unemployment rate.*

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## 1. Introduction

Since the global recession that took hold around the first decade of this century, Malta registered a more favourable economic performance than most other euro area countries. It is difficult to reconcile Malta's relatively high rate of economic growth with the openness of a small economy facing a hostile external environment. However, this divergent performance could partly be explained by the pronounced structural changes that occurred in the Maltese economy in the years preceding the crisis, which, although somewhat in line with trends observed in previous decades, gave a new impetus to the economy. In fact, the structural changes seen in recent years appear to have led to significant divergences from past macroeconomic behaviour. At the same time, the emergence of new services sectors has also coincided with a decline in the share of industrial activity, making it imperative to assess whether the shift towards services has made the Maltese economy more or less diversified and what the potential main macroeconomic effects of this shift could be.

Unfortunately it is somewhat hard to discern the impact of structural changes on the Maltese economy due to the lack of consistent macroeconomic time series extending to the years before 1995, when the European System of Accounts 1995 was adopted by the National Statistics Office.<sup>2</sup> Yet another major change in Malta's macroeconomic statistics was made in 2014, with the adoption of the European System of Accounts 2010.<sup>3</sup> In this light, while recognising the methodological differences between pre and post-European System of Accounts data, this article uses the annual macroeconomic indicators database developed by the Research Office of the Central Bank of Malta and described in Grech (2015a).<sup>4</sup>

## 2. Economic growth and the economy's changing structure

In recent decades Malta's gross domestic product (GDP) has steadily risen and converged towards those of the advanced economies of the European Union (EU). Thus, while in 1980 Malta's GDP per capita stood at just 48% of Germany's, Europe's leading economy, by 2014 it had risen to 68%.<sup>5</sup>

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<sup>1</sup> Dr Aaron G. Grech is the Chief Officer of the Economics and Statistics Division of the Central Bank of Malta and is a visiting research fellow at the London School of Economics. Mr Brian Micallef is the Manager of the Research Office and Ms Sandra Zerafa is a Senior Research Economist in the same office. Any errors, as well as the views expressed in this article, are the authors' sole responsibility.

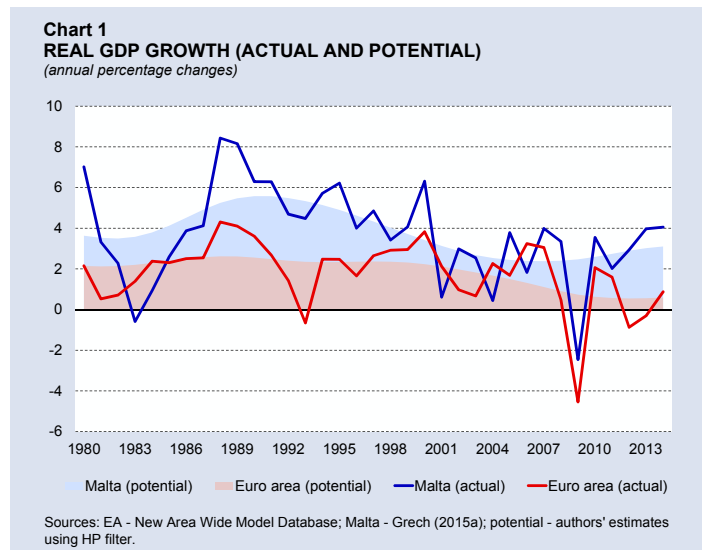
<sup>2</sup> For a description of these changes see Grech & Pace (2004).

<sup>3</sup> For a description of these changes see Pace Ross, Bonello & Dimech (2014).

<sup>4</sup> In this database (available at <https://www.centralbankmalta.org/file.aspx?f=11218>) pre-1995 national accounts data are created by splicing series using the growth rates available in pre-95 set of accounts (available at <https://www.centralbankmalta.org/real-economy-indicators>). Unemployment and employment data pre-2000 are from Grech (2003) and Grech (2004). The data for the euro area used in this article are mostly from the Area Wide Model Database, <http://www.eabcn.org/area-wide-model>, the World Development Indicators Database, <http://data.worldbank.org/data-catalog/world-development-indicators> and the Eurostat website, <http://ec.europa.eu/eurostat>.

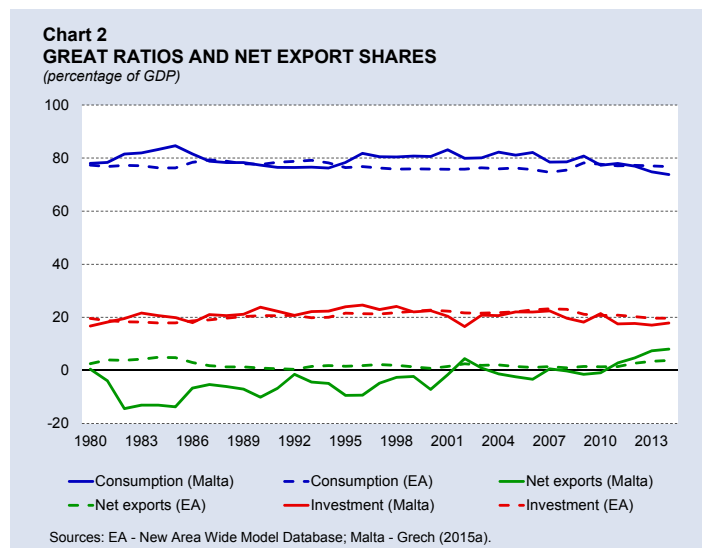
<sup>5</sup> These estimates are from the latest Penn World Tables, <http://www.rug.nl/research/ggdc/data/pwt/pwt-8.1> and Eurostat.

Chart 1 shows that while in the 1980–2000 period business cycle trends in Malta were similar to those of the euro area,<sup>6</sup> however, growth in most years was higher in Malta than in the euro area. Real GDP grew at an average rate of 6.3% between 1988 and 1995. This growth slowed down in the second half of the 1990s, but at 4.1% was still higher than that in the euro area. The first half of the 2000s marked a significant change of pace in Malta, as economic restructuring ahead of accession to the EU in 2004 led to a marked slowdown in growth. While the liberalisation of markets and the removal of state aid and subsidies affected traditionally protected sectors, this period also saw the Maltese economy, in particular the electronics industry and the tourism sector, adversely hit by the substantial weakening of global demand which followed the bursting of the information technology stock bubble and the aftermath of the September 11 attacks on the US.



Despite the great recession, Malta's economic outturn remained relatively buoyant, and the gap between Maltese and euro area GDP growth rates has started to diverge significantly. While in part this reflects the weak performance of the euro area as a whole, Malta's potential output has been picking up strongly and is no longer following the modest downward path observed since the early 1990s.

To understand the dynamics behind these developments, one can analyse the great ratios<sup>7</sup> and net export shares of the Maltese economy and the euro area economy as a whole. Chart 2 shows that, as expected, in view of its small size, the Maltese economy is rather more volatile than the euro area average. With a few exceptions, the sum of private and government consumption has been higher in Malta. In particular, during the 1990s, private consumption was buoyed by rising house prices and the easing of liquidity constraints following the liberalisation of the financial sector (Cassar & Cordina, 2001). However, in recent years the consumption to output ratio has declined and converged greatly with the euro area, and even falling below it in recent years. On the other hand, while up to the 2000s the investment ratio in Malta had exceeded that in the euro area, during the run-up to EU accession it declined significantly.<sup>8</sup> This decline resumed after the great recession.



<sup>6</sup> Use of the term 'euro area' in the 1980s and 1990s refers to the 19 European Union countries that made up the euro area as at the end of 2015.

<sup>7</sup> The great ratios referred to in this section are the consumption to output and investment to output ratios.

<sup>8</sup> Note, however, that the large decline reported for 2002 was a statistical effect of the national airline selling and leasing back its aircraft, rather than an actual decline in investment.



The main medium-term difference between the Maltese and the euro area economies appears to be the development of the share of net exports of goods and services in GDP. While Malta had deficits of close to 15% of GDP in the early 1980s, the euro area has always been a net exporter. Malta's trade performance has steadily improved since the mid-1980s, but the pace accelerated only since 2006. Thus, Malta has been a net exporter for the last four years, with a net export surplus as a percentage of GDP exceeding the euro area average.

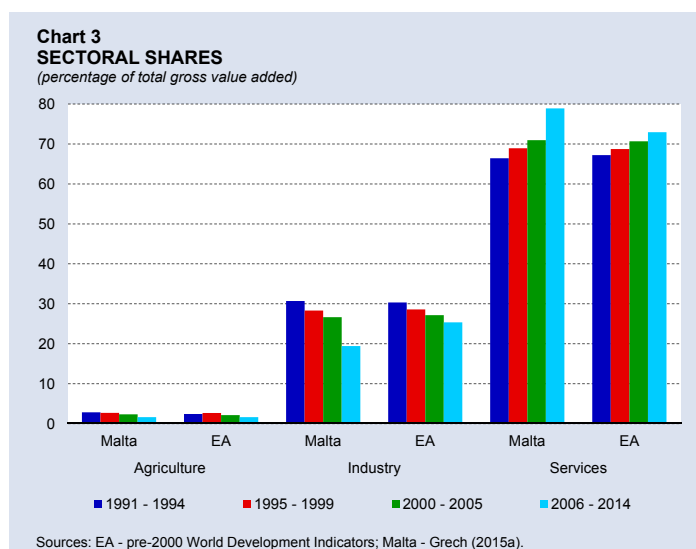


Chart 3 helps explain why this turnaround occurred. In the early 1990s, similar to the EU, the share of agricultural output in the Maltese economy stood at less than 3% of total gross value added. By the early 21st century it had halved. The industrial sector in Malta was smaller in the late 1990s than that of the euro area, accounting for 28.3% of gross value added against 28.6% for the latter. However, by the start of the 2000s, robust growth in Malta's industry, away from labour-intensive industries to more skilled and technologically-based manufacturing, contributed to a narrowing of the gap. Subsequently, however, the growth rate of value added in the manufacturing sector started to decelerate: in fact the value added in the period 2006-2014 was just 5.9% higher than in the 2000-2005 period, as against a growth rate of 11.0% in the euro area in the same comparative periods. The relative slow rate of growth in Malta meant that the share of industry in total value added declined to around 20% during the period from 2006 to 2014, while it largely held up in the euro area, at around 25%.

The transformation of the Maltese economy is the result of the appearance of a large swathe of new service operators rather than the disappearance of existing industrial operators. Some industrial sub-sectors, such as the manufacturing of pharmaceutical products have increased their economic share. Meanwhile, even agriculture and fisheries witnessed considerable growth in value added, up by 45%, despite having their share in the national economy halve in the last two decades. The decline in the relative employment share for industry is noticeably more pronounced than in its relative value added share, suggesting that, over time, firms in this sector have become more capital intensive and increased productivity. The intra-sectoral composition of activity also changed substantially. For instance, whereas in the 1980s those employed in the manufacture of clothing and footwear constituted 17% of all industrial workers, in 2014, their share had fallen to 4%.

### *2.1 The shift to services in Malta*

Growth in the services sector in Malta surged ahead after accession to the EU. While Malta traditionally had a large services sector owing to the presence of an established British naval base prior to 1979 and the necessitated several ancillary services, liberalisation measures, the higher availability of better educated labour resources and a targeted strategy to attract foreign direct investment opened up further services sectors. Besides the traditional areas of tourism, education, health, retailing and banking activities, the services industry expanded to include higher value added activities generated by the financial services sector, specialised forms of tourism – like language schools and dive centres – maritime activity, professional services, back-office administration, information technology and gaming.

In the 25 years preceding EU accession the relative share of services grew by 12 percentage points to 73% in 2004. However, nearly the same rise was experienced in just a decade after EU accession as the share of

services in total output rose to 83% in 2014. In fact, whereas in 2004, Malta had the seventh highest share of services in its gross value added among EU countries, by 2014 it had the third highest. The rise in the share of services between 2004 and 2014 was the greatest across EU countries.

When compared with the euro area, developments in the share of services in total output were remarkable. In 2014, this sector constituted around 74% of total activity in the euro area, just 3.0 percentage points higher than in 2004. Meanwhile, whereas the latter had an external services surplus of 0.6% of GDP in 2014, up from 0.3% in 2004, Malta had a 20.8% surplus, up from 13.1% of GDP ten years earlier.

The growth of new sectors, besides reducing the relative importance of industry, has also affected the share of existing services sectors. For instance, the share of tourism workers out of total service employment has declined from 11.5% in the 1980s to around 8.0% in 2014, despite the fact that, in absolute numbers, employment in tourism rose by half during the last 30 years. Computer programming, professional services and administrative support accounted for a quarter of the increase in value added since EU accession. This is quite an achievement, given that in 2004 these sectors amounted to just 9% of value added. In ten years, the value added of computer programming rose to more than four times its initial value. Moreover, during the same time, the arts, entertainment and recreation sector, which includes gambling and betting, saw its share of value added increase from 2.1% to 9.5%.

## 2.2 Job-rich economic growth leading to a more diversified economy

In terms of total gross value added, the Maltese economy grew by €1.7 billion, or 69% between 1995 and 2004, but expanded by €2.8 billion, or 66% in the following decade. The trend in employment was quite different, with the expansion in the first period being of just 3.1% (or 4,510 jobs) as against 26.0% (or 38,930 jobs) in the following decade.

In the decade before EU accession, the five sectors that contributed the largest absolute increase in gross value added were construction, real estate, financial services, education and public administration. Together they made up 39% of the increase in value added and almost the entire increase in employment. In the following decade, the five largest sectoral contributions came from financial services, computer programming, legal and accounting services, gambling & betting and education. Together they made up 46% of the growth in value added and around 43% of the rise in employment. Sectors which until 2004 were quite small, like computer programming, and gambling & betting, saw their value added grow by five to six times by 2014, but increased their employment by less than 80%. Thus for instance, computer programming's employment share rose from 0.9% to 2.1% between 1995 and 2014, while its gross value added share increased from 1.1% to 3.2%.

A number of indicators (see Table 1) suggest that the Maltese economy has become more diversified over time and that the recent expansion of the services has not led to any increase in the concentration of

**Table 1**  
**DIVERSIFICATION MEASURES BASED ON VALUE ADDED BREAKDOWN BY**  
**38 SECTORS**

	1995	2004	2014
Standard deviation	0.030	0.029	0.029
Coefficient of variation	115%	109%	109%
Size of largest sector	15.3%	13.1%	11.1%
Size of largest five sectors	43.2%	41.2%	40.4%
Median share	1.5%	1.5%	1.4%
Herfindahl index	0.060	0.057	0.057
Normalised Herfindahl index	0.035	0.031	0.031

Source: Authors' estimates using Eurostat data.

economic activity. Both the median share of value added and standard deviation of the different shares have declined over these two decades. The size of the largest five sectors has gone from 43.2% of gross value added in 1995 to 40.4% in 2014, mainly as the largest sector, wholesale and retail, has seen its share drop to 11.1%, down from 15.3% two decades earlier. The Herfindahl index – a standard measure used to study the concentration of activity<sup>9</sup> – has declined since 1995. Economic sectors in Malta also have a low and declining normalised Herfindahl index, implying that gross value added is fairly equally distributed amongst them.

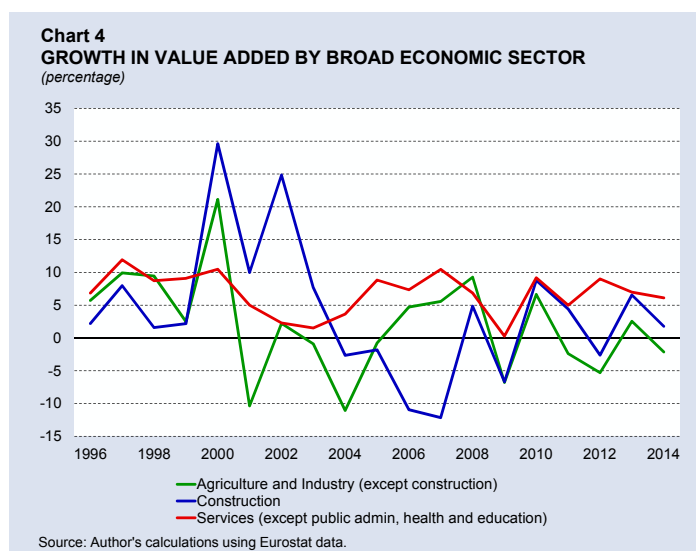
The level of the Herfindahl index for Malta compares well with the situation observed across the euro area. At 0.057, this index is only slightly higher than the 0.053 for the euro area. More importantly, the trend of the diversification indicators for Malta is contrary to that observed using euro area data. Across the euro area, the Herfindahl index has risen from 0.049 in 2000 to 0.053 in 2013, while the size of the largest five sectors has expanded from 38.7% to 39.9% over the same period.

If one were to use sectoral employment rather than value added, the diversification indicators also show reduced concentration and more convergence in the size of sectors. However, while the gross value added-based indicators show a consistent rise in diversification over the two decades, the employment-based indicators suggest that in the decade before EU accession, sectoral employment had become more concentrated. This possibly reflects the fact that during that period a number of sectors laid off workers during their restructuring and overall job growth was quite muted. By contrast, the following decade saw a reversal of this trend and resulted in a broader-based recovery in employment.

### **2.3 The main macroeconomic effects of greater diversification**

Given that the new sectors are able to generate more output using lower investment in construction and machinery it has become more difficult to determine potential output by focusing just on physical investment and employment. The progress of the Maltese economy will become ever more dependent on the availability of skilled workers. Furthermore, the diversification of the Maltese economy and the shift towards services could have significant implications on the extent of cyclical fluctuations.

Chart 4 shows the year-on-year change in gross value added in manufacturing, construction and in services. Figures for the latter exclude public administration, health and education, as these activities tend to be relatively stable as they are mostly financed by the government. As can be seen, the emergence of the new services sectors has done little to affect the volatility of the change in the value added of the services sector. If anything, the standard deviation of services' value added changes has moderated since 2005. By contrast, manufacturing and construction continued to exhibit quite volatile changes in their value added. Over the whole period, the standard deviation of relative changes in industrial value added was more than three times higher than that exhibited by services. This suggests that the increased diversification of the Maltese economy has smoothed the economic cycle.



<sup>9</sup> The Herfindahl index is calculated as the summation of the squared market shares. For instance if there are three firms with equal share, the index gives a value of 0.33 (0.33<sup>2</sup> + 0.33<sup>2</sup> + 0.33<sup>2</sup>), while if two of these firms each control 45% and the third just 10%, the index gives a value of 0.42. A higher value implies more concentration.

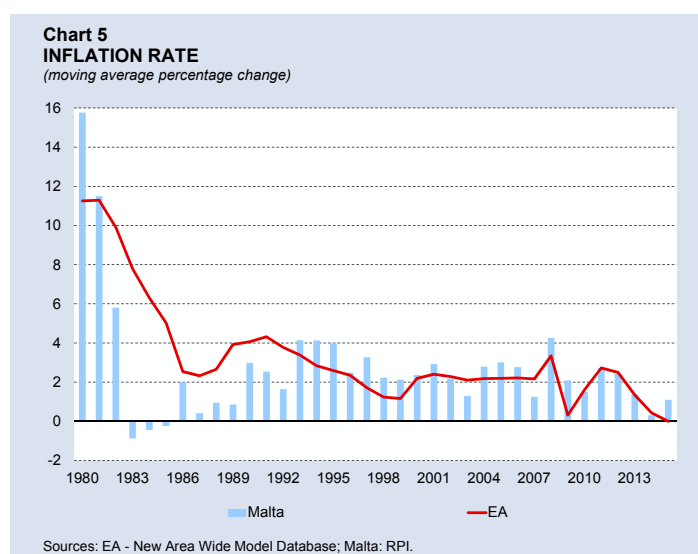
When assessed in terms of employment and competitiveness measures, it should be noted that the job-rich economic growth of the first decade post-EU accession was partly driven by the expansion of a number of labour-intensive services sectors. On the one hand, this reflected social changes, such as the ageing transition and the rising female labour participation rate. This has meant that certain activities that were previously conducted informally by housekeepers are now being serviced in the formal economy. Thus, whereas in 2004 there were about 3,300 workers in residential care services, by 2014 they had more than doubled to 6,700. This constituted a tenth of all employment growth, and was slightly higher than the increase observed in the gambling & betting sector. Another change noticeable during this decade and which has resulted in a spike in employment was the spread of contracting-out. Over a tenth of the overall increase in employment between 2004 and 2014 occurred in security, office administrative and support services. This could explain some of the declines in manufacturing and public service employment as these sectors have contracted out these activities, whereas in the past they would have been carried out in-house. In both residential care services and in security, office administration and support services, a significant part of the rise in employment went to migrants, with these two sectors accounting for more than a fifth of the increase in the number of foreign workers observed during this decade.

The expansion of these labour-intensive services activities has played an important role in the apparent growth in unit labour costs observed in recent years, despite a relatively low rise in average compensation. At the same time, the high value added services sectors, such as legal and accounting, tend to be mostly reliant on human rather than physical capital, explaining why the economy has continued to grow rapidly despite a decline in the investment ratio compared to the mid-1990s. These trends may complicate economic analysis. For example, it becomes harder to use unit labour costs to assess competitiveness, as they are partly driven by these structural changes. Part of the increase in labour costs reflects the higher quality of the workforce. For instance, the rate of early school leavers has fallen from 33% in 2005 to 20% in 2014 (though it remains higher than the 11% observed in the euro area). Similarly, in 2014, 57% of those in employment in Malta had completed upper secondary education, as against 41% in 2004, reducing the gap with the euro area by a third. Looking at just the younger cohorts of workers, the reduction in the gap is even more pronounced, at close to two-thirds.

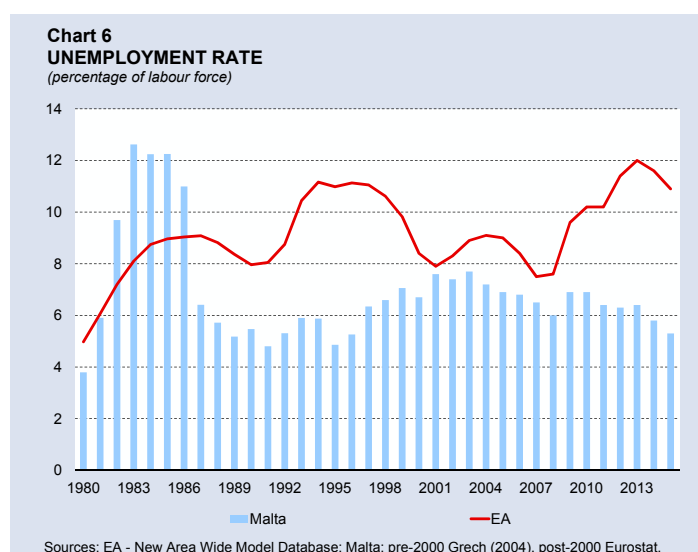
### 3. The broader impact of these structural changes

An index of unit labour costs (ULCs) to track Malta's competitiveness shows that after following a similar path to that of the euro area, Malta's ULCs have been rising at a much faster rate since 2006. Nonetheless, as can be seen from Chart 5, there is no evidence that higher ULCs relative to the euro area have been reflected in a higher rate of inflation. In contrast with developments in ULCs, retail price movements in Malta have been contained, and the local rate of inflation has tended to converge with that of the euro area over the past couple of years.

In the early 1980s, Malta's rate of inflation was higher than the euro area, but wage and price controls, coupled with a sharp recession, resulted in a short bout of deflation. In the 1990s, inflation picked up in the wake of a 10% devaluation of the Maltese currency in 1992 that was triggered by the crisis in the European Exchange Rate Mechanism. The introduction of wage indexation at the same time may have resulted in the anchoring of inflation to a slightly higher



rate than previously, though it is more likely that the higher inflation rate in the nineties and early 2000s may have reflected the significant pace of economic growth and the associated pressures on wages. After a spike in the related price index, owing to a surge in international energy and food prices in 2008, inflation moderated in the subsequent years both in Malta and the euro area. Since 2010 there has been practically no divergence between Malta's retail price inflation and euro area inflation, as against a differential of 0.4 percentage points in the preceding decade.



Whereas inflation has converged to the euro area average, labour market developments in Malta have contrasted notably with those of the euro area. Up to the mid-1980s unemployment in Malta was particularly high and even exceeded that in the euro area. The economic growth of the late 1980s, together with a sharp rise in public employment, helped reduce Malta's unemployment rate to well below that in the euro area (see Chart 6). The divergence continued to widen in the 1990s, but it narrowed significantly in the early 2000s as the unemployment rate in Malta rose in response to the restructuring of the Maltese economy that was taking place ahead of EU accession.

#### 4. Labour market trends

In the aftermath of the great recession, unemployment across most of the euro area increased sharply. This is attributable to a number of factors, such as differences in the severity of the crisis and policy responses adopted by national authorities, the exposure of some countries to sectoral developments and country-specific institutional features of the labour market.

Compared with the euro area, the Maltese labour market remained resilient, with the unemployment rate declining even though labour participation rates rose sharply (Micallef, 2013). While government assistance to manufacturing and tourism helped to cushion the labour market from the effects of the recession, the diversification of the economy to service activities helped to strengthen it notwithstanding the surrounding adverse economic and financial conditions. The sectors that increased the demand for labour were the new service sectors, which, due to their very nature, were able to offer flexible conditions that attracted new entrants into the labour market.

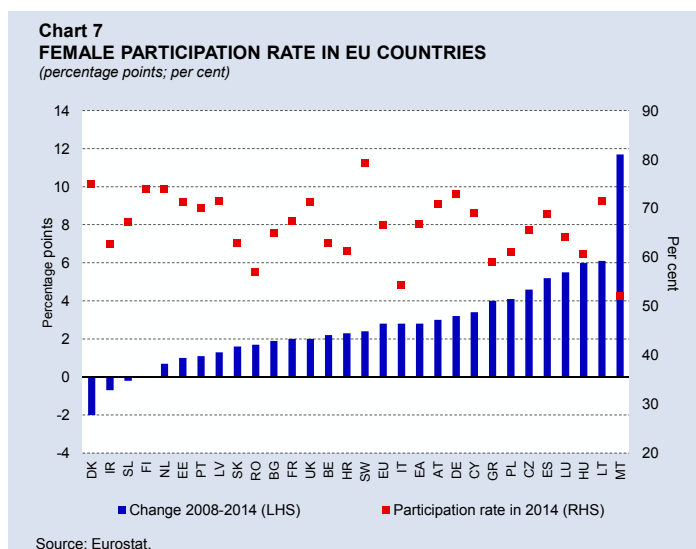
The unemployment rate has declined to 5.3% in 2015, with Malta being one of just three countries in the EU that registered a decline in the unemployment rate compared to the pre-crisis level. Additionally, various estimates point to a downward trend in the structural unemployment rate that started in the mid-2000s.

More generally, the domestic labour market has changed very rapidly in recent years, complementing the changes in the structure of the Maltese economy. Changes in the labour input have also been instrumental in the recovery of potential output growth, which according to various estimates, have exceeded the pre-crisis growth rates. The latter has occurred despite a deceleration in the working age population and has reflected two factors that raised the supply of labour: rising female participation and an influx of foreign workers.

#### 4.1 Reforms to increase the participation rate

Contrary to the pro-cyclical behaviour of the participation rate in past recessions, the labour supply in most EU countries remained resilient since the onset of the crisis. In Malta, the participation rate continued to rise from 59.1% of the working age population in 2008 to 66.3% in 2014, the highest increase registered among all EU countries. Despite remaining lower than the EU average of 72.3%, Malta has managed to narrow the gap by almost half since 2008.

Between 2008 and 2014, the female participation rate in Malta increased by 11.7 percentage points, by far the highest increase registered among EU countries (see Chart 7). Despite this improvement, however, the female participation rate, at 52.1% in 2014, still remains one of the lowest in the EU and hence, there is ample room for further catching-up in the future. On the contrary, the participation rate of males increased by 2.7 percentage points during this period and, at 79.9% in 2014, remains higher than the EU average.



The increase in female employment was facilitated by a number of government initiatives aimed at increasing the participation rate of women in the labour market.<sup>10</sup> Measures include back-to-work fiscal incentives for women, new income tax computations, an increase in maternity and adoption leave, tax credits for self-employed and exemptions of means-testing for income earned by women working part-time. Self-employed women working on a part time basis, as in the case of employed persons, were given the opportunity to choose to pay a 15% pro rata contribution on their income. Childcare facilities were made more available and affordable. A number of public child care centres were introduced and their operational hours extended to be more effective for working parents. The introduction of after-school care services in a number of schools also helped to bridge the gap between day school and regular working hours of parents in employment. Other initiatives were targeted to provide care for children before schools' official opening hours to allow additional flexibility to working parents.

These reforms had a significant impact on the economy's potential output growth. The trend increase in participation is estimated to have contributed, on average, to 0.8 percentage points per annum to potential output between 2008 and 2014. According to different estimates presented in Micallef (2015) that aim to identify the impact of reforms from alternative factors, such as those related to education and demographics, the impact of the various reforms is calculated to have raised the economy's potential output growth by 0.3 percentage points per annum between 2008 and 2014. In conjunction with the above initiatives, a number of measures were aimed to further improve basic skills attainment and reduce early school leavers, both of which intended to strengthen the employability prospects of people joining the labour market.

A related trend in the domestic labour market has been the increasing engagement of part-timers as the new sectors provided more flexible employment opportunities. According to the Labour Force Survey, part-time employment accounts for half of the overall increase in employment since 2008, with females

<sup>10</sup> The increase in female participation is even more striking when seen from a long-term perspective. Grech (2015a) ascribes this to the transformation in the role of women in society, with rising education levels combined with changing social norms. Using a historical database, the author documents that the increase in female participation observed in the last decade is higher than that witnessed in the previous three decades.

accounting for around two-thirds of that rise during this period. The gap in the share of part-time employment between Malta and the EU average has more than halved between 2004 and 2014, while the proportion of employees on fixed term contracts has doubled to 7.7% in 2014, although it still remains lower than the 14% seen in the EU.

#### 4.2 The impact of migration

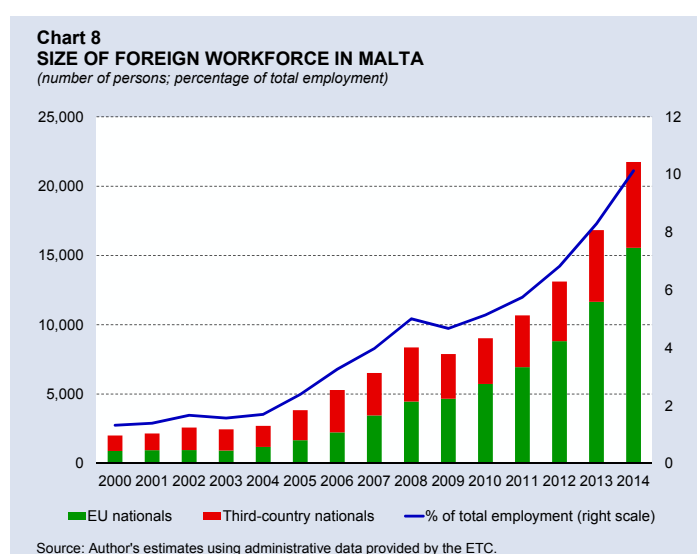
Another important factor that boosted the island's labour market resilience has been the significant influx of migrant workers, mostly from the EU. The availability of skilled foreign workers has helped the development of new industries, which otherwise would be bottlenecked by skills shortages. These new sectors, in turn, led to a more diversified economy, less subject to industry-specific shocks and to cyclical fluctuations.

Following EU accession in 2004, the number of EU nationals working in Malta has increased by 13 times, to nearly 15,600 in 2014. In addition, there were approximately 6,200 third-country nationals working in Malta in 2014, four times the amount present a decade earlier. Chart 8 shows that the share of foreigners in the workforce increased from 1.7% in 2004 to 10.1% in 2014. This increase occurred despite the fact that the rise in the Maltese workforce after the crisis was very high by historic records. The rising share of the foreign workforce should therefore not be misconstrued as evidence that foreigners are taking up the place of Maltese workers. On the contrary, data seem to suggest that the rising demand for labour by domestic industries is too strong to be serviced solely by the supply of Maltese workers, even when the latter is expanding quite strongly due to the rapid rise in female participation.

In terms of occupational distribution, foreign workers are mainly clustered at both ends of the skill spectrum, the higher end where skills are scarce and the lower end where jobs are no longer that attractive for Maltese workers. At the sectoral level, the remote gaming sector, hotels & restaurants and professional services & administrative support accounts for nearly half of all foreign employees in 2014.

In addition, the composition of the foreign workforce has changed significantly over time. While in 2000 nearly three quarters of foreign workers were managers, professional and technical staff, by 2014 this has fallen to less than half. This occurred despite the fact that the absolute number of professionals in this category increased from 1,400 to 8,400 during this period. At the same time, the proportion of the foreign workforce engaged in elementary occupations and in clerical and support duties rose from 7.5% in 2000 to 23.3% in 2014. These two trends for foreign workers – a declining share of higher-end and a rising proportion of lower-end occupations – differ from those observed among Maltese workers.

According to Grech (2015b), the influx of foreign workers contributed significantly to boost the economy's potential output growth. Before the 2009 crisis, foreign workers boosted average annual potential GDP growth by 0.5 percentage points and by 0.6 percentage points between 2010 and 2014. In addition to their significant contribution towards economic growth, foreign workers have also contributed to improve public finances. Since EU accession, the amount of income tax and national insurance contribution paid by foreign workers increased from €15.3 million to €103.6 million in 2014. By 2014, revenue from foreign workers accounted to 10.1% of total revenue



from personal income tax and national insurance contributions, up from 2.4% in 2000. This is corroborated by administrative data, which indicate that the amount of revenue collected from foreign workers increased by nine times during the period 2000 to 2014, whereas that from Maltese workers doubled.

## 5. Conclusion

The structural changes in the Maltese economy are leading to a higher utilisation of labour resources and to a much improved position on the external account. Diversification, both towards new sectors as well as specific niches within established ones, has increased the flexibility and the resilience of the economy, making it less subject to industry-specific disturbances and to cyclical fluctuations. The increased supply of labour, driven by a higher female participation rate and an influx of foreign workers, addressed possible shortages in the labour market, both in the low and highly skilled sectors and prevented an increase in wage growth that would have adversely affected the country's competitiveness. Potential output growth has recovered strongly after the crisis, exceeding the growth rates registered during the 2000s. Current projections by international organisations suggest that the rate of domestic economic growth will persistently exceed that of the euro area, which bode well for the country's catching-up process.

For this benign scenario to continue, policymakers need to buttress their policies to further improve human capital and encourage more participation in the labour market, while supporting growth and competition across all sectors of the economy. The successful continuation of these trends needs to be complemented by adequate investment in the supporting physical and technological infrastructure of the country, as well as by policies that increase labour productivity.

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# MEASURING INTERNATIONAL COMPETITIVENESS

Noel Rapa<sup>1</sup>

*This article analyses developments in the international price competitiveness of Malta. It argues that the deterioration in competitiveness shown by aggregate cost based measures, namely relative ULCs and ULC-deflated EERs, contrasts with the recent economic performance of the Maltese economy. In light of the susceptibility of these indicators to changes in the composition of output, a new competitiveness measure based on sector ULC and EERs is proposed. Results show that contrary to what is suggested by traditional indicators, Malta's competitiveness has not deteriorated in the last 15 years. Nevertheless, policies aimed at improving the quality of both labour and capital are important to help the Maltese economy improve its competitiveness in the long-run.*

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## 1. Introduction

The economic and financial crisis of 2008 has highlighted the divergence in external imbalances within the global economy leading to a renewed interest in the study of the determinants of international competitiveness. More recently, the Eurozone crisis has highlighted the need of structural reforms aimed at improving the international competitiveness of deficit countries. Indeed, persistent losses in international competitiveness have been identified as a major cause of the low growth rates experienced by the periphery countries since their membership in the EMU (European Central Bank, 2012). In light of these arguments, policymakers within the Eurozone are striving to implement structural reforms aimed at boosting the competitiveness of deficit countries thereby helping them correct their external imbalances and return to sustainable levels of economic growth. Against this backdrop, a correct assessment and measurement of international competitiveness is crucial to help policymakers in devising policies aimed at correcting external imbalances of an economy.

While international competitiveness is consensually regarded as a key driver of sustainable economic growth, properly defining this concept has proven to be a key analytical and policy challenge. This elusive concept can be defined either from a long-run or short-run perspective.<sup>2</sup> In the long run, competitiveness is often defined in terms of the long term growth potential of the economy and is often associated with the productivity of the factors of production available in an economy. When analysed from this perspective, the main determinants of competitiveness are often regarded as being of a qualitative nature and are therefore difficult to measure in a quantifiable way. Indeed, decisions made by economic agents to spend and save, the efficiency of financial markets to transform savings into investment, the availability of skilled labour force, the uptake of technological innovation as well as the quality of the institutions and policymaking processes can affect the country's long-term competitiveness (European Central Bank, 2012). Due to the difficulty usually encountered when measuring the qualitative aspect of competitiveness, most economists have focused on the short-term aspect of competitiveness, namely that defined in terms of misalignments in relative prices and costs of economies. The prices of an economy's exports are in part determined by the costs and strategic decisions of the economy's firms. This, together with broader macroeconomic factors that are outside the control of firms, such as exchange rate fluctuations, affect an economy's competitiveness and therefore its external trade flows. While the concept of price competitiveness is often regarded as rather narrow and incomplete, it is considered as a very important determinant of the external performance of an economy. Indeed, recent research in the area has indicated that the trade deficits experienced by southern European countries prior to the Eurozone crisis has been largely due to divergence in relative prices (European Central Bank, 2012).

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<sup>2</sup> See for instance De Broeck, Guscina & Mehrez (2012) and Mann (1999).

Further to the conceptual ambiguity surrounding this concept, the study of price competitiveness has been affected by the inherent difficulties encountered in constructing indicators meant to measure changes in the competitiveness of an economy. Despite the amount of work that has been done on this topic, there is no clear consensus on how best to measure international competitiveness. In addition, a large number of indicators commonly used for this purpose, often appear to convey conflicting messages to the user. Moreover, empirical research has traditionally struggled to find an unambiguous relationship between competitiveness indicators and economic activity.<sup>3</sup>

In light of these views, this article attempts to shed some light on developments in the price competitiveness of the Maltese economy in the last decades. The next section describes aggregate cost indicators that are traditionally used to assess a country's cost competitiveness. These developments are then contrasted with macroeconomic evidence highlighting the weaknesses of aggregate cost-based indicators. The following section proposes an alternative measure of cost competitiveness based on sectoral cost indices while a concluding section draws some conclusions and policy recommendations.

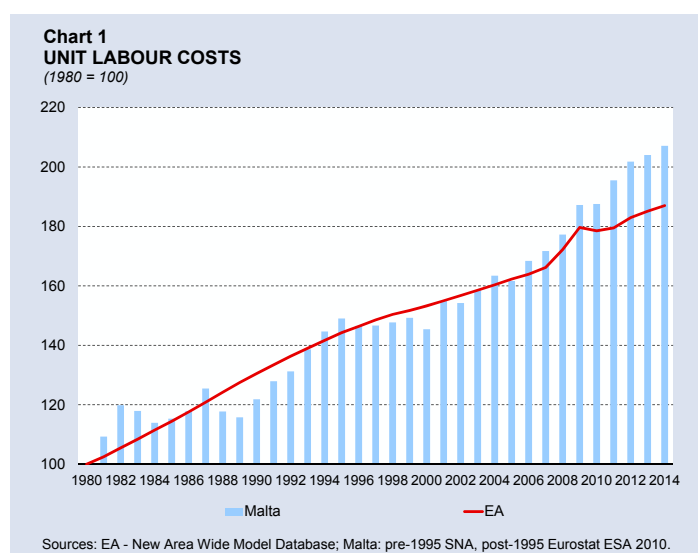
## 2. Aggregate measures of cost competitiveness

### 2.1 Unit labour costs

While international competitiveness can be measured in terms of either price or cost-based measures, empirical researchers as well as policymakers have predominantly chosen to use aggregate cost-based indicators for their analysis and policy recommendations.<sup>4</sup> In view of data availability challenges concerning the productivity and costs of capital, often, only one factor of production, labour, is considered in the analysis. A very popular indicator in this respect is aggregate unit labour costs (ULCs), defined as the ratio of workers' compensation per employee to labour productivity. An increase (decrease) in ULCs implies a rise (fall) in the labour costs of production relative to productivity, and hence a loss (gain) of competitiveness.

Chart 1 compares the evolution of Malta's ULCs with those of the euro area average between 1980 and 2014. During the period spanning 1980 to 2006, Maltese ULCs have been growing in line with those of the euro area average. Indeed, the average growth rate in ULCs registered in Malta between 1996 and 2006 stood at 0.86%, the third lowest in the euro area (after Germany, Austria and Finland) and lower than the euro area average. However, from 2007 onwards, Maltese ULCs started diverging from the euro area average. Indeed, between 2010 and 2014, ULCs in Malta grew at an average rate of 2.1%, the highest rate registered in the euro area and the second highest in the EU, implying a deterioration in Malta's international competitiveness.

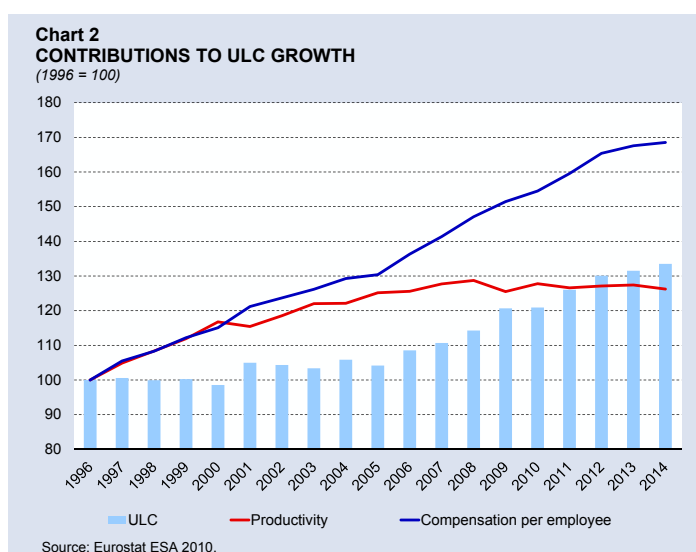
Looking at the underlying developments in compensation per



<sup>3</sup> Kaldor (1970) was one of the first to propose an inverse relationship between GDP and the ratio of money wages to productivity, used as a proxy for competitiveness. However, the same author in Kaldor (1978) concludes that the empirical evidence available for the relation between these two variables is inconclusive, a result known as Kaldor's paradox.

<sup>4</sup> See for instance Cerra, Soikkeli & Saxena (2003) and Lipschitz, & McDonald (1992) for a survey of related literature and empirical evidence of the superiority of cost-based indicators over their price-based counterparts.

employee and labour productivity, it becomes evident that the main driver behind the recent deterioration in Malta's relative ULCs has been a slowdown in productivity growth (see Chart 2). Indeed, by 2010, average growth in productivity has slowed down from 2.4% registered between 1996 and 2006, in line with rates registered in Scandinavian economies, to around 0.1%, fourth lowest in the euro area and significantly less than the euro area average. During the same period, average compensation per employee growth has slowed down from 3.1% (registered between 1996 and 2006) to around 2.1%, in line with the growth rates registered in Austria and France and significantly less than the Baltic States.

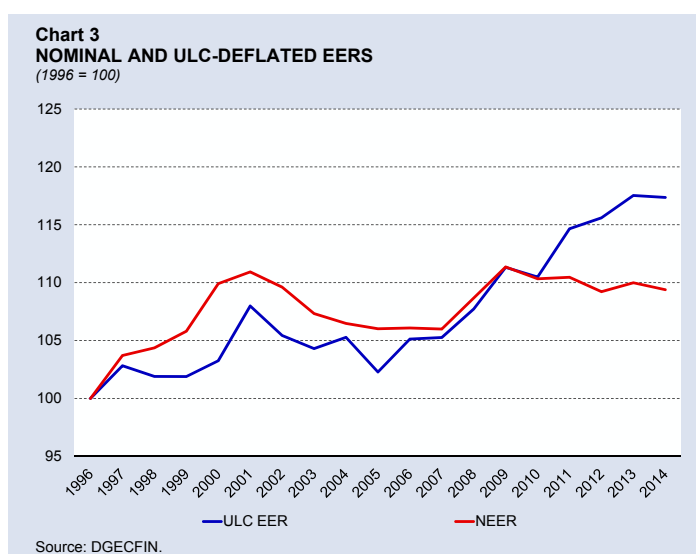


## 2.2 Relative unit labour costs and effective exchange rates

Aggregate measures of ULCs are unit-less values that can only be interpreted relative to a suitable base. Comparing ULC developments vis-à-vis the euro area average is therefore somewhat simplistic, as it does not take into consideration how important each of Malta's trading partners is as both an importer and a competitor of Maltese exports. Moreover, as previously explained, the price competitiveness of an economy is given by both firm specific factors (such as costs and mark-ups) and exchange rate movements, which cannot be controlled by individual firms. To account for these deficiencies, policymakers and researchers often resort to ULC deflated Effective Exchange Rate (EER) indices.

A nominal EER is a weighted average of bilateral exchange rate indices with weights derived either from model-based estimates or from bilateral trade flows. The real EER is derived by deflating its nominal counterpart with an index tracking the evolution of the home country's costs or prices relative to those of its competitors. To better account for the complex nature of a country's trade competitiveness, EERs are usually computed using a trade-based double weighting scheme, which takes into account each of the competitor countries' contribution to the total supply in the home country's target markets, and the relative importance of each market in the home country's international trade.<sup>5</sup>

Chart 3 shows the evolution of Malta's ULC-deflated real EER between 1996 and 2014. These



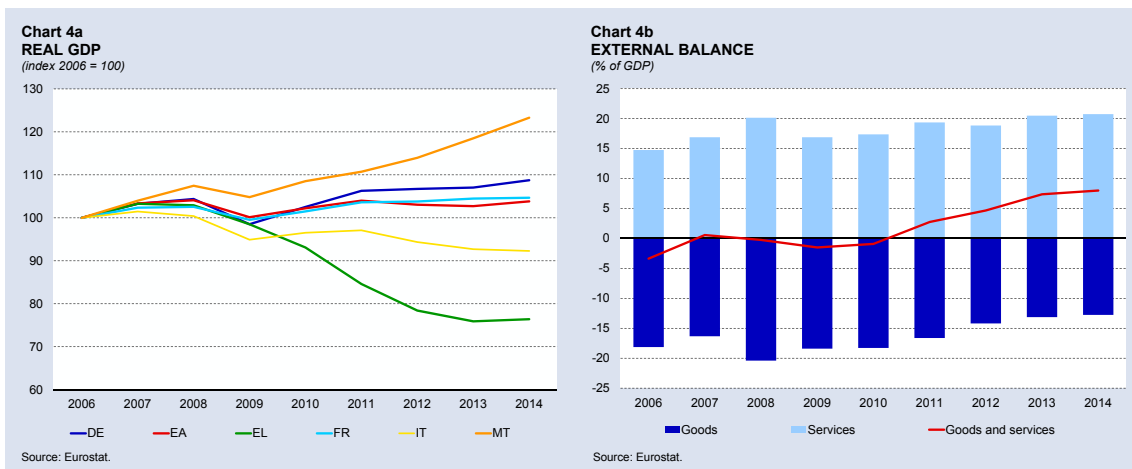
<sup>5</sup> For a discussion on the merits of this weighting scheme and the methods used to compute EERS see Turner & Van't dack (1993).

results show that after correcting for bilateral exchange rate movements, Maltese cost competitiveness has remained quite stable between 1994 and 2005. During this period, Malta's real EER first appreciated by roughly 8% until 2000, driven entirely by adverse exchange rate movements. However, this appreciation was almost entirely reversed between 2000 and 2005, helped by favourable developments in both relative ULCs and nominal EER. From 2006 onwards, the real EER shows a consistent worsening of Malta's international price competitiveness. These developments were in part due to an appreciation of Malta's nominal EER between 2007 and 2009. On the other hand, from 2010 onwards the appreciation in Malta's real EER was entirely due to a consistent increase in Malta's ULCs relative to those of its main competitors.

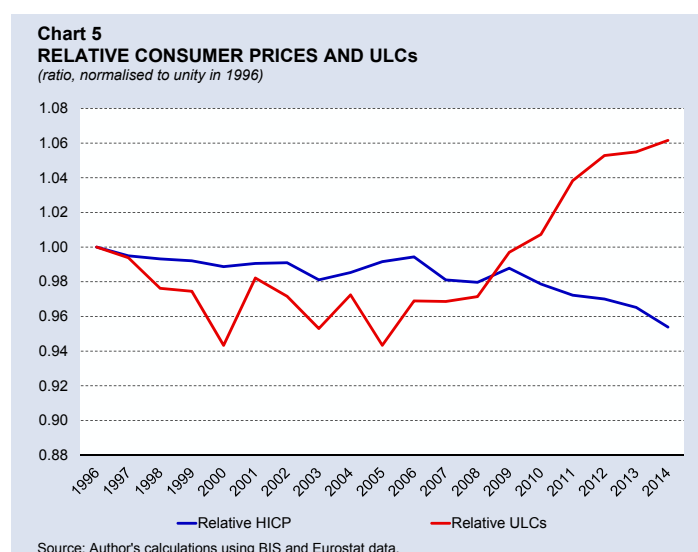
### 3. Reconciling economic performance and unit labour cost developments

At face value, these developments suggest a significant deterioration in Malta's international cost competitiveness from 2006 onwards. However, these findings contrast sharply with Malta's recent economic performance. In fact, the Maltese economy has weathered the international financial crisis of 2009 relatively well, with real GDP surpassing pre-crisis levels by mid-2010 (see Chart 4a). Moreover, unlike most of the other euro area countries, Malta's economy did not contract during the Eurozone crisis of 2012. In addition, together with Germany, Malta is one of the two EU countries whose potential GDP had already exceeded pre-crisis growth rates by 2014. Indeed, by this year, Malta's GDP level was around 14% higher than the level registered in 2009, with net exports featuring as the main contributor behind this rise in economic activity. Malta's external position has traditionally ended in deficits close to 15% of GDP since the early 1980s. However, as shown in Chart 4b, Malta's trade performance has improved considerably ever since. From 2010 onwards, Malta has consistently registered positive trade balances driven by improvements in both goods and services net exports. Similar improvements were registered in the labour market, with employment growth returning to pre-crisis levels by 2010. Also, notwithstanding an increasing participation rate, unemployment rate in Malta has fallen substantially from just below 7% in 2009 to 5.9% in 2014.

In order to reconcile the unfavourable developments in ULCs with the concurrent strengthening of Malta's external position, one needs to consider the weaknesses of cost-based indicators, in particular those based on aggregate ULCs. As previously discussed, price competitiveness at the firm level is not simply defined by the costs incurred by firms but also by exchange rate movements and more importantly by the market structure they operate in. Therefore, when using ULCs to assess the price competitiveness of a nation, one is implicitly assuming that the link between ULCs and prices (therefore the market structure of firms) is stable across countries and time.



To assess a possible decoupling of relative cost and price measures in Malta, Chart 5 plots relative aggregate ULCs and relative overall consumer price deflators.<sup>6</sup> These results show that between 1996 and 2006, developments in both relative costs and prices were roughly similar, with both indicators showing an improvement in Malta's competitiveness. From 2006 onwards, the two measures diverge considerably. The relative CPI measure shows further improvements in Malta's CPI prices relative to those of its trading peers, possibly reflecting the higher degree of competition in the local market as a result of



Malta's accession to the EU. On the other hand, during the same period relative ULCs show a sudden and sustained increase in local labour costs. These developments show that the assumption of a stable link between price and cost competitiveness indicators is too simplistic especially for an economy such as Malta's, that has experienced a number of structural reforms that have altered the market structure of the firms operating in it.

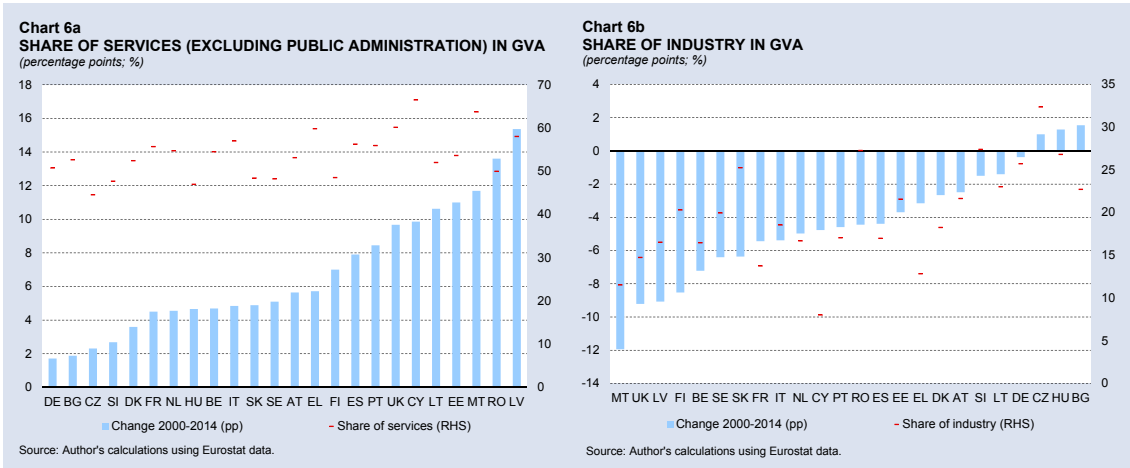
Another weakness of aggregate ULC based indicators is that they are susceptible to shifts in the composition of output and sector-wide changes.<sup>7</sup> As argued by Honohan & Walsh (2002), average ULCs can be increased by shifts in the sectoral composition of output towards more labour-intensive sectors, even if no single sector has experienced a worsening in its competitiveness. Moreover, aggregate ULCs are affected by the fact that ULC indices evolve differently across sectors depending on global technological improvements.<sup>8</sup> Thus a country specialising in a sector where ULCs are globally falling due to technological advances, will experience a fall in its ULC-based indicators without necessarily reflecting changes in sectorial competitiveness.

Even before the recession of 2009, the Maltese economy has undergone a number of structural changes, which led to a diversification of its economic base and a shift from traditional industries towards higher-value added activities in the services sector. Chart 6a shows that between 2000 and 2014 the share of services (defined as total services excluding public administration) in overall gross value added has increased by slightly less than 12 percentage points, the third highest increase registered in the same period across the EU. By 2014 the share of services has reached roughly 66%, one of the highest levels in the EU and in line with that of the UK. As shown in Chart 6b these developments have coincided with a fall in the share of the manufacturing sector of around 12 percentage points, pointing at a sharp shift in the composition of Maltese output from the manufacturing to higher-value added services sectors. The service sector, by its very nature, tends to be characterised by lower labour productivity levels than those of manufacturing. This reflects the fact that while manufacturing has become less labour intensive and has increasingly moved towards automated processes that increase labour productivity, the services sector remains dependent on a higher level of labour input. Thus, Malta's shift from the more labour productive manufacturing sector towards the less productive services sector has led to a composition effect that has

<sup>6</sup> Both foreign ULC and consumer prices are computed using the weights used by the BIS to compute EERs. Therefore, in line with relevant literature, the weights used follow a double-weighting scheme.

<sup>7</sup> De Broeck, Guscina & Mehrez (2012).

<sup>8</sup> Ibid.



increased Malta's aggregate ULC index, irrespective of the developments in cost competitiveness at a sector level.

#### 4. A competitiveness measure based on sector unit labour costs

In an attempt to address the weaknesses of aggregate ULC-based indicators, this section follows the approaches of Cerra et al (2003) and more recently of DGEFCFIN (2014) and proposes sectorial ULC indices for Malta for the industry and services sectors.<sup>9</sup> These indices are then used to compute real EERs for each sector as the geometric mean of nominal bilateral exchange rates deflated by the relative ULCs in each sector (i.e. the ULCs of a sector in the home country relative to a weighted average of ULCs in the same sector in all other countries). Specifically:

$$REER_j^i = \prod_k \left( \frac{ulc_j^i}{ulc_j^k} e^{i,k} \right)^{\psi_j^{i,k}}$$

Where  $REER_j^i$  is the ULC-deflated real EER of country  $i$  in sector  $j$ ,  $ulc_j^k$  is the unit labour cost in sector  $j$  in country  $k$ , and  $e^{i,k}$  is the bilateral exchange rate.  $\psi_j^{i,k}$  is the weight given to country  $k$  and is calculated as the share of GVA of sector  $j$  in country  $k$  relative to the global GVA in the sector excluding the home country ( $i$ ).<sup>10,11</sup>

$$\psi_j^{i,k} = \frac{GVA_j^k}{(\sum_k GVA_j^k) - GVA_j^i}$$

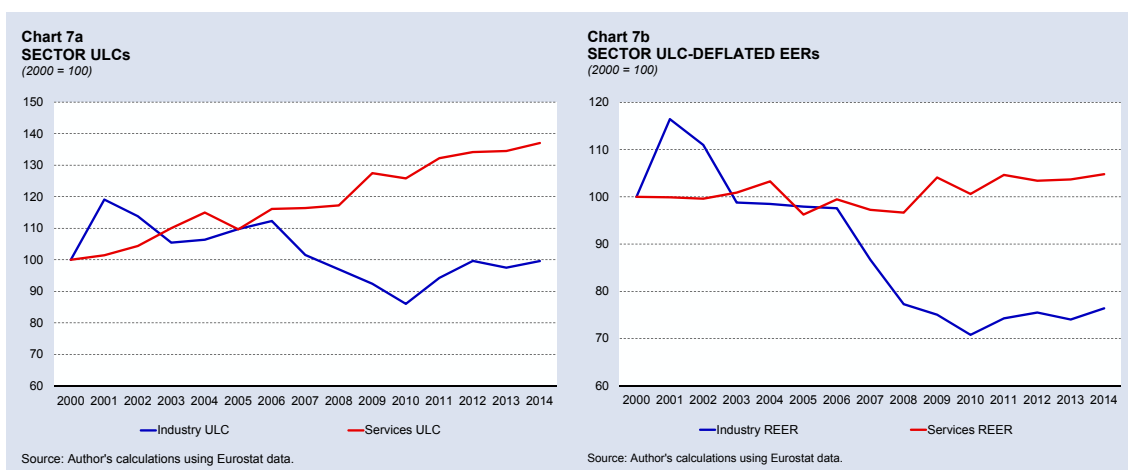
An overall EER suitable to analyse the overall competitiveness of the Maltese economy is then constructed as a weighted average of the two sectorial real EERs with weights reflecting the relative importance of each sector in total GVA.

Chart 7a presents developments in the ULC indices in the industry and services sectors in Malta between 2000 and 2014. It is immediately apparent that the developments between the two sectors have diverged considerably from 2006 onwards. Indeed, after the accession to the EU, the ULCs of the industrial sector have dropped significantly, mainly driven by gains in labour productivity as Malta shifted from traditional to higher-value added manufacturing. After 2010, growth in industrial productivity slowed down, failing to

<sup>9</sup> The industry sector is defined as all industrial production excluding construction while the services sector includes all services excluding public administration. Since no data for GVA deflators by industry are available for Malta, the industrial Purchase Price Index (PPI) and the overall GDP deflator were used for the computation of real GVA for the industry and services sectors respectively.

<sup>10</sup> The above calculations are repeated for each point in time. The time subscript is therefore dropped for simplicity.

<sup>11</sup> Notwithstanding its superiority, a double-weighting scheme could not be used due to the lack of bilateral services trade flows. Also, due to data availability issues, the analysis is limited to the sample period spanning 2000 to 2014 and covers only EU countries. While the dataset encompasses more than 60% of Malta's exports, the omission of non-EU countries such as the US and China is a limitation that could lead to an underestimation of the gains or losses in competitiveness.



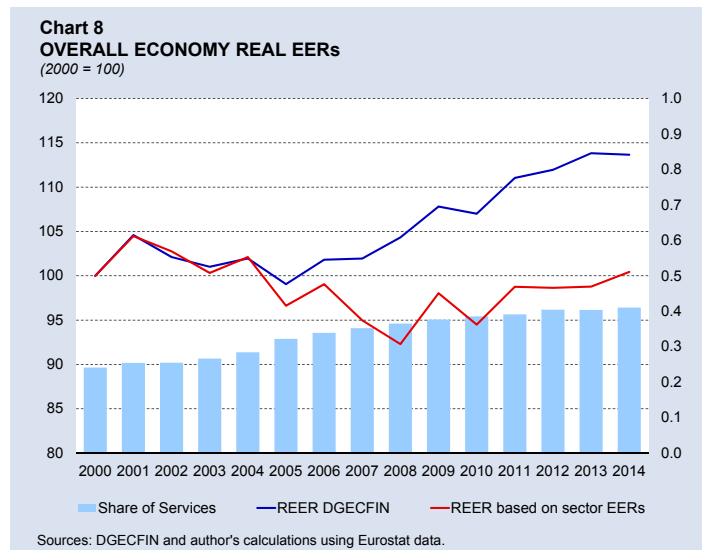
match the growth rates registered in compensation per employee, thereby pushing up the ULCs in this sector. The services sector, on the other hand, has experienced a steady increase in its ULCs, mainly driven by increases in wages. This result may be driven by recent shifts in the composition of overall services GVA. Indeed, throughout the period under consideration, the share of non-traditional services (such as financial and technical activities including amongst others the gaming industry) in overall services GVA has increased substantially. These structural shifts together with the higher average wages of non-traditional services activities are likely to have contributed to the increase registered in the overall services sector ULCs.<sup>12</sup>

Similar to their aggregate counterparts, ULCs at the sectorial level are unit-less indices that need to be compared to some industry norm. To take in consideration developments in the sectoral ULCs of Malta's main trading partners together with movements in the exchange rate, Chart 7b plots Malta's sectorial EERs deflated by relative sectoral ULCs. Results show that over the period under consideration, Maltese industry has gained competitiveness over its direct peers. Between 2000 and 2006, the industry sector competitiveness has remained constant despite favourable movements in the nominal effective exchange rate. Helped by a number of structural reforms and the switch to higher value added manufacturing, Malta's industrial competitiveness improved considerably immediately after Malta's accession to the EU. Indeed, positive developments in relative ULCs in this sector have significantly outweighed adverse movements in the nominal EER brought about by the appreciation of the euro against sterling. This positive trend was partially reversed after 2010. Driven by an increase in its relative ULCs, the industry sector real EER appreciated marginally by 5% between 2010 and 2014. The services sector in Malta has maintained its cost competitiveness relatively unchanged between 2000 and 2010. This was achieved despite the contemporaneous significant expansion of the Maltese services sector that could have brought about some upward pressures on the wages in this sector, potentially undermining its competitive edge. Similar to the industry sector, Maltese services became relatively more expensive after 2010 driven entirely by increases in their relative prices.

Chart 8 plots the overall real EER based on sectoral ULCs compared with a traditional aggregate based ULC-deflated EER. Results from the new indicator show that before and slightly after its accession to the EU, Malta has experienced an improvement in its cost competitiveness, mainly driven by gains in the industrial sector. This trend was reversed from 2009 onwards, due to deteriorating competitiveness in both the industry and services sectors. Despite the recent appreciation of its overall EER, the overall cost competitiveness of the Maltese economy has remained relatively unchanged throughout the period under consideration, contrasting with the results derived from the aggregate ULC deflated EER. Indeed, while the latter

<sup>12</sup> While being less pronounced than those affecting aggregate ULCs, composition effects due to sector wide changes are still likely to affect the sectoral ULCs computed in this article. Unfortunately, the unavailability of GVA deflators by NACE category impedes the computation of more disaggregated ULC indices.

shows a 14% deterioration in Malta's cost competitiveness between 2000 and 2014, real EERs deflated by sectoral ULCs show practically no changes in the overall cost competitiveness of the economy. Moreover, these two indicators have started to diverge considerably between 2004 and 2010, a period characterised by a marked increase in the share of services in overall GVA. This confirms that sectoral ULC based EERs are less prone to sectoral shifts in output, and are thus a better gauge to cost competitiveness in economies undergoing a large number of structural changes.<sup>13</sup>



## 5. Conclusion

Aggregate ULC measures show a considerable worsening of Malta's international price competitiveness in the last decade. Between 1980 and the mid-2000s, Malta's aggregate ULCs have been growing in line with those of the euro area showing no changes in Malta's relative cost competitiveness. However, from 2006 onwards, Malta's ULC growth has picked up from 0.86% registered between 1996 and 2006 to 2.1% after 2006, one of the highest growth rates registered in the EU. These conclusions are confirmed by ULC-deflated EERs that allow for movements in bilateral exchange rates and are able to take in consideration the importance of each of Malta's trading partners both as a competitor and as an importer of Maltese exports. These findings contrast sharply with Malta's economic performance in the last 8 years. After weathering the international recession of 2009, Malta's economy has grown at a faster pace than that of its main trading partners. Furthermore, during this period, Malta has succeeded in considerably improving its international trade performance, pushing its net external position in positive territory from 2010 onwards.

The lack of an apparent link between aggregate ULC developments and international trade performance is very clear in Maltese data and may in part be explained by some of the weaknesses of aggregate based ULCs. Indeed, these indicators are unable to account for improvements in the market structures of economies that may lead to lower price mark-ups and thus lower prices. More importantly, these indicators are very sensitive to changes in the sectoral composition of output and may show deteriorations in the international trade competitiveness of economies that shift resources towards sectors with high labour intensities. This factor seems to have significantly affected Malta's ULC developments. Indeed, the divergence in Maltese and euro area ULCs occurs simultaneously with a considerable expansion of Malta's services sector and the consequent decline in the importance of industrial production in overall GVA.

In an attempt to account for weaknesses of aggregate cost indicators, this article computes sector based ULC indices, which are then used to compute, sector specific real EERs. When compared to aggregate ULC-based indicators, sectoral EERs are less prone to sectoral shifts in output and are thus better suited to measure international competitiveness of economies undergoing structural changes. Results show that contrary to what suggested by traditional aggregate indicators, Malta's cost competitiveness has not deteriorated in the last 15 years, with improvements in the industry real EERs offsetting an appreciation of the services sector real EER.

<sup>13</sup> Note that on the contrary of publicly available aggregate EERs, the sector-based real EER excludes public administration and construction in its computation, assuming that evolutions in the public and construction sectors are not relevant to an economy's competitiveness. It is important to note that the results discussed in this article are not affected by the inclusion or otherwise of public administration and construction, implying that the divergence between aggregate and sector-based EERs is not driven by the exclusion of these two sectors.



As stressed at the beginning of this article, the concepts of relative prices and costs are only one of the many aspects that define the international competitiveness of an economy. While relative prices are surely a determinant of net exports in the short run, the long run international performance of an economy rests on the quality of the factors of production of a nation. Therefore a holistic approach towards improving Malta's international competitiveness should not be limited at measuring and gauging Malta's relative price developments, but should encompass structural reforms aimed at improving the productivity of both labour and capital inputs. Against this backdrop, it is essential to increase investment in education in an effort to improve the quality of labour input as well as to guarantee higher labour market flexibility. Moreover, policies aimed at ensuring a faster uptake of new technologies as well as improving the local business environment and the quality of the political and policymaking processes should help the Maltese economy improve its long-term productivity levels, allowing it to compete favourably in the international market.

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## **PART II**

# **THE RELATIONSHIP BETWEEN OUTPUT, PRICES AND EMPLOYMENT IN MALTA**



# ASSESSING POTENTIAL OUTPUT GROWTH OF THE MALTESE ECONOMY USING A PRODUCTION FUNCTION APPROACH

Aaron G. Grech and Brian Micallef<sup>1</sup>

*After outlining the various methods used to estimate potential output, this article presents estimates for Malta derived from one of the most commonly used methods, the production function approach. Given the uncertainty surrounding these kinds of estimates, these estimates are compared with those made for Malta by other institutions using different methods. Based on this analysis and on a cross-country comparison with other euro area economies, a number of observations are made that would enable potential growth to accelerate and result in a faster economic convergence.*

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## 1. Introduction

Malta is the smallest member of the euro area, comprising less than 1% of the monetary union's economic size. It also has one of the lowest levels of gross domestic product (GDP) per capita among euro area members and is located in a region, the Mediterranean, which has been characterised by political unrest and severe economic distress in recent years. To be able to surmount these difficulties and converge to the higher relative economic standards of its fellow monetary union members, Malta faces the challenge of achieving relatively higher rates of growth in its potential output. The latter is usually defined as the highest level of output achievable without generating inflationary pressures in factor markets.

Estimating potential output has always been a challenge to policy makers, especially in economies undergoing structural changes (like Malta, which is moving from a manufacturing and tourism-based economy to a more diversified and higher value-added services based economy) or in the aftermath of wars, natural disasters or financial crises (Malta is surrounded in the north by economies embroiled in the sovereign debt crisis and in the south by countries who have gone through the economic turmoil of the Arab Spring). Conceptually, potential output is often defined as the sustainable production capabilities of an economy determined by the structure of production, the state of technology and available resources. A closely related concept is the output gap, defined as the difference between actual and potential output. Measures of the output gap provide an indication of the overall balance between demand and supply conditions in the economy. This is generally considered useful information by policy makers, for example to determine and predict price pressures, and to gauge progress in fiscal consolidation.<sup>2</sup>

A number of studies have documented that financial and economic crises have a sizeable impact on the level of potential output and that, following their occurrence, output does not revert to its previous growth trend but rather remains permanently below it.<sup>3</sup> There are several factors that can affect the economy's supply capacity after a recession. On the production side, examples include the scrapping of existing capital stock owing to business failure, a slowdown in investment due to high uncertainty about future prospects and tight credit conditions to firms. This state of events can, in turn, depress the growth rate of total factor productivity,

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<sup>2</sup> For a comprehensive review of the various policy applications of potential output measures, see, for instance, De Masi (1997).

<sup>3</sup> For instance, European Commission (2009) identifies three possible scenarios in which the crisis could affect potential output. All three scenarios assume a short-run decline in the level of potential output but differ in terms of its long-run impact on the growth rate. In the first scenario, potential output growth accelerates after the crisis, therefore allowing the economy to recover all lost output and hence, the level of potential output returns to its initial trajectory. The second scenario assumes that potential growth rate returns to its pre-crisis rate in the long-run but there is a permanent downward shift in the level of potential output. The third scenario assumes that the growth rate of potential output will be permanently lower after a crisis, which implies an increasing loss of potential output over time compared with the pre-crisis level.

especially if it leads to lower spending on research and development. On the labour market front, in addition to the erosion of skills, some workers who lose their jobs may become discouraged in finding alternative work and leave the labour force entirely.

The implications of the global recession (triggered by the financial crisis of 2009) for the growth rate of potential output, and to determine whether the world (and in turn, the Maltese) economy will settle on a lower growth path, are still open issues. Apart from the crisis, demographic developments will adversely affect potential output growth in a number of countries in the coming years owing to the shrinkage of the workforce because of an ageing population. The assessment of such effects on the growth path of medium-term potential output remains a key issue for economic policy analysis.

After outlining the various methods used to estimate potential output, this article presents estimates for Malta derived from one of the most commonly used methods, that is, the production function approach. Given the uncertainty surrounding these kinds of estimates, they are compared with those made for Malta by other institutions using different methods. Based on this analysis and on a cross-country comparison, a number of policy recommendations and final observations are made.

## **2. Alternative methods to estimate potential output**

There are various methods available in the literature to estimate potential output.<sup>4</sup> These can be grouped into three broad categories: the production function or growth-accounting exercises, statistical approaches and measures computed from dynamic stochastic general equilibrium (DSGE) models. The first approach attempts to create an explicit model of the supply side of the economy using economic theory. The second simply attempts to break down real GDP directly into a trend and a cyclical component. The third approach, although founded in economic theory like the first, is conceptually different. It recreates the level of output of the economy that would prevail in the absence of the structural rigidities that form part of the underlying model.

The production function framework is generally considered a useful way to explain the key economic forces underlying developments in output and growth in the medium term.<sup>5</sup> This approach provides a comprehensive framework for estimating potential output, with a clear link between output and its long-term fundamental determinants. Thus, it may be used to assess the impact on potential output of structural changes and individual policies. Nevertheless, this approach has certain disadvantages. First, it raises important data problems, in particular measures of capital stock are often not available and data on hours worked are not very reliable. Second, it requires measures of the trend components of the factor inputs. Different assumptions about these trend components can lead to different estimates of potential output.

Statistical methods of estimating potential output are based on extracting the trend from the output series using statistical techniques. These methods can be divided into two categories. Univariate methods extract the trend from the information contained in the output series in isolation, without using the information contained in other variables. A widely used approach in such a univariate estimation of potential output is the Hodrick-Prescott (HP) filter. This filter extracts a trend component by trying to balance a good fit to the actual series with a certain degree of smoothness in the trend. While such filters are relatively easy to use, they have a number of drawbacks, the most important being the poor reliability of the end-of-sample estimates and the arbitrary choice of the smoothing parameter. In addition, these methods take no account of economic theory or of information involving other series, which may help to separate the trend from the cycle. The filter will also smooth structural breaks, even if these take the form of clear shifts in the level or the growth rate of the series and, therefore, it generates misleading estimates of potential output around

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<sup>4</sup> For a non-technical overview of these alternative methods and policy implications, see Mishkin (2007) or Cotis et al. (2005).

<sup>5</sup> The European Commission, for instance, adopts this method as it considers it as the only one that can “underpin a comprehensive economic assessment of the outlook” and is the most “satisfactory instrument to frame economic policy discussions or explain policy decisions to the public”. See European Policy Committee (2001). A sectoral production function approach is also used by the Congressional Budget Office (CBO) in the US, details of which are available in CBO (2001).

these periods. Moreover, this simple filter is ill adapted to handle the high degree of volatility manifested in the time series of very small open economies.<sup>6</sup>

Multivariate filters attempt to extract the trend using the information in the output series in conjunction with information contained in other variables, most notably inflation or the unemployment rate. These techniques typically attempt to take into account empirical relationships, such as the Phillips curve or Okun's Law.<sup>7</sup> They too, however, suffer from drawbacks, such as the sensitivity of these estimates to the modelling specification of these relationships, including the treatment of expectations and estimates of equilibrium concepts, like the non-accelerating inflation rate of unemployment (NAIRU).<sup>8</sup>

Finally, measures of potential output can also be derived using DSGE models. The latter are micro-founded models in which certain rigidities, such as wage and price stickiness, are used to match developments observed in macroeconomic data. Removing these rigidities offers a natural way to define a measure of potential output in a model-consistent way. This measure of potential output is thus defined as the output level that would be realised in equilibrium if prices and wages were perfectly flexible. The drawback of this approach is that, without rigidities, output – identified as “potential output” in this framework – adjusts more rapidly than observed in the data. This gives rise to more volatile measures of potential output than usually obtained by other methods.<sup>9</sup> Furthermore, DSGE estimates of potential output are considered to be more model-dependent than the alternatives.

Given the advantages and drawbacks of various approaches used in the literature, analysts do not usually depend exclusively on a single estimate of potential output. The most common approach is to rely on a production function approach and then compute alternative estimates, most likely from a statistical model, as a cross-check. Disparities across potential output estimates and comparison with those published by international institutions, like the International Monetary Fund (IMF) and the European Commission, are often used as an indication of the uncertainty surrounding these estimates. When available, survey data on the degree of capacity utilisation can also be used either as a check on output gap estimates or as complementary information to inform policy makers on the current state of the economy.

### **3. The production function approach applied for the Maltese economy**

In line with the approach taken by international institutions, in this article the benchmark approach is taken to be a production function meant to model the supply side of the local economy. This production function relates output to the level of technology and factor inputs, namely labour and capital, by means of a constant-returns-to-scale Cobb-Douglas specification, namely:

$$Y_t = TFP_t * K_t^\alpha * L_t^{1-\alpha}$$

where  $Y_t$  denotes output at time  $t$ ,  $L_t$  the labour input,  $K_t$  the capital stock and  $TFP_t$  the total factor productivity. TFP is derived as the HP-filter of the Solow residual, using the standard smoothing parameter of 1600 for quarterly data. The ‘Solow residual’ is that part of economic growth that cannot be explained through growth in the capital stock or in the labour supply and is a proxy for productivity gains.

In the Maltese case the share of labour income is calibrated at 0.58, based on the share of compensation of employees in gross value added (GVA) adjusted for the proportion of the labour force that consists of self-employed. The stock of capital is calculated using the perpetual inventory method.<sup>10</sup> Housing investment is excluded from the measurement of the capital stock. The capital stock thus includes both public investment and non-housing investment by the private sector.

<sup>6</sup> See Grech (2013).

<sup>7</sup> See Micallef (2014) for an application of a multivariate filter for Malta to estimate potential output and NAIRU.

<sup>8</sup> Carnot et al. (2005).

<sup>9</sup> See Vetlov et al. (2010) for a discussion of alternative notions of potential output in DSGE models used in ESCB central banks.

<sup>10</sup> The perpetual inventory method is based on the following formula:  $K_t = (1 - \delta)K_{t-1} + I_t$ , where  $K_t$  is level of the capital stock,  $I_t$  is real investment and  $\delta$  represents the depreciation rate.

In more detail, labour input comprises several key variables of the labour market:

$$L_t = WAP_t * \overline{PR}_t * (1 - \overline{UNR}_t) * \overline{HRS}_t$$

where  $WAP_t$  denotes the working-age population,  $\overline{PR}_t$  the trend participation rate,  $\overline{UNR}_t$  the NAIRU and the  $\overline{HRS}_t$  trend hours worked. To help derive potential labour utilisation, the trend participation rate and hours worked are obtained using the HP filter. NAIRU is computed from a multivariate filter, which is based on well-established relationships in economic theory, such as the Phillips Curve and Okun's Law.<sup>11</sup>

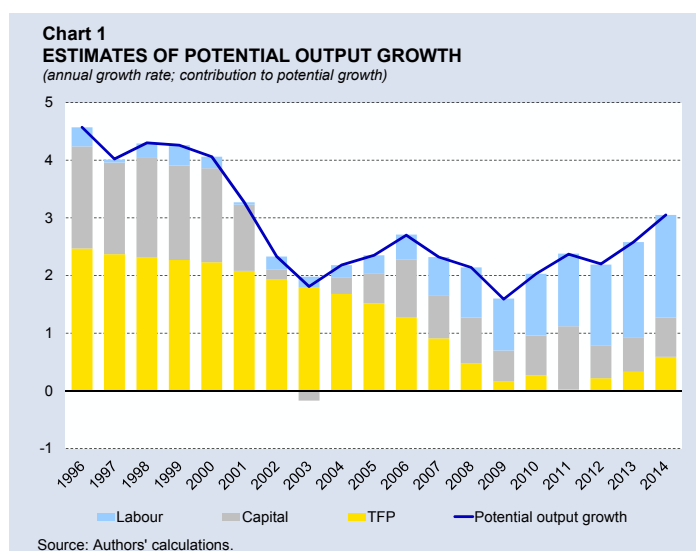
#### 4. Estimates of potential output growth for Malta

Chart 1 plots potential GDP growth and its decomposition between 1996 and 2014, using the production function approach.<sup>12</sup> According to this method, Malta's potential output growth declined from above 4% in the late 1990s to a trough of below 2.0% in 2003, primarily owing to both a downward trend in productivity and a slowdown in investment, with the latter leading to a slower accumulation of capital.<sup>13</sup> Potential output growth recovered slightly during the cyclical upswing between 2004 and 2008, peaking at around 2.7% in 2006. This increase was driven by a rebound in investment and a stronger contribution from labour, mostly due to favourable demographics. On the contrary, the contribution from TFP maintained its downward trend.

The recession of 2009 had an adverse effect on potential output growth, which declined to around 1.8% per annum between 2009 and 2010. The slowdown was mainly due to the contribution of capital and TFP, which maintained its downward trend. The contribution of capital to potential output growth declined from an average of 1.0 percentage point before the crisis to around 0.7 percentage point between 2010 and 2014. This calculation is however influenced by the relatively high investment rates of the late 1990s. Over the past decade, the contribution of capital remained broadly stable at around 0.7 percentage points, as the post-crisis slowdown in investment was mainly driven by housing, which, as described above, are excluded from the calculation of productive capital.

The contribution of TFP to potential output growth has recovered somewhat since 2012 but it still remains a fraction of that experienced in the late 1990s and early 2000s. From a longer-term perspective, the slowdown in TFP growth started before the crisis and could be a reflection of structural changes in the Maltese economy, such as the reallocation of resources to sectors, for instance, from manufacturing to services, where productivity growth is slower (Dabla-Norris et al., 2015). More generally, a striking feature of the evolution of TFP in Malta is the absence of pro-cyclicality – (productivity, whether measured in terms of labour or total factor productivity, generally tends to rise during booms and falls during recessions) – that is usually observed in other economies (Basu & Fernald, 2001).

The contribution of labour to potential output growth increased significantly in recent years (see



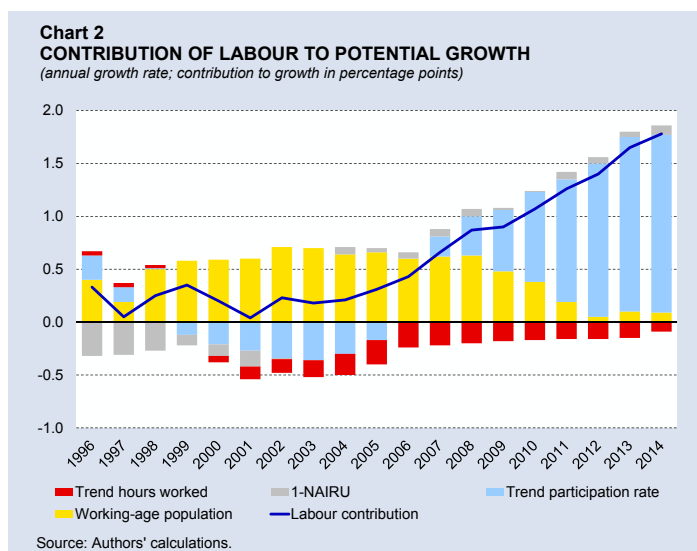
<sup>11</sup> See, for instance, Benes et al. (2010).

<sup>12</sup> Estimates in this paper are based on ESA 2010 methodology. Minor differences from the results presented in Grech & Micallef (2013) are due to the use of ESA1995 statistics.

<sup>13</sup> Similar results are reported in Grech (2004).



Chart 2). In the years before the recession, the main source was an increase in the working-age population and, to a lesser extent, the downward trend in NAIRU. On the contrary, both the trend participation rate and hours worked contributed negatively. The latter coincides with the increase in part-time employment, which lowers the hours worked per person. In recent years, the unfavourable effects of an ageing population started to weigh in, with a gradual decline in the contribution of the working-age population. However, these effects have been outweighed by the rising participation rate. This was mainly driven by the rise in the female participation rate, which went up by 11.8 percentage points since 2008, by far the largest increase among EU countries, though it remains relatively low at 52.2% in 2014. NAIRU also maintained its downward trend, as the rise in the domestic unemployment rate started to be reversed as early as 2010.

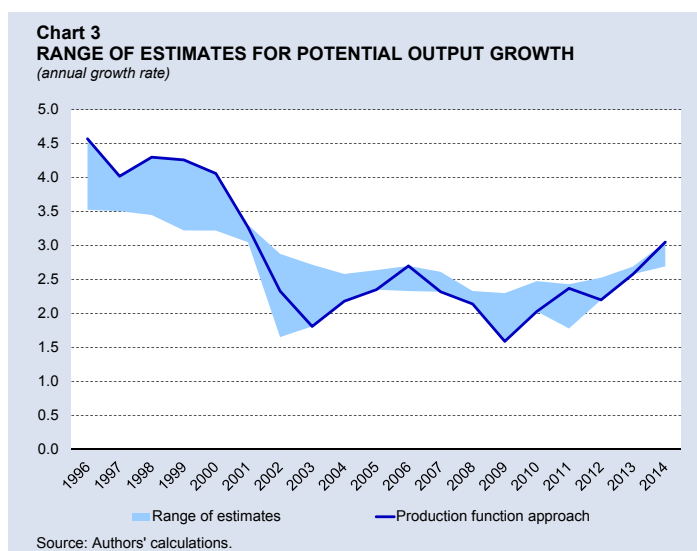


### 5. Comparison with estimates by other institutions

As already mentioned, estimates of potential output are surrounded by a considerable degree of uncertainty. This stems from a number of factors, such as the unobservable nature of this variable and the sensitivity of the results to the chosen method. The uncertainty surrounding the estimates of potential output is especially pronounced during a period of structural change in the economy or after a recession, when it is difficult to disentangle transitory effects from permanent ones.

One way of quantifying this uncertainty is by comparing the results of the production function approach with alternative estimates, computed for instance from a statistical model, or with those published by international organisations. This section compares the estimates made in the previous section of Maltese potential output and the output gap with four alternative estimates. These include a standard HP filter, and the estimates published by the Ministry of Finance and the European Commission. Estimates by the European Commission, which are based on a production function approach similar to the one presented in the previous section, refer to those published in the 2015 Autumn Economic Forecasts.<sup>14</sup> Estimates of potential output from DSGE models are not available for Malta.

Chart 3 plots a range of estimates of potential output growth around

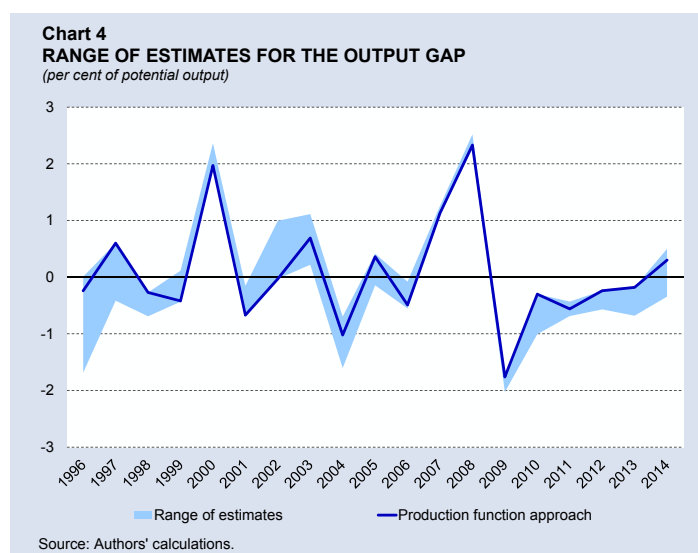


<sup>14</sup> For details of the Commission's production function approach, see D'Auria et al. (2010) and Havik et al. (2014). The Commission's approach is very similar to the one used in this paper with two main differences: (i) the labour share in the Commission's production function is assumed to be the same for all EU countries whereas in our case, it was calculated from the data, that is, the average share of labour in GVA adjusted for the share of self-employed and (ii) differences in extracting the structural components of some inputs in the production function, such as TFP and non-accelerating wage inflation rate of unemployment (NAWRU).

the estimates derived using the production function approach as outlined above. Despite some disparities across the various point estimates of potential output, the different models point to a similar story. Potential output slowed down significantly between the late 1990s and the early years of the last decade. Moreover, despite the moderate increase in the supply capacity during the cyclical upswing before the 2009 recession, potential output growth had not recovered to the rates prevailing in the late 1990s. The weakness in economic activity following the 2009 recession led to a slowdown in the growth rate of potential GDP, which however started to recover in recent years, with most estimates pointing to growth rates in 2014 that exceed those registered in the pre-crisis period.

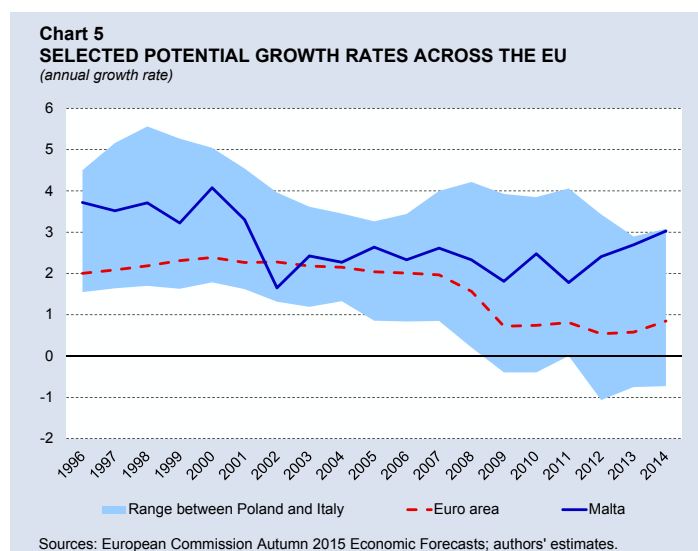
Building upon the various estimates for potential output, Chart 4 plots the range of estimates for the output gap. Allowing for some degree of uncertainty in point estimates, all the indicators are broadly consistent in the analysis of the business cycle fluctuations of the Maltese economy over the past two decades. Between 1996 and 2014, there were two clear periods when the economy was operating above potential. The first one was in 2000, driven in part by a large (temporary) increase in activity in Malta's semi-conductor industry in the context of the international technology boom. The second one occurred between 2007 and 2008, before the global recession.

This recession, which led to a fall in domestic output in 2009, also pushed output below its potential and led to a negative output gap of around 2%. The subsequent recovery in economic activity led to a relatively quick correction of the output gap, especially when compared to other EU economies. The output gap worsened slightly in 2012 owing to the slowdown in GDP growth due to the sovereign debt crisis in Europe but following two years of above average GDP growth, the gap between actual and potential GDP was broadly in balance by 2014.



## 6. Cross-country comparisons within the European Union

The impact of the great recession on Malta's potential output growth was more muted than in the rest of the EU. Chart 5 plots selected potential growth rates across the EU between 1996 and 2014. Poland, which is shown at the top of the range, had the most consistently positive potential output path in the EU, with growth averaging 4.1% per year, while Italy had the lowest, at just 0.7% on average. Note, however, that in some countries, potential output has exhibited boom and bust dynamics, with relatively high growth rates before the crisis, as in Ireland and Latvia, but



shrinking potential since 2008. Italy and Poland have, in fact, been selected on the basis of the consistency and stability of their growth path, in order to ascertain the main contributing factors behind success or failure.

The relatively strong growth of potential output in Poland appears to be driven by a consistent decline in structural unemployment, supported by a relatively stable, albeit moderate investment to GDP ratio. The long-term decline in Italian growth potential, from around 2.3% in 1980s to less than 1% in the 2000s, is driven by the downward trend in total factor productivity. Recent studies have attributed this slowdown to a combination of deteriorating competitiveness and resource misallocation, the latter most likely a result of out-dated management practices and limited penetration of information and communication technologies (Hassan & Ottaviano, 2012).

Malta has been closer to the top of the range, especially in the late 1990s and in the last two years, and has outperformed the average for the euro area, except during the period of economic restructuring that preceded EU accession in 2004. This bodes well for the pace of real convergence of the Maltese economy. The gap between the two economies has widened in recent years given the divergent path in economic growth experienced after the crisis. In particular, growth in the euro area seems to have stabilized at a lower level after 2009, although this picture masks considerable heterogeneity in the constituent countries. On the contrary, potential growth in Malta has already reached and, according to some estimates, even surpassed, the growth rate experienced in the cyclical upswing before the crisis.

Finally, as the sizeable changes in Malta's potential growth rates show, the business cycle in Malta is more volatile than in the euro area, as would be expected for a very small open economy, but, with the exception of the last few years, it is quite synchronised with that in the rest of the monetary union.

## **7. Conclusion**

As in other euro area countries, in Malta the impact of a slowdown in population growth has so far been offset by rising participation rates. In contrast, as in other countries with a better-than-average potential output path, Malta has been spared the large rise in the structural unemployment rate that has affected many euro area economies. However, TFP growth has been on a declining trend, especially when seen from a longer term perspective and, despite the pick-up in recent years, its contribution to potential output growth is only a fraction of that observed in the late 1990s.

To sustain the growth in potential output, it is crucial to create a better business environment and generate the conditions to facilitate more start-ups, while attracting new businesses to Malta. The ageing Maltese population limits the possible increases in participation rates, so that potential output growth is unlikely to be sustained only through higher labour inputs. That said, policymakers need to continue to put in place the right incentives for more people to join and remain longer in the labour force, while pursuing structural reforms to reduce unemployment. Given the increased share of very competitive high value-added service activities, it is also essential to have further investment in education to improve the quality of human capital and increase labour market flexibility. This must be supported by adequate investment in the supporting physical, communications and information technology infrastructure of the country. Finally, policymakers need to continue to pursue structural reforms that lead to an improvement in productivity.

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# OKUN'S LAW AND STRUCTURAL UNEMPLOYMENT IN MALTA

Brian Micallef<sup>1</sup>

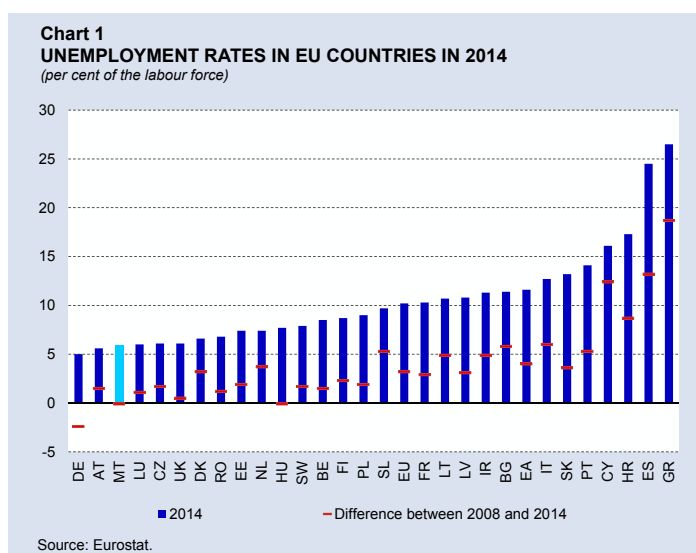
*This article looks at the output-unemployment nexus in Malta and different measures of structural unemployment (NAIRU), focusing in particular on the post-crisis period. The relationship between output and unemployment is relatively weak in Malta compared with other EU economies, although the link has become more pronounced in recent years. Empirical estimates suggest that the rate of output growth consistent with a stable unemployment rate is around 2%, with an Okun's coefficient of slightly less than 0.2. Over the course of the business cycle, the output-unemployment relationship appears to be more pronounced during recessions. Various estimates suggest that Malta's NAIRU has been on a downward trend over the past decade and that the 2009 crisis had no permanent impact on NAIRU.*

## 1. Introduction

The economic and financial crisis of 2009 and more recently, the sovereign debt crisis of 2012 have taken a heavy toll on the labour market in Europe, although to differing degrees in various countries. This is most evident by the different unemployment rates, which have reached unprecedented levels among EU countries (see Chart 1). For instance, in 2014, the lowest unemployment rate in the European Union was registered in Germany, at 5.0%, whereas in Greece it stood at 26.5%. Youth unemployment has reached even more alarming figures in some countries, exceeding 50% in Spain and Greece. At 5.9% in 2014, the unemployment rate in Malta remains one of the lowest in the European Union.

This divergence among EU countries can be explained by a number of factors. In addition to the severity of the crisis, differences also reflect the nature of the shocks hitting the individual economies and the presence of pre-crisis imbalances, such as booms in the construction sector or accumulated losses in competitiveness (ECB 2012b, 2015). Differences in country-specific labour market institutions and variations in policy initiatives designed to deal with fluctuations in economic activity also play an important role in explaining the cross-country heterogeneity.

In economic literature, the negative relationship between output and unemployment is known as Okun's Law, named after the economist who first documented this relationship in the early 1960s.<sup>2</sup> Part of the appeal of Okun's Law is its simplicity, even though it is widely recognised that this "law" is just a statistical relationship and not necessarily a structural feature of an economy. This means that this relationship may not be stable over time, especially when the economy undergoes structural changes. Indeed, recent studies suggest that this may be the case, especially after



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<sup>2</sup> See Okun (1962).

the economic and financial crisis of 2009.<sup>3</sup> Empirical studies also document significant variations in Okun's coefficient across countries, while others point towards the presence of asymmetries in this relationship, with unemployment likely to rise more during recessions than to decrease during periods of expansion (Ball et al., 2012; Casez & Verick, 2011).

In addition to the business cycle movement between output and unemployment, however, in stressed countries the rise in the unemployment rate was accompanied by an increase in the long-term unemployed. The latter was especially pronounced for young people. This could lead to the erosion of human capital as jobless workers lose skills or drop out of the labour market, eventually resulting in even higher structural unemployment and lower output growth.

The 'structural unemployment rate' is defined as the rate of unemployment consistent with stable inflation (Gordon, 1997). This is also referred to as the 'non-accelerating inflation rate of unemployment' or NAIRU. The level of NAIRU and its evolution over time are important for policy makers for a number of reasons. First, it is essential to measure the 'unemployment gap' – defined as the gap between the unemployment rate and NAIRU – which is a cyclical indicator of the state of the labour market and a useful measure for assessing the outlook for inflation. Over the course of the cycle, an actual jobless rate that exceeds NAIRU (that is, a positive gap) provides an indication of downward price pressures. Inversely, an unemployment rate which falls short of the NAIRU (that is, a negative gap) is a signal of higher inflation. Second, NAIRU is a key component in measuring potential output and thus the output gap as well as, indirectly gauging cyclically-adjusted fiscal indicators. Finally, developments in NAIRU provide an indication of the success or otherwise of structural labour market policies.

Against this background, this article presents empirical estimates for Okun's law in Malta, and tests the stability of this relationship over time and its sensitivity to the economic cycle. The second part of the article focuses on developments in NAIRU. In both sections, developments in Malta are also compared with those of other EU economies, focusing in particular on the post-crisis period. The article concludes with some policy recommendations based on the main findings.

## 2. Okun's Law

The original formulation of Okun's Law, estimated with post-second World War US data, suggested that a 2.0% to 3.0% drop in output growth is associated with an increase in the unemployment rate of around 1 percentage point. More recent estimates for the euro area in the pre-crisis period suggest that a 1 percentage point decline in output growth is associated with a contemporaneous 0.4 percentage point rise in the unemployment rate (ECB, 2011). Estimates based on a period that includes the recession, point to a reduction in the output-unemployment relationship, to around 0.3 percentage point, as measures adopted during the crisis to stem the pace of job losses have led to some distortions in this relationship.

There are two versions of Okun's Law.

The 'difference' version relates the change in unemployment rate (UNR) to real gross domestic product (GDP) growth:

$$\Delta\text{UNR} = c_1 - c_2 * \Delta\text{GDP} \quad (1)$$

where  $\Delta\text{UNR}$  represents the annual percentage point change in the unemployment rate and  $\Delta\text{GDP}$  measures the annual percentage change in real GDP. This equation captures the contemporaneous correlation between GDP growth and changes in the unemployment rate. The parameter  $c_2$  represents Okun's coefficient, which a priori is expected to be negative, since positive GDP growth is associated with a declining unemployment rate. The ratio  $\frac{-c_1}{c_2}$  represents the rate of output growth that is consistent with a stable unemployment rate.

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<sup>3</sup> See Knotek (2007).

More recently, a dynamic version of Okun's relationship has evolved through the introduction of lags in equation (1) in both the dependent and the explanatory variables.<sup>4</sup> This is meant to account for changes in economic activity that affect the labour market with a lag and for the possible omission of relevant variables from the equation.

The 'gap' version relates the level of the unemployment rate to the output gap, i.e. the difference between actual and potential GDP:

$$\text{UNR} = c_1 - c_2 * \text{output gap} \quad (2)$$

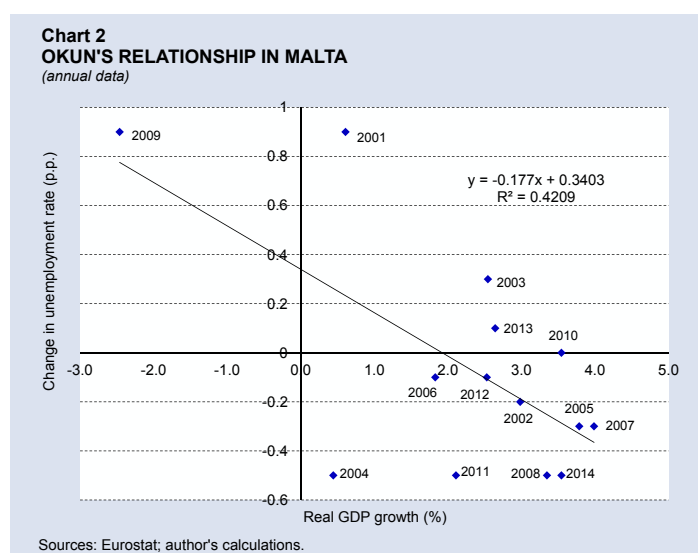
In this specification, the parameter  $c_1$  is associated with the unemployment rate that is consistent with full employment while, a priori, one expects  $c_2$  to be negative. The problem with this specification is that the output gap and potential output are unobservable variables. Economists usually estimate these variables by statistical filtering techniques or by using a production function approach. To avoid a debate on the appropriate approach to estimate the output gap, and in the light of the sensitivity of the results of the method chosen, the rest of this article will focus on the difference version of Okun's Law.

### 3. Empirical estimates of Okun's Law

Chart 2 shows the annual changes in the unemployment rate against real GDP growth for Malta, using annual data for the period between 2001 and 2014. The chart shows that, as expected, there is a negative relationship between real GDP growth and the change in the unemployment rate, with periods of economic expansions being associated with a declining unemployment rate and vice versa. The rate of output growth consistent with a stable unemployment rate is estimated at 1.9%. The regression line that runs through the scatter plot implies an Okun's coefficient of 0.18. This means that a 1 percentage point increase in GDP growth in excess of 1.9% lowers the unemployment rate by around 0.18 percentage point.

Excluding 2004 from the analysis, which as seen in Chart 2 is an outlier, the estimated Okun's coefficient increases to slightly above 0.2, while the rate of output growth consistent with a stable unemployment rate rises to 2.3%. In this case, we also observe a considerable improvement in the fit of the equation, with the R2 increasing from 0.42 to 0.63.

Table 1 presents further econometric estimates for the difference version of Okun's Law for Malta, using quarterly data from the first quarter of 2001 to the last quarter of 2014.<sup>5</sup> The first equation, named static, points to an Okun's coefficient of -0.08, while the rate of output growth consistent with a stable unemployment rate is estimated at 1.75%. The second and third row present results of the dynamic specification, with lags of both dependent and explanatory variables. The first dynamic version suggests that the effect of contemporaneous GDP growth on unemployment is not statistically significant. Both dynamic specifications



<sup>4</sup> See Ball et al. (2012) and Casez & Verick (2011).

<sup>5</sup> Since quarterly data start from 2000, the first four observations are lost when taking the annual growth rate in GDP and the change in the unemployment rate. GDP and unemployment statistics are derived from the National Accounts and the Labour Force Survey, respectively.

**Table 1**  
**REGRESSION COEFFICIENTS FOR OKUN'S LAW**

Dependent variable:  $\Delta(\text{UNR}_t)$   
Sample: 2001Q1 - 2014Q4

Specification	Explanatory variables			
	intercept	$\Delta(\text{GDP}_t)$	$\Delta(\text{GDP}_{t-1})$	$\Delta(\text{UNR}_{t-1})$
Static	0.14	-0.08 **		
Dynamic (1)	0.14	-0.01	-0.06 *	0.52 ***
Dynamic (2)	0.11		-0.07 **	0.53 ***

Statistical significance: \* at 10% level, \*\* at 5% level, \*\*\* at 1% level.

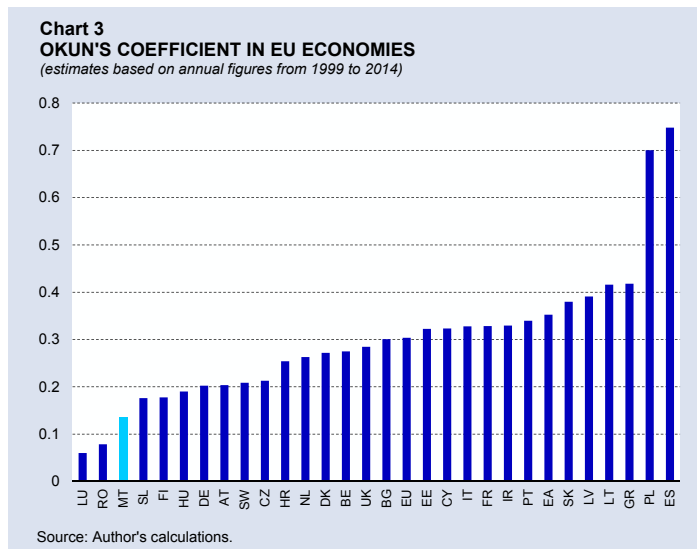
Source: Author's calculations.

suggest that developments in domestic economic activity affect the labour market with a lag. The short-run Okun's coefficient, lagged by one quarter, is estimated between 0.06 and 0.07, while the long-run coefficient stands at 0.15.<sup>6</sup> These estimates are broadly in line with a recent study on Okun's Law in Malta that uses administrative data on unemployment instead of the Labour Force Survey.<sup>7</sup>

Using the static specification as in Table 1 estimated on the basis of annual data from the start of the monetary union, Chart 3 plots Okun's coefficient for all EU countries. The chart shows that Okun's coefficient for Malta is one of the lowest in the European Union.<sup>8</sup>

The low coefficient of Okun's Law in Malta can be explained by a number of factors. The first relates to the relatively large size of the public sector. Contrary to those in the private sector, employees in the public sector are to some degree sheltered from developments in the real economy. Labour hoarding could also be responsible for the low responsiveness of unemployment to economic activity. Businesses resort to labour hoarding if hiring new workers involves substantial search and training costs, namely, if the skills required are very firm-specific and, hence, difficult to find among potentially new workers. In such an environment, firms may opt to vary the utilization rate of labour during a period of temporary weak demand instead of laying off workers. Indeed, according to survey information collected in the context of the Wage Dynamics Report, more than half the surveyed firms indicated that, when faced with economic shocks, they prefer to cut non-labour costs and overtime rather than shedding jobs (Central Bank of Malta, 2012).

The cross-country comparison shows a considerable degree of heterogeneity in Okun's coefficient. This heterogeneity is due to differences in country-specific labour



<sup>6</sup> For instance, in dynamic equation (2), the long-run effect is calculated as:  $\frac{-0.09}{(1-0.57)}$ . See Vogelvang (2005) for further information on the long-run effects of dynamic models.

<sup>7</sup> Apap & Gravino (2014).

<sup>8</sup> This is consistent with the analysis in ECB (2012). Even when the year 2004 is excluded, the results would still leave Malta at the lower end of the rankings.



market institutions, employment protection legislation, labour market flexibility and the source and magnitude of shocks hitting the economy. For instance, the high coefficient in Spain is related to the elevated incidence of temporary contracts, which, over the past decade or so, have accounted for around a third of Spanish employment, thereby making it easier for firms to adjust employment in response to changes in economic activity.

### 3.1 Testing the stability of Okun's coefficient

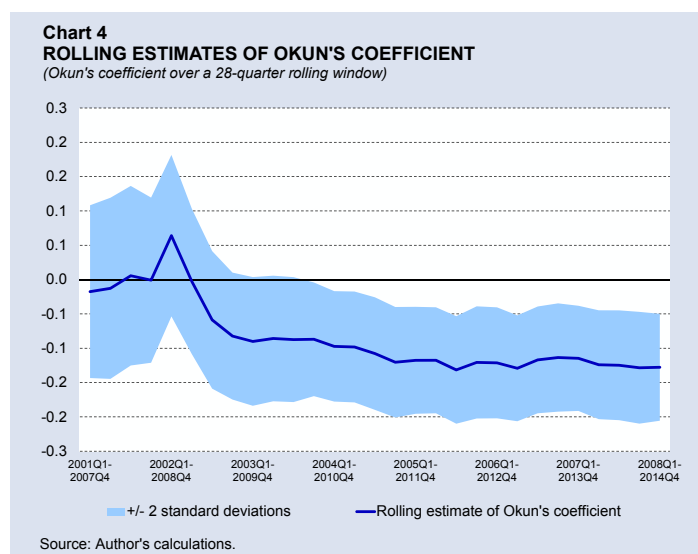
The stability of Okun's coefficient over time has recently been questioned by a number of studies.<sup>9</sup> To test this hypothesis, the empirical version of Okun's Law for Malta presented above is re-estimated using a 'rolling regression technique'. This means that the equation is estimated over a sequence of sample periods, thereby producing a set of estimated coefficients. This exercise applies the static specification using a fixed window of 28 quarters (seven years), which is broadly the length of the business cycle. More specifically, the first equation is estimated over the period 2001Q1-2007Q4, the second one for 2001Q2-2008Q1, and so on. This process is repeated until the final regression with a 28-quarter window includes the last observation from the sample (i.e. 2008Q1-2014Q4).

If the relationship between output and unemployment remained stable over the sample period, the coefficients from the regressions estimated over different samples should be relatively similar. On the contrary, substantial changes in the coefficients imply that the relationship has not been stable over time. This method provides the means for detecting whether developments in the early part of the last decade are influencing the estimation of recent relationships.

Chart 4 shows that the unemployment-output relationship in Malta has changed considerably over the last decade. In particular, the relationship between these variables was not statistically significant in the early 2000s. However, Okun's coefficient has been relatively stable and statistically significant since 2005, standing at slightly higher than 0.10. This finding is confirmed by restricting the estimation of Okun's law to the post-2005 sample, with Okun's coefficient becoming statistically significant and larger than the one showed in the first equation in Table 1.

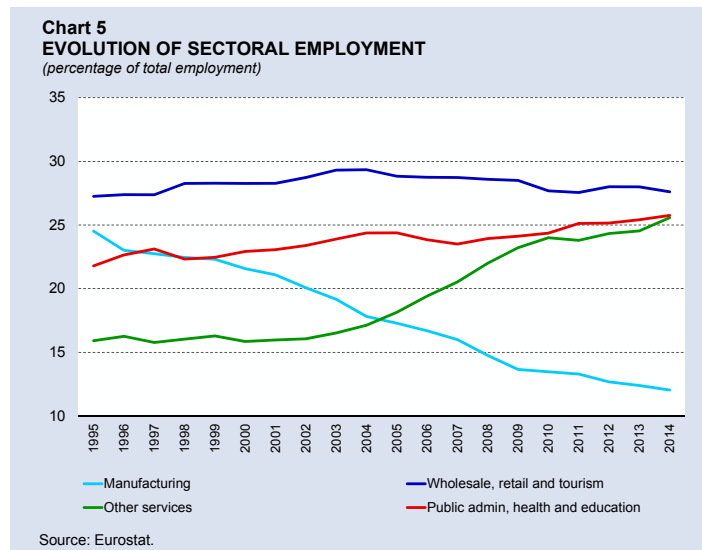
The increased responsiveness of unemployment to economic activity since the mid-2000s can be partly explained by the increased use of part-timers and workers with temporary contracts. For example, the share of temporary employees in total employees has almost doubled over the past decade. These workers have less employment protection relative to those with permanent contracts and, hence, their contracts are less likely to be renewed in times of falling demand. The share of employees with part-time work increased from slightly less than 9% of total employment in 2004 to more than 16% a decade later.

In general, this phenomenon should be seen in the light of structural changes that have taken place in the Maltese economy over the last decade. In particular, these are related to the diversification of the economy towards the services sector, which is more labour-intensive,



<sup>9</sup> See IMF (2012).

both in terms of output and employment, at the expense of traditional industries.<sup>10</sup> For instance, the share of employment in the manufacturing sector has steadily declined from 24.5% of total employment in 1995 to 12.0% in 2014 (see Chart 5). At the same time, the share of services excluding wholesale, retail and tourism has gone up from 15.9% to 25.6%.<sup>11</sup> These changes in the services sector occurred primarily after EU membership in 2004. The responsiveness of unemployment to output is thus affected by these trends in the labour market, with service industries being the main driver of employment growth in recent years, in conjunction with an expansion in the supply of labour driven by a gradual increase in the participation rate of females.



### 3.2. Testing for asymmetry

An important assumption in the specifications of Okun's Law outlined above is that the response of unemployment to GDP is restricted to be the same during expansions and recessions. Asymmetry in this relationship would imply that the response of the unemployment rate to changes in GDP depends also on whether the economy is expanding or contracting. Here, the asymmetry is tested through two methods that distinguish between periods of recessions and expansions.<sup>12</sup>

The first approach checks directly for asymmetry. In equations (1) and (3) in Table 2, the GDP growth rate is split into, and replaced by, two variables. One is  $d_{-}(\Delta GDP_t)^{-ve}$ , which consists of the rate of change in GDP for those quarters when GDP contracted, while the remaining quarters show a value of zero. The other variable is  $d_{+}(\Delta GDP_t)^{+ve}$ , which contains the rate of change in GDP for those quarters when GDP increased, while the remaining quarters show a value of zero. Equation (3) also includes an autoregressive term.

The specifications in the second approach (equations 2 and 4) account for asymmetry by retaining overall GDP growth, but also adding  $d_{-}(\Delta GDP_t)^{-ve}$ , the dummy for GDP contraction, already referred to in the previous paragraph. In this way, the second approach tests for both the standard Okun's coefficient and the coefficient during periods of negative GDP growth. Equations (4) also contain an autoregressive term.

Table 2 presents the results for Malta from both static and dynamic specifications of the difference version while testing also for asymmetry. Both static and dynamic specifications provide evidence of an asymmetric relationship between output and unemployment, indicating that during recessions the response of unemployment to output tends to be more pronounced.<sup>13</sup> Estimates of Okun's coefficient during periods of positive growth are lower than those during periods of negative growth, but these estimates are not statistically significant and with the wrong sign.

According to the estimates in Table 2, Okun's coefficient during a recessionary environment can increase to around 0.4 and hence, is significantly more pronounced than those presented in the symmetric specifications of Table 1.

<sup>10</sup> See Grech (2015).

<sup>11</sup> This category includes information & communication, finance & insurance, real estate activities, professional, scientific & technical sectors and the recreation sector.

<sup>12</sup> Similar approaches were used in Knotek (2007) and IMF (2012).

<sup>13</sup> A similar finding for Malta was reported in Cazes & Verick (2011).

**Table 2**  
**REGRESSION COEFFICIENTS WITH ASYMMETRY**

Dependent variable:  $\Delta(\text{UNR}_t)$

Sample 2001Q1 - 2014Q4

Equation	Specification	intercept	Explanatory variables				
			$\Delta(\text{GDP}_t)$	$\Delta(\text{GDP}_{t-1})$	$\Delta(\text{UNR}_{t-1})$	$d_{-\Delta(\text{GDP}_t)^{-ve}}$	$d_{+\Delta(\text{GDP}_t)^{+ve}}$
1	Static	-0.24				-0.39***	0.03
2	Static	-0.24	0.03			-0.42***	
3	Dynamic	-0.22			0.50***	-0.27***	0.04
4	Dynamic	0.01		-0.04	0.48***	-0.17***	

Statistical significance: \* at 10% level, \*\* at 5% level, \*\*\* at 1% level.  
The last two columns refer to the specification of dummy variables to test for asymmetry.  
Source: Author's calculations.

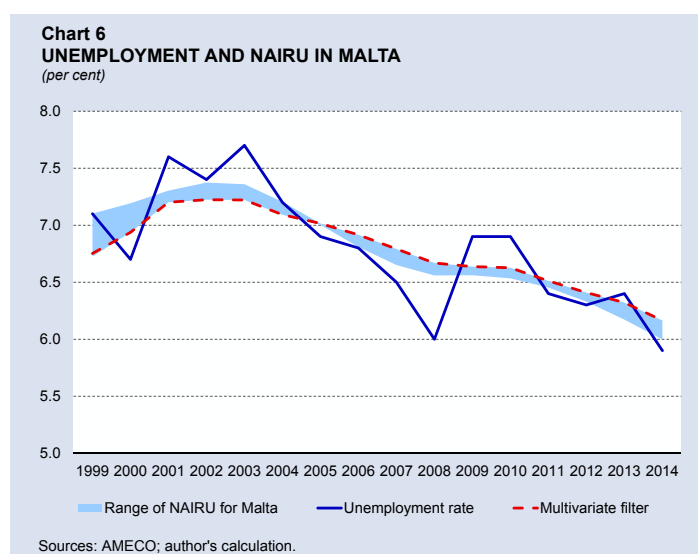
#### 4. Estimates of structural unemployment

In addition to the business cycle movement between output and unemployment, however, in stressed countries the rise in the unemployment rate was accompanied by an increase in the long-term unemployed. In the euro area, output remains far below the pre-recession trend while unemployment has remained stubbornly high, especially when compared with other advanced economies such as the US and UK. These factors have brought the issue of hysteresis, a concept originally introduced in the 1980s, back to the policy and academic debate (Blanchard & Summers, 1988).

Like potential output, NAIRU is an unobservable variable and has to be estimated using statistical or econometric models. There are two main methods used in the literature. The first is a statistical approach, like the Hodrick-Prescott (HP) filter, which extracts the trend component from a time series of unemployment. While this approach is relatively easy to implement, it suffers from the usual drawbacks associated with these filters, including the end-of-sample bias and difficulties to adequately capture structural breaks. The second approach links statistical approaches to economic information, based on long-standing economic relationships like the Phillips Curve and Okun's Law. The former links price pressures to slack in the economy or in the labour market, while the latter focuses on the relationship between economic activity and the unemployment rate. Studies that rely on a reduced form of the Phillips curve framework sometimes use both price and wage inflation to estimate time-varying structural unemployment rates.

Given the uncertainty surrounding estimates of NAIRU, central banks typically rely on more than one approach. These approaches are usually compared with estimates derived from policy institutions, like the European Commission, the International Monetary Fund and the Organisation of Economic Co-operation and Development. When available, estimates of NAIRU and the unemployment gap are also benchmarked against soft indicators, for instance, from business surveys or information on vacancies, to facilitate economic interpretation of results.

Chart 6 plots the range of different estimates of Malta's structural



unemployment against the actual unemployment rate. The range is based on three different estimates of NAIRU: a multivariate filter, an HP filter and the estimate used by the European Commission in its Autumn 2015 economic forecasts. The multivariate filter is estimated using data on real GDP, the unemployment rate, core inflation and foreign demand, the latter reflecting the small and open nature of the Maltese economy.<sup>14</sup> The multivariate filter approach is used by the Central Bank of Malta as the measure of NAIRU in its macro-econometric model and is also a key input in the Bank's estimates of potential output.<sup>15</sup> To estimate the NAIRU, the European Commission applies a multivariate filtering approach that decomposes the trend from the cycle.<sup>16</sup>

Despite uncertainty surrounding point estimates, the different approaches point to broadly similar dynamics in Malta's NAIRU over the last decade.

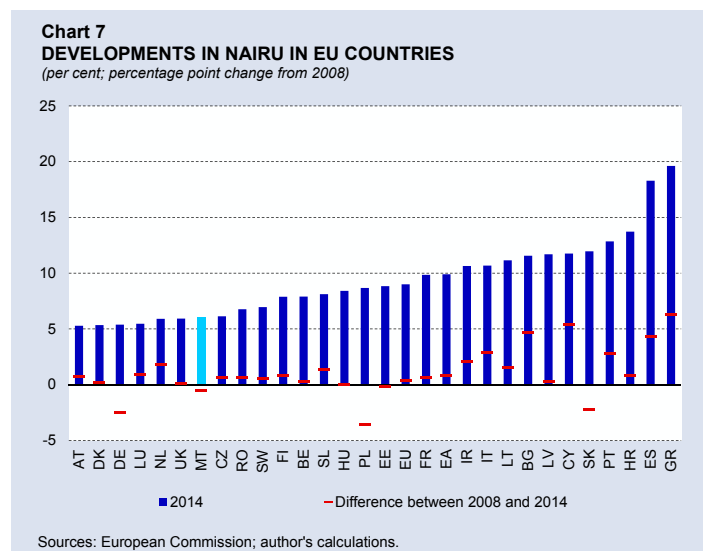
In the early 2000s, NAIRU was relatively high, standing at between 7.2% and 7.4%. This period was characterised by sluggish economic growth, owing both to shocks that hit the economy and the introduction of foreign competition in certain industries in the run-up to EU membership. As a result, the 'unemployment gap', the difference between the actual unemployment rate and NAIRU, was broadly positive during this period.

The period between 2004 until the onset of the recession in 2009 was characterised by a downward trend in NAIRU. This period saw the diversification of the economic base from traditional industries to higher value added ones, mostly in the services sector but also in manufacturing. Consequently, the unemployment gap turned negative in 2007 and 2008.

The economic and financial crisis in 2009 led to a sharp increase in the unemployment rate, though it still remained below the levels seen between 2001 and 2003. In addition, unlike the situation in stressed European countries, the rise in the domestic unemployment rate proved to be temporary, with the rate gradually declining to pre-crisis levels, and the positive unemployment gap closed by 2011.

This performance was due to a number of factors, including the timely and targeted intervention of the authorities to assist the manufacturing and tourism sectors, the diversification of the economy to sectors which proved resilient to the recession and the absence of major shocks in the financial sector (Micallef, 2013). As a result, NAIRU maintained its downward trend, standing at around 6.0% - 6.2% in 2014.

Chart 7 plots the level of NAIRU for all EU countries in 2014 and the change in structural unemployment compared with the level prevailing before the crisis. As expected, this cross-country comparison shows a high degree of heterogeneity among EU countries. Compared with other EU countries, Malta has a relatively low structural unemployment rate and is one of only a few countries which have experienced a drop in NAIRU between 2008 and 2014. On the contrary, stressed economies have not only high levels of



<sup>14</sup> See Micallef (2014).

<sup>15</sup> See Grech & Micallef (2013) and Grech & Micallef (2014).

<sup>16</sup> See D'Auria et al (2010).

NAIRU but also experienced an increase in structural unemployment from pre-crisis levels. For instance, estimates of NAIRU in Greece and Cyprus increased by more than 5 percentage points since 2008.

## **5. Conclusion**

The results presented point to a number of interesting observations on the relationship between real economic activity and the labour market in Malta.

The relationship between output and unemployment is relatively weak in Malta compared with other EU economies, although the link has become more pronounced in recent years perhaps due to the changing structure of employment and the labour market. Empirical estimates suggest that the rate of output growth consistent with a stable unemployment rate is around 2%, with an Okun's coefficient of slightly less than 0.2. More specifically, this implies that a 1 percentage point increase in GDP growth above 2% lowers the unemployment rate by slightly less than 0.2 percentage point.

Over the course of the business cycle, the output-unemployment relationship appears to be more pronounced during recessions. This finding would strengthen the call for prudent fiscal policy during the business cycle to create fiscal space in good times, thereby allowing room for manoeuvre in times of subdued demand to stimulate economic activity and avoid job losses. In addition, the asymmetric relationship between unemployment and output implies that the pace of job creation following a recession may be insufficient to absorb the newly unemployed. Hence, a more proactive approach should be pursued to provide appropriate training and incentives to the unemployed to upgrade their skills to meet the changing requirements of the new industries, thereby facilitating their re-employment.

Turning to the structural component of unemployment, the range of estimates presented in this article suggest that NAIRU exhibited a downward trend since the early 2000s. A number of factors could have contributed to more labour market flexibility and to an improvement in the match between labour demand and supply, such as the rise in vocational training through the establishment of Malta College of Arts, Science and Technology (MCAST), stronger links between the educational system and industry, and the increase in the number of University graduates. A number of initiatives were also taken to motivate more people to join and stay longer in the labour market. The above analysis also shows that Malta has a low level of structural unemployment compared with other EU countries and that the economic and financial crisis of 2009 had no permanent impact on the domestic NAIRU. Malta in fact stands out as one of only a few countries in the EU that have actually experienced a decline in NAIRU compared to its pre-crisis level.

Remaining bottlenecks in the domestic labour market should, however, still be addressed. For instance, while the share of long-term unemployed has not risen to the same extent as in some other EU countries, it still remains relatively high, standing at around 46.9% of those searching for a job in 2014. Malta also ranks at the bottom end of EU rankings in terms of education attainment. The National Employment Policy, published in 2013, identifies low education attainment levels, partly driven by a high proportion of early school leavers and a mismatch between demand and supply of skills as the two main challenges facing the domestic labour market. Policies targeted at these two areas, together with others strengthening links between academia and industry, will increase the flexibility of the domestic labour market and enhance the efficiency of the matching process between job seekers and vacancies thereby contributing to a further reduction in structural unemployment.

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# THE PHILLIPS CURVE IN THE MALTESE ECONOMY

William Gatt<sup>1</sup>

*This paper estimates a Phillips curve for Malta over the period 1966-2014 and finds that the slope of the Phillips curve has flattened over time, implying that the link between inflation and economic activity has weakened. The study also finds a progressive increase in the importance of import price shocks in driving consumer price inflation in Malta. These results are robust to different modelling and estimation techniques. It is argued that these developments have been observed in other countries and that in the case of Malta they are driven by more stable inflation relative to the past, positive structural changes in the labour market as well as the effects of globalization.*

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## 1. Introduction

Economists believe that, in the short run, inflation moves in line with economic conditions. This relationship, known as the Phillips curve, traces its origins to an empirical exercise showing the existence of a negative relationship between nominal wage growth and unemployment in the United Kingdom, which A.W. Phillips published in 1958.<sup>2</sup> The theory developed after this finding spoke of how, during times of high demand, firms employ more workers, leading to a tighter labour market. This puts upward pressure on wage claims and, hence, on firm operating costs, which are reflected in higher prices for goods and services. Low demand generates the opposite effect. Thus, favourable demand-side shocks boost economic activity, lowering unemployment; subsequently, we should observe an increase in inflation.<sup>3</sup>

In the past policymakers believed they could exploit this trade-off and reduce unemployment at the cost of faster growth in prices. However, advances in the theory behind the Phillips curve, in particular the incorporation of people's expectations in the late 1960s, as well as a better framework for firms' pricing behaviour in the 1970s and 1980s, showed that exploiting this trade-off did not really pay off in the medium to long run.<sup>4,5</sup> Today the Phillips curve is a complex but important component of the New Keynesian micro-founded models, which are the workhorse models in academia, central banks and other policymaking institutions. Despite the rich theory behind it, recent studies have shown that simple versions of the Phillips curve can nonetheless summarise developments in inflation reasonably well.<sup>6</sup>

## 2. Estimating a Phillips curve for Malta

There are two main consumer price indices for the Maltese economy: the HICP and the RPI. Both these indices broadly cover the same set of goods and services, but the RPI does not cover services, which are related to tourism, such as accommodation services. Furthermore, the HICP database starts in 1996, while the RPI database dates much further back in time. As a result, inflation in the RPI was used as the explanatory variable in the Phillips curve for Malta. RPI inflation since the mid-1960s is shown in Chart 1.

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<sup>1</sup> Mr William Gatt is a Senior Research Economist in the Research Office of the Central Bank of Malta. The author would like to thank Professor Josef Bonnici, Mr Alfred Mifsud, Mr Alexander Demarco, Dr Aaron G. Grech and colleagues for valuable comments and suggestions during an internal presentation. Any errors, as well as the views expressed here, are the author's sole responsibility.

<sup>2</sup> Phillips (1958).

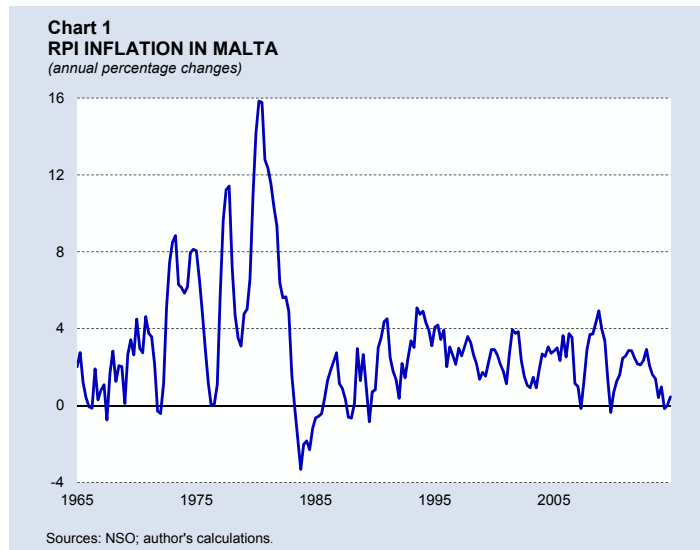
<sup>3</sup> Favourable supply-side shocks, such as lower oil prices, on the other hand tend to boost economic activity and lower inflation. For instance, in Grech & Micallef (2014) it is shown that a drop in oil prices of 20% lowers inflation by 0.74 percentage point after three years, in Malta. Conversely, a rise in government expenditure of 1% of GDP raises inflation by 0.47 percentage point over the same period.

<sup>4</sup> Economists soon realised that as people came to expect higher inflation owing to policymakers' intervention, unions called for higher wage growth, which increased unemployment back to the "equilibrium" level. When this point would have been reached, there would be no more upward pressure on price and wage growth, so the economy would return to the previous unemployment rate, yet it would have a higher rate of price inflation. Thus, the Phillips curve is vertical in the long run.

<sup>5</sup> For a list of the important contributions to this field, see Kajuth, F. (2012).

<sup>6</sup> See, for instance, Ball & Mazumder (2011) and ECB (2014).

Inflation was, on average, high and volatile in the early part of the period. This is in line with inflation in other advanced economies and was mainly due to the effects of two oil price shocks during the 1970s. The sudden drop in inflation in the early 1980s was due to a series of price controls, which were enacted to rein in price growth, particularly in household staples. Subsequently, the Maltese economy generated moderate inflation, which fluctuated around the average of 2.5% between 1990 and 2014. This stabilisation of inflation also mirrors developments in advanced economies.



While a simple plot of Maltese data on inflation and unemployment displays the negative relationship typically associated with a Phillips Curve, to understand this relationship one needs to adopt a more rigorous approach.<sup>7</sup>

The Phillips curve model that was specified for Malta is given by:

$$\pi_t = \alpha \tilde{U}_{t-3} + \gamma \pi_{t-1}^{IMP} + \rho_1 \pi_{t-1} + \rho_2 \pi_{t-4} + c$$

whereby  $\pi$  is annual RPI inflation,  $\tilde{U}$  is cyclical unemployment, defined as the deviation of unemployment from the non-accelerating inflation rate of unemployment (NAIRU),  $\pi^{IMP}$  is a measure of relative import price growth and  $c$  is a constant.<sup>8</sup> Similar specifications have been used in recent studies to understand the extent to which the Phillips curve holds in many advanced economies.<sup>9</sup> Estimation results based on Ordinary Least Squares, shown in Table 1, indicate that over the past four decades the link between inflation and economic activity was strong. Indeed, the coefficient  $\alpha$ , the “slope” of the Phillips curve, is negative as expected, and

	Full sample 1966Q4 - 2014Q4	Sub-sample 1 1966Q4 - 1995Q4	Sub-sample 2 1996Q1 - 2014Q4
$\alpha$	-0.48 **	-0.58 **	-0.28
$\gamma$	0.11 **	0.13 **	0.30 **
$\rho_1$	1.05 ***	1.09 ***	0.91 ***
$\rho_2$	-0.21 ***	-0.21 ***	-0.34 ***
$c$	0.30 **	0.10	1.11 **
Adjusted R <sup>2</sup>	0.860	0.867	0.638
Standard error of regression	0.857	1.408	0.675
Sample size (quarters)	193	117	76

Note: \*\*\*, \*\* and \* denote statistical significance at the 1%, 5% and 10% level of significance respectively, based on Newey-West standard errors.  
Source: Author's calculations.

<sup>7</sup> See Grech (2015a).

<sup>8</sup> The NAIRU was estimated by the author using a trend-cycle decomposition on the series of ETC data on the registered unemployment rate by means of a Kalman Filter. Developments in the NAIRU are qualitatively similar to those found in Micallef (2014), but as the former is based on registered unemployment, the level of the NAIRU is different. Relative import price growth is defined as inflation in the consumer price index of four major trading partners (France, Germany, Italy and the United Kingdom, weighted using relative import trade shares) less RPI inflation.

<sup>9</sup> See IMF (2013) and Blanchard, Cerutti & Summers (2015).

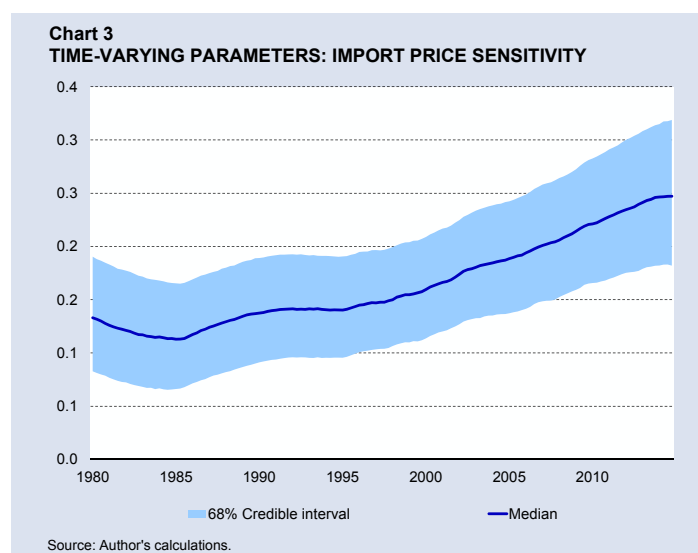
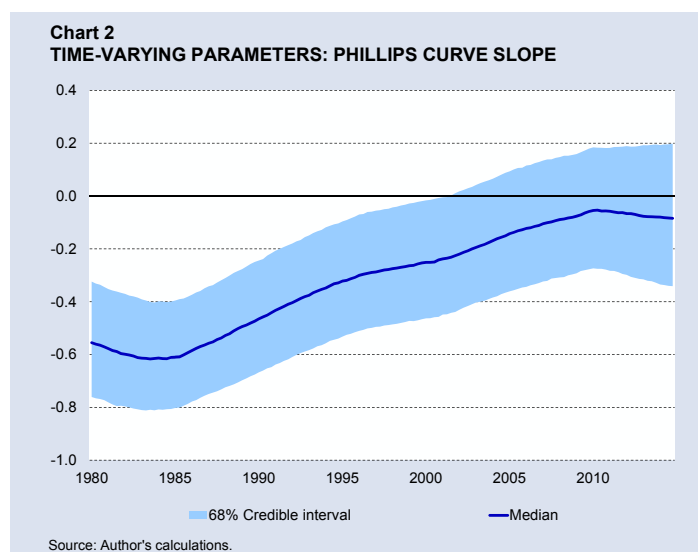


is statistically significant. The results also point towards an important role for import price shocks, on account of Malta having a small and open economy.

As noted above, the Maltese economy has been through two “regimes”: one with high and volatile inflation and another characterised by more moderate price growth. It is therefore reasonable to expect that these structural changes may have affected the Phillips curve relationship over time. To test this empirically, the sample was divided into two, and the Phillips curve was re-estimated over each sub-sample. The results are shown in Table 1. One can note that, while the slope in the first sub-sample is negative and significant, it is not statistically different from 0 in the second sub-sample. This can be considered as evidence of a flattening Phillips curve in the latter period, when inflation was no longer correlated to economic activity. On the other hand, it appears that the pass-through of import price shocks increased in the second sub-sample.

These results provide support to the hypothesis that structural changes may have changed the workings of the economy. To test this hypothesis further, the same specification was re-cast in terms of a Time-Varying Parameter model with Stochastic Volatility (TVP-SV), a more flexible model which allows the parameters and the variance of shocks to inflation to change over time.<sup>10,11</sup> Charts 2 and 3 show the estimated evolution of the slope of the Phillips curve and the import price sensitivity over time.<sup>12</sup>

The latter results provide further evidence of a weakening in the slope of the Phillips curve. In Chart 2 the slope starts close to the estimate from sub-sample 1 in Table 1 above, but then progressively falls in absolute terms to around one-sixth of this value by end-2014. Furthermore, the uncertainty around the estimates towards the end of the sample is high. Chart 3 shows the evolution of the parameter on relative import price shocks. It too



<sup>10</sup> While in the first set of results presented the parameters were treated as fixed, in this framework they were modelled as random walks. The logarithm of the variance of inflation is also modelled as random walk. A model which allows the parameters to change over time but ignores the changing volatility in the dependant variable is likely to overestimate or lead to spurious variation in the coefficients, as the latter ‘soak up’ some of the variance of the residuals. See Cogley & Sargent (2005) and Primiceri (2005). The TVP-SV model is estimated using Bayesian techniques.

<sup>11</sup> This follows the practice in recent studies. See Álvarez & Urtasun (2013), IMF (2013) and Blanchard, Cerutti & Summers (2015).

<sup>12</sup> Since estimation is based on Bayesian methods which use a training sample (in this case data spanning 1966Q4-1979Q4), the results are available from 1980 onwards.

confirms the hypothesis that the link between import price shocks and local inflation has increased since the late 1990s.

### 3. Conclusion

These phenomena are not unique to the Maltese economy. Studies by the International Monetary Fund and other institutions have found that the flattening of the Phillips curve has occurred in many advanced economies over the same period.<sup>13</sup> Starting in the mid-1980s, central banks committed to the sole task of maintaining stable inflation. It is argued that these efforts gained the public's credibility and ushered in the so-called Great Moderation – a period in which unemployment and inflation fell, economies prospered and business cycles became much less volatile. As a result, inflation expectations were controlled, leading to lower pressure on wage growth. Given these developments, the Phillips curve trade-off ceased to be exploited. This is one explanation.

At low levels of inflation people tend to resist any reduction in wages during bad times, and firms face costs in revising prices by a small amount too often.<sup>14</sup> These factors tend to weaken the link between economic activity and inflation, yielding a flatter Phillips curve.<sup>15</sup> A survey conducted by the Central Bank of Malta found evidence of downward wage rigidity: the majority of firms surveyed preferred to cut non-labour costs, reduce overtime and freeze, rather than cut wages when faced with economic shocks (Central Bank of Malta, 2011).

Another possible cause, particularly relevant to Malta, is that the labour market has changed significantly. Trade unionisation rates have declined substantially from 33% in 1995 to 23% in 2013 (Micallef & Caruana, 2014). At the same time, labour participation rates, which had remained stable for decades, rose very sharply after 1995, led by a near doubling of the female participation rate. In recent years, this was also complemented by a significant inflow of foreign workers (Grech, 2015b). Availability of labour may have dampened wage claims.

Globalisation can also account for these developments. Lower global inflation is in part due to increased openness to trade and cheaper imported goods – the so-called “China effect”.<sup>16</sup> In Malta this coincided with EU accession, the adoption of the euro and the growing rise of internet purchases, which all reduced the potential for lack of sufficient competition in the goods market.

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<sup>13</sup> Refer to the studies cited in Footnote 9. A few studies found that after the Great Recession of 2009, the slope actually steepened. See, inter alia, Oinonen & Paloviita (2014) and Riggi & Venditti (2015).

<sup>14</sup> See Yellen (2012) and Ball, Mankiw & Romer (1988).

<sup>15</sup> There is also further evidence (not presented here) that the Phillips curve is asymmetric in Malta; there is no link between economic activity and prices during a slowdown, but during an upturn prices seem to respond slightly to an overheating economy.

<sup>16</sup> For a discussion see Lewis & Saleheen (2014).

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## **PART III**

# **INFLATION IN MALTA**



# UNDERSTANDING INFLATION DYNAMICS IN MALTA

Brian Micallef and Reuben Ellul<sup>1</sup>

*This article focuses on the underlying patterns and determinants of inflation in Malta, with particular emphasis on inflation persistence and differentials compared to the euro area. Inflation persistence is moderate, estimated around 0.4, as domestic inflation has a tendency to return relatively quickly to its long-term mean. The latter averaged 2.5% per annum between 1997 and 2014, around 0.6 percentage points higher than in the euro area. These differentials are even more relevant in the context of a monetary union where country-specific shocks cannot be corrected by monetary and exchange rate policies but through structural reforms and relative price and wage adjustments. Model based decomposition of inflation differentials points to the predominance of cost-push shocks, with an important role also assigned to inflation expectations and the need to contain cost pressures.*

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## 1. Introduction

A full understanding of the underlying patterns and determinants of inflation is crucial for policy makers as they have important consequences for the conduct of monetary policy. The appropriate response of monetary policy to a shock depends on the degree to which the effect on inflation is persistent. In the euro area, monetary policy is determined by the Governing Council of the European Central Bank (ECB) with the aim of ensuring price stability in the euro area as a whole. However, a good understanding of Malta's inflation process is still very relevant for domestic policy makers. For instance, different degrees of inflation persistence – defined as the tendency of inflation to gradually return to its long-term mean following a shock<sup>2</sup> – compared to the euro area average could be a source of inflation differentials vis-à-vis the rest of the monetary union, which, in turn, will affect the country's external price competitiveness.

A country that registers persistently higher inflation than its main trading partners will eventually suffer from a deterioration in its external price competitiveness. Between 1997 and 2014, consumer price inflation in Malta, as measured by the Harmonized Index of Consumer Prices (HICP) averaged 2.5% per annum, 0.6 percentage points (p.p.) higher than in the euro area. During this period, inflation in Malta has been higher than in the euro area in all but four years.

Inflation differentials are even more relevant in the context of a monetary union, where asymmetric shocks cannot be corrected by changes in monetary or exchange rate policies. Instead, adjustment will have to take place through structural reforms, which increase the flexibility of the economy, and relative price and wage movements. While price dispersion is a common feature of currency unions, inflation differentials in the euro area have been very persistent, with some countries systematically registering higher or lower inflation compared to the union's average, exacerbating the internal imbalances within the monetary union.

In addition, a more in-depth understanding of the underlying process and determinants of inflation in Malta, both at the aggregate and sectoral level, enables researchers to enhance existing macro-econometric models, which would eventually lead to improved tools for forecasting and simulation analysis.

Against this background, this article focuses on the domestic inflation persistence process and the differentials vis-à-vis the euro area. It also looks at the main theories in the literature, sectoral developments and cross-country comparisons with other euro area countries. The final section provides some policy recommendations from the main findings.

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<sup>1</sup> Mr Brian Micallef is the Manager of the Research Office of the Central Bank of Malta. Mr Reuben Ellul is a Senior Economist in the Economic and Monetary Analysis Office. Any errors, as well as the views expressed here, are the authors' sole responsibility.

<sup>2</sup> See Altissimo et al. (2006).

## 2. The inflation process in Malta: key facts

Chart 1 plots the annual growth rate of consumer prices in Malta between 1997 and 2014, as measured by the HICP. During this period, various factors have influenced the inflation rate and pushed it away from its long-run mean. Examples include oil and commodity price shocks, exchange rate movements, the removal of levies on a range of imported products in the run-up to EU membership and fiscal measures such as VAT changes. Inflation is also influenced by the cyclical position of the economy, with periods of weak economic activity usually associated with lower inflation, and vice versa. Despite these occurrences, inflation in Malta appeared to have remained remarkably stable over this period, fluctuating around a mean of 2.5%, as can be seen in Chart 1.

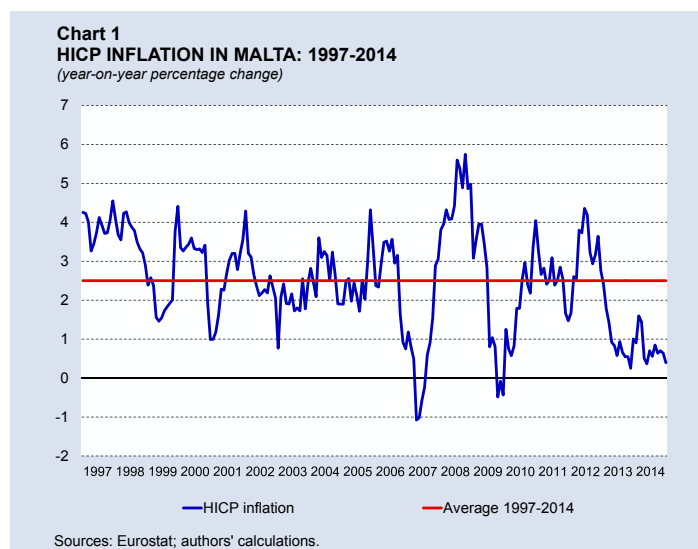


Table 1 provides key summary statistics for various measures of inflation in Malta and the euro area. On average, inflation in Malta has been around 0.6 p.p. higher than the 1.9% registered in the euro area. In addition, inflation developments in Malta have been more volatile, in part reflecting the interplay of external shocks, such as the high and volatile oil and commodity prices experienced in recent years, with domestic rigidities, such as monopolistic practices and low competition in certain sectors of the economy. The latter are, to a certain extent, structural features of a small economy.

Higher inflation in Malta is not limited only to the headline HICP index but is also present in other HICP sub-indices that exclude the most volatile components, such as energy and food, or administered prices. Between 1997 and 2014, measures of underlying inflation that exclude energy and food averaged around 0.5 to 0.7 p.p. higher than in the euro area and have been more volatile. For example, overall inflation excluding energy, food, alcohol and tobacco in Malta fluctuated between a maximum of 4.4% and a minimum

**Table 1**  
**KEY SUMMARY STATISTICS 1997-2014**

Per cent

	Average	Minimum	Maximum	Volatility <sup>(1)</sup>
<i>Malta</i>				
HICP inflation	2.3	-1.1	5.7	0.6
Overall inflation excluding energy	2.1	-0.6	4.8	0.5
Overall inflation excluding energy, food, alcohol and tobacco	1.7	-0.9	4.4	0.6
Overall inflation excluding administered prices <sup>(2)</sup>	2.1	-0.8	5.1	0.6
<i>Euro area</i>				
HICP inflation	1.9	-0.6	4.0	0.4
Overall inflation excluding energy	1.7	0.5	3.1	0.4
Overall inflation excluding energy, food, alcohol and tobacco	1.5	0.7	2.6	0.3
Overall inflation excluding administered prices <sup>(2)</sup>	1.9	-0.9	4.2	0.5

<sup>(1)</sup> Measured as the standard deviation of the series divided by the mean.

<sup>(2)</sup> Series start in 2002.

Sources: Eurostat; authors' calculations.



of -0.9% during this period, whereas in the euro area, the range was between 2.6% and 0.7%, respectively. Even with the exclusion of administered prices, inflation in Malta has been on average 0.2 p.p. higher. These findings warrant a deeper understanding of the structural forces behind Malta's inflation dynamics and the price setting behaviour of domestic firms.

### **3. Sources of inflation persistence**

The dominant theoretical framework for inflation in the literature, the so-called 'New Keynesian Phillips Curve' (NKPC), identifies three possible sources of inflation persistence.

First, persistence could arise from the degree of inertia or backward-looking methods in the price formation mechanism. This form of persistence is commonly referred to as 'intrinsic persistence'. Second, the way economic agents form their expectations about future inflation determines another type of persistence, which is referred to as 'expectations-based persistence'. The third source of persistence could be due to persistent fluctuations in the determinants of inflation, such as real marginal costs, which incorporates elements like wages and productivity that affect the cost structure of firms. This form of persistence is known as 'extrinsic persistence'. Each of these three sources is associated with one of the three terms of the NKPC, which is one of the core equations in today's structural models used for forecasting and policy analysis by policy institutions and academia.

In the NKPC,

$$\pi_t = \gamma_1 \pi_{t-1} + (1 - \gamma_1) E_t \pi_{t+1} + \gamma_2 mc_t \quad (1)$$

where  $\pi_t$  stands for inflation,  $E_t$  for expectations and  $mc_t$  for real marginal costs.  $\gamma_1$  and  $(1 - \gamma_1)$  determine the weight of inertia and expectations in the price formation process. These are assumed to add up to unity to ensure no long-run trade-off between inflation and economic activity (Berg et al., 2006).  $\gamma_2$  measures the sensitivity of inflation to cost conditions, which are typically assumed to vary according to the cyclical position of the economy.

A large body of literature has emerged on inflation persistence over the past decade focusing on these three sources of inflation persistence. This empirical work analysed a wide variety of data, including aggregate time series for the euro area and its member countries, micro consumer and producer prices as well as firm-level surveys. In general, however, econometric estimates of persistence are still surrounded by a considerable degree of uncertainty, possibly due to different methodological approaches, sensitivity to the choice of sample period and the price indices used.

Most studies in the literature estimate intrinsic or inertial inflation persistence using a univariate time series approach, mainly an autoregressive process.<sup>3</sup> In these models, inflation persistence is commonly measured as the sum of autoregressive coefficients.<sup>4</sup>

A common finding in this literature is that a high degree of reported inflation persistence is related to the neglect of breaks in the mean of inflation. For instance, when applying univariate regressions over a long sample, typically starting from 1970s or 1980s, most studies report highly persistent inflation processes for both the euro area and the United States. However, when structural breaks in the inflation mean are taken into account, most studies point to moderate degrees of inflation persistence.

Another common finding is the considerable degree of heterogeneity in persistence across countries and sectors. In general, most studies show that unprocessed food and energy exhibit a low degree of persistence, while industrial goods and services exhibit higher persistence. This difference across sectors most likely reflects different price-setting practices, which, in turn depend on the market structures in which firms operate (e.g. market determined vs. administered prices).

A number of studies also report evidence of aggregation effects, with persistence in disaggregated price indices being different from the aggregate series. This phenomenon could be attributable to idiosyncratic shocks in certain sub-indices cancelling each other out but also possibly because the more persistent series receive a larger weight (Altissimo et al., 2006).

<sup>3</sup> See for instance Levin & Piger (2004), Gadzinski & Orlandi (2004), Lünemann & Mathä (2004) and O'Reilly & Whelan (2004).

<sup>4</sup> Another branch of the literature uses structural or multivariate analysis to study persistence, thereby being able to estimate all the three sources of persistence. See Dossche & Everaert (2005).

Estimates of inflation persistence in Malta are relatively scarce. Demarco (2004) applies a first-order autoregressive model to sectoral Retail Price Index (RPI) sub-indices to construct a measure of core inflation for Malta. In this study, food and energy sub-indices were found to exhibit low persistence while certain sub-indices in services and industrial goods were found to have a moderate degree of persistence.<sup>5</sup> Two other studies compare aggregate inflation persistence in the euro area and the new Member States (Vladova & Pachedijiev, 2008; Franta et al., 2010). Both these studies report low estimates for Malta and that inflation persistence in Malta is broadly comparable to that of other euro area countries and lower than the estimates for most Eastern European Member States of the European Union.

### 3.1 Theoretical framework

Following Lünemann & Mathä (2004), we focus on inertial inflation and measure persistence as the sum of auto-regressive coefficients. The following equation was estimated for all price indices:

$$\pi_{i,t} = c_{i,t} + \sum_{k=1}^{K^*} \beta_{i,k} \pi_{i,t-k} + \varepsilon_{i,t} \text{ with } \rho_i = \sum_{k=1}^{K^*} \beta_{i,k} \quad (2)$$

where  $\pi_{i,t}$  refers to the average year-on-year inflation rate in quarter  $t$ , for index  $i$ , while the persistence parameter,  $\rho_i$ , refers to the sum of autoregressive coefficients, with  $K^*$  standing for the optimal lag length identified by the Akaike information criterion.<sup>6</sup>

This equation is useful for the assessment of inflation persistence, particularly because the assumption that the mean rate of inflation has remained constant over time is a reasonable one for the period under consideration, as can be seen in Chart 1.

A process is said to be ‘mean-reverting’, that is, tending to revert to a constant, ‘long-term mean’, if the autoregressive coefficient  $\rho$  lies within the range  $0 < |\rho| < 1$ .<sup>7</sup> On the other hand, if  $|\rho| = 1$ , we have a ‘unit root’ process, in which case the process does not return back to its mean after a shock. The term  $(1 - \rho)$  is called the ‘speed of mean-reversion’. A common way to measure the speed of mean reversion is to compute the half-life of a shock. The latter counts the number of periods in which the effect of a shock remains above half its initial impact.<sup>8</sup>

### 3.2 Methodology

To estimate inflation persistence, we use disaggregated HICP indices, published by Eurostat and covering the period from January 1996 to December 2014. The analysis focuses on year-on-year inflation rates measured at a quarterly frequency. This method is very similar to the one used by Demarco (2004). The main differences concern the use of the HICP instead of the RPI, a quarterly instead of a monthly frequency and an optimal lag-length chosen on the basis of an information criterion instead of being restricted to 1.

At the outset, it is important to highlight two points. First, data quality is more problematic in more disaggregated series, as the latter tend to be subject to significant structural breaks – such as price liberalisation in some sectors, changes in the composition of the indices and changes in data collection methods. One-off events also tend to have a more pronounced impact on disaggregated series. Second, the weights of the different indices may have changed significantly over the years. Thus, while individual disaggregated series may exhibit high levels of persistence, at a more aggregated level estimates could be lower, reflecting offsetting developments in the separate sub-indices over time.

Aggregation effects show up to when the degree of persistence at an aggregate level differs from that shown by its constituent parts. These effects can also appear across time, as the weights of the different components change over the years.

<sup>5</sup> The persistent categories were the following: housing, household equipment and maintenance, personal care, recreation and culture and other goods and services

<sup>6</sup> The optimal lag-length for each regression is determined separately for each sub-index. The equation also includes a constant term.

<sup>7</sup> A positive autoregressive coefficient implies the process reverts to its long-term mean in a smooth fashion while a negative coefficient implies that it converges to its means in an oscillatory pattern.

<sup>8</sup> Half-life measured in years is computed as  $\ln(0.5)/\ln(|\rho|)$ . The time it takes for a process to return to its mean following a shock depends on the autoregressive coefficient  $\rho$ : the lower the value of  $\rho$ , the faster it returns to its mean value and vice versa. For instance, the half-life associated with a persistence parameter of 0.3 and 0.5 is around seven months and one year, respectively. At the other end of the spectrum, a highly persistent process with an autoregressive parameter of 0.9 has a half-life in excess of 6.5 years.

For this study, a uniform estimation approach based on equation (2) was applied. Estimates were computed at high and intermediate levels of aggregation for the euro area, Malta, a number of small and open economies that share similar characteristics with Malta and for countries with significant trade links with the local economy. The countries covered include Cyprus, Estonia, Ireland, Italy, Luxembourg, Slovenia, the United Kingdom, as well as the euro area as a whole. The persistence parameter was calculated for the overall HICP inflation, the five main HICP components and the 12 HICP sub-categories.<sup>9</sup>

### 3.3 Results

Table 2 shows the estimates of the autoregressive coefficients at various levels of aggregation and across a number of economies. The persistence parameter for the overall HICP inflation in Malta is estimated at 0.44. The half-life associated with this parameter is slightly more than ten months.

Inflation persistence is lower in Malta than in the euro area as a whole and lower than in any of the other countries listed in Table 2. Estimates of the persistence parameter in Cyprus, another small open economy, is rather

**Table 2**  
**ESTIMATES OF THE DEGREE OF INFLATION PERSISTENCE ( $\rho$ ): 1997-2014**

	MT	EA <sup>(1)</sup>	LU	CY	EE <sup>(2)</sup>	SI <sup>(3)</sup>	UK	IT
Overall HICP	0.44	0.68	0.74	0.47	0.75	0.93	0.86	0.73
Food and non-alcoholic beverages	0.71	0.75	0.76	0.61	0.70	0.81	0.82	0.83
Alcoholic beverages, tobacco and narcotics	0.78	0.88	0.78	0.75	0.75	0.74	0.88	0.83
Clothing and footwear	0.57	0.31	0.69	0.47	0.89	0.83	0.90	0.55
Housing, water, electricity, gas and other fuels	0.77	0.79	0.61	0.53	0.80	0.78	0.75	0.75
Furnishings, household equipment and routine maintenance of the house	0.53	0.87	0.56	0.46	0.83	0.94	0.92	0.76
Health	0.84	0.79	0.73	0.86	0.78	0.92	0.58	0.70
Transport	0.58	0.69	0.69	0.61	0.76	0.89	0.71	0.72
Communications	0.86	0.82	0.74	0.88	0.87	0.86	0.88	0.71
Recreation and culture	0.73	0.70	0.67	0.66	0.74	0.86	0.86	0.85
Education	0.73	0.65	0.73	0.95	0.97	0.89	0.78	0.59
Restaurants and hotels	0.47	0.88	0.86	0.81	0.83	0.90	0.74	0.97
Miscellaneous goods and services	0.55	0.94	0.77	0.87	0.78	0.94	0.84	0.88
Energy	0.68	0.60	0.58	0.49	0.58	0.57	0.73	0.77
Unprocessed food	0.52	0.55	0.70	0.40	0.53	0.43	0.68	0.78
Processed food	0.59	0.81	0.82	0.63	0.74	0.86	0.87	0.79
Industrial goods excluding energy (NEIG)	0.57	0.60	0.69	0.72	0.83	0.92	0.93	0.64
Services	0.71	0.91	0.71	0.83	0.83	0.94	0.72	0.92
Services - Communication	0.86	0.82	0.74	0.88	0.87	0.80	0.88	0.71
Services - Housing	0.59	0.91	0.77	0.90	0.89	0.89	0.86	0.84
Services - Recreation	0.63	0.81	0.81	0.83	0.73	0.90	0.83	0.97
Services - Transport	0.54	0.81	0.80	0.65	0.85	0.86	0.65	0.69
Services - Miscellaneous	0.63	0.90	0.65	0.95	0.83	0.89	0.80	0.71

<sup>(1)</sup> For the euro area, miscellaneous services are unavailable for 1999.

<sup>(2)</sup> For Estonia, the indices for NEIG, overall services and housing services are only available from December 1997. Data for energy, recreational services and miscellaneous services are available from December 2000.

<sup>(3)</sup> For Slovenia, the indices for energy, unprocessed and processed food, NEIG and services are only available from December 1999.

Source: Authors' calculations.

<sup>9</sup> The main HICP components are unprocessed food, processed food, energy, non-energy industrial goods, as well as services overall and the services sub-components.

close to the estimate for domestic inflation. For the euro area as a whole, the persistence parameter is estimated at 0.68, which is within the range of estimates of between 0.40 and 0.80 reported by Altissimo et al. (2006).

A closer look at the disaggregated series for Malta indicates a degree of aggregation bias, as most sub-components of the HICP yield higher estimates of persistence than the overall HICP. A similar result is also evident in the estimates for Cyprus.

There is a large degree of similarity across countries in particular components, as also shown in several previous studies. In general, services and non-energy industrial goods exhibit a higher degree of persistence than energy and unprocessed food. On the contrary, prices for the latter two categories are changed more often, mostly in response to frequent changes in input prices.

In Malta inflation in services exhibits the highest degree of persistence compared with the other HICP categories, with a parameter estimate that is slightly above 0.70. This finding is shared by all seven countries listed in Table 2. In general, the services index demonstrates a narrow range of relatively high estimates for inflation persistence across the countries covered in this study. In fact, most of the services indices and its five sub-components have a persistence parameter in excess of 0.70 in all countries considered.

One possible explanation for the relatively high persistence in services could be due to this category's high dependence on wage costs. Since wages do not tend to be volatile and are changed rather infrequently, inflation persistence is apt to be more pronounced in cases where the labour content is higher. Another possible explanation is that prices in various service categories are subject to some form of price regulation and hence, not immediately responsive to demand and supply conditions.

Persistence in energy inflation in Malta is estimated at slightly below 0.70, somewhat higher than in the euro area. In previous estimates reported in Micallef & Ellul (2013), which only included data until 2012, the persistence of energy prices was lower. Low persistence estimates for energy constitute a common finding in the literature and the phenomenon is mainly associated with the frequent changes in input commodity prices. However, upon including more recent observations for the two years to 2014, the domestic persistence parameter for this component was markedly higher. This might reflect the downward trend in energy price inflation since 2010 brought about by the reduction in utility tariffs and the decline in the international oil prices.

Persistence in non-energy industrial goods and processed food in Malta is estimated at slightly below 0.60. Both are at the lower end of the range estimates across the countries in the study. At 0.52, the lower degree of persistence in the unprocessed food category can be associated with a pronounced seasonal pattern of some of the indices in this category, as also observed in a number of other countries.<sup>10</sup>

At a further level of disaggregation, the picture is more heterogeneous as one-off events or sector-specific developments become more pronounced. At the 12-level classification, one observes an increase in the degree of inflation persistence, with all sub-indices having a persistence parameter above 0.50. More generally, sub-indices whose prices are heavily influenced by government policy, such as tobacco and spirits, exhibit a high degree of persistence.

#### **4. Inflation differentials between Malta and the euro area**

With inflation persistence lower in Malta compared to the euro area, we now turn to possible explanations for the presence of inflation differentials between the two economic areas.

One possible source of inflation differentials can be households' different consumption expenditure patterns. A comparison of the evolution of the HICP consumption basket of Malta and the euro area between 1997 and 2014 leads to four main observations. First, despite the downward trend observed in Malta's hotels and restaurants category, this component, with a weight of 16.1% in 2014, is still significantly larger than in the

<sup>10</sup> This is confirmed by estimating persistence parameters for the individual components of the Food and non-alcoholic beverages sub-index (results are not shown). Within this category, the lowest persistence parameters were registered for Vegetables (CP0117), Fish and seafood (CP0113), and Fruits (CP0116), all of which contain a strong seasonal pattern.

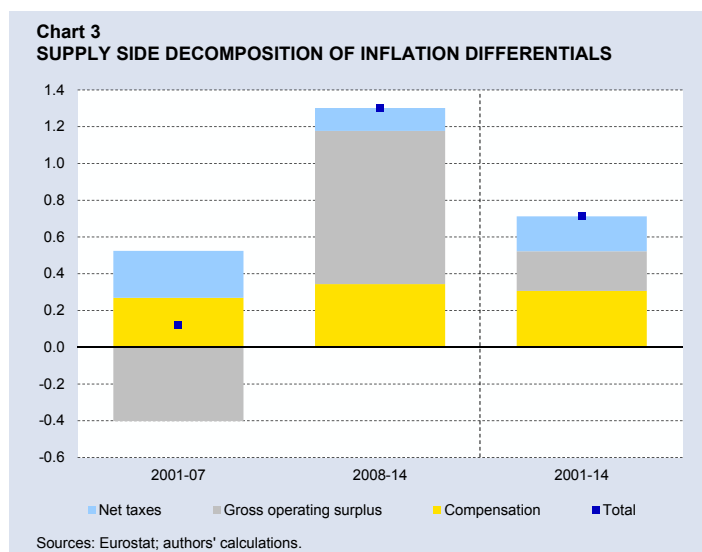
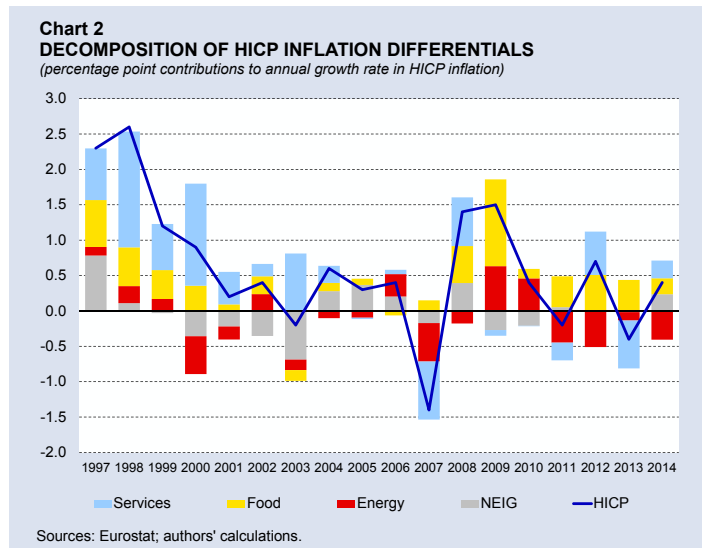
euro area, which stood at 9.2%, reflecting Malta’s reliance on the tourism industry. Second, the weight of the housing, water, electricity and gas component in Malta’s expenditure basket, which stood at 8.1% in 2014, still remains around half of that observed in the euro area. This is also reflected in the weight of the energy component in Malta, which at 8.0% in 2014, is one of the lowest among the euro area countries. Third, the weight of the food category in Malta, at 20.3%, has broadly converged to that in the euro area. Finally, one observes an increase in households’ expenditure on recreational and information technology-related items at the expense of more traditional categories, such as furnishing and clothing. This trend reflects society’s changing consumption patterns, especially the importance of online shopping observed in recent years, and is, in general, in line with spending habits in the euro area.

With the first three categories – hotel and restaurants, energy, and food – being important drivers of inflationary pressures in recent years, differences in weights in both regions’ consumption baskets could have contributed to exacerbate or dampen inflation differentials in the face of common shocks to both economies.

Finally, the underlying drivers of inflation differentials are different in the pre-EU and post-EU membership period. Chart 2 decomposes inflation differentials into four main components: services, food, energy and non-energy industrial goods (NEIG). This decomposition suggests that services, and, to a lesser extent, food, have been the main drivers of inflation differentials until Malta’s EU membership in 2004.

Inflation differentials have been more volatile and pronounced between 2007 and 2009. The sharp drop in 2007 was mainly due to hospitality prices and energy. The latter reflect the decision by the authorities to postpone the adjustment of utility prices to higher global oil prices. The subsequent revision in utility prices in the latter part of 2008 led to positive inflation differentials in a period when energy prices in the euro area started to decelerate. The positive inflation differentials in 2008 were also driven by the pick-up in hospitality prices, driven by a buoyant tourism sector following the arrival of low-cost airlines. Food price inflation remained stubbornly high in the latter half of 2008 and in 2009, despite the decline in international food commodity prices. Over the last four years, inflation in Malta has been broadly in line with that in the euro area.

From a supply-side perspective, price inflation as measured by the annual growth rate of the GDP deflator, can be decomposed in three components, namely growth in wages, profits (gross operating surplus) and net taxes (see Chart 3). Growth



in wages and net taxes has been the main driver of the differentials in the GDP deflator between the two economies before euro membership in 2008. The growth in wages was in part driven by two collective agreements in the public sector while the contribution of net taxes was positively affected by the increase in VAT rate to 18% in 2004. The contribution from gross operating surplus was, however, negative following a period of restructuring in the manufacturing sector. On the contrary, the differentials after euro area membership have been driven mainly by gross operating surplus, reflecting the sectoral diversification of the Maltese economy towards higher value-added industries. The contribution of wages and net taxes remained broadly similar between the two periods.

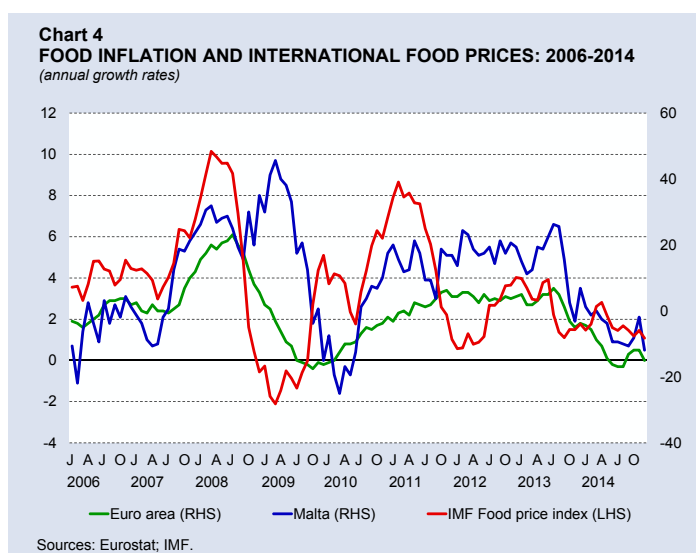
#### 4.1 Main theories explaining inflation differentials

The underlying sources of inflation differentials in EMU have been extensively studied and documented over the past decade.<sup>11</sup> In general, the factors explaining these differentials can be broadly grouped in three categories: (i) price level convergence (ii) cross-country differences in the business cycles and (iii) structural factors, such as heterogeneous product and labour markets.

Inflation differentials can be the result of equilibrium changes in relative prices due to price level convergence as a result of an economic catching-up process. In this case, higher inflation is not necessarily a 'bad' thing but rather an equilibrium process. In particular, the Balassa-Samuelson theory focuses on the effect of sectoral differences in productivity growth on the aggregate price level and is often associated with the process of convergence in income levels across countries.

Evidence suggests that the Balassa-Samuelson effect may have played only a limited role in explaining inflation differentials in Malta. Contrary to most of the countries that joined the EU in 2004 and 2007, relative income levels in Malta, as measured by GDP per capita in Purchasing Power Standards, were already above 80% of the EU average in the early 2000s. Price convergence, however, was more pronounced, increasing from 68.4% of the EU average in 2004 to 80.3% in 2014.<sup>12</sup>

The second theory is also not supported by the data. Before the onset of the crisis in 2009, while average GDP growth in Malta has been higher than that in the euro area, it was considerably below the growth rates experienced by other countries that were subject to demand shocks in the form of an appreciation in asset prices, or with similar levels of economic development.<sup>13</sup> In addition, Malta's business cycle had become increasingly synchronized with that of the euro area, although some differences emerged after the crisis, with Malta's output gap returning to broadly in balance by 2014 while economic slack remains significant in the euro area.

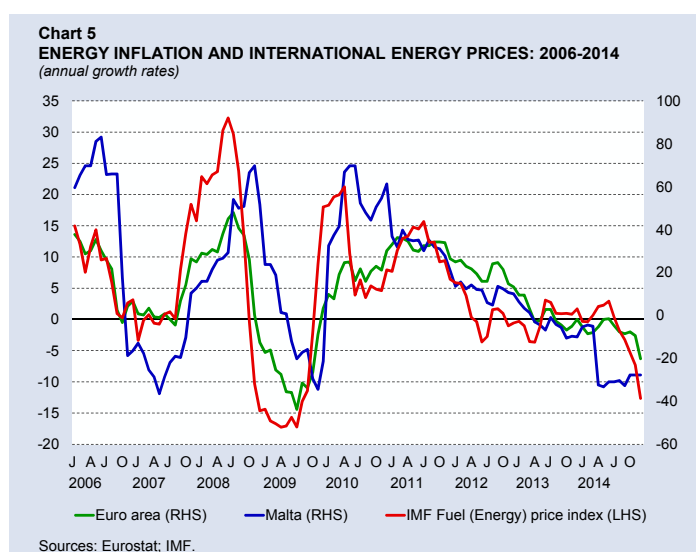


<sup>11</sup> See Gonzales-Paramo (2005) for a non-technical overview of the main features and possible causes of inflation differentials in the euro area and their implications for economic policies.

<sup>12</sup> This is in line with ECB (2011) which concludes that the catching-up process have played a minor role in explaining inflation differentials in the euro area since the relationship between inflation and GDP per capita appears to be rather weak.

<sup>13</sup> Average annual GDP growth rate between 1999 and 2007 stood at 3.0% in Malta compared to 2.3% in the euro area. This rate is lower than that registered in other small open economies with a similar level of economic development, such as Cyprus (4.2%), Slovenia (4.4%) and the Czech Republic (4.2%). GDP growth rates in Ireland and Spain, two countries that registered high increases in house prices before the crisis, averaged 6.6% and 3.9%, respectively. Data source: EC Autumn Economic Forecasts 2015.

Structural features of the economy may imply different inflation dynamics even in the face of symmetric shocks. This can arise, for instance, due to different degrees of oil dependency, differences in exchange rate pass-through patterns or the country-specific characteristics of product and labour markets. This is likely to be an important factor for Malta where differences in market structures, in part explained by the characteristics of Malta's small island economy, are more likely to play an important role. Testament to this is the experience with higher international energy and food prices between 2007 and 2009, when the magnitudes and timing of the pass-through to domestic prices were different from those observed in the euro area and the respective prices in international markets (see Charts 4 and 5).



#### 4.2 Econometric analysis of inflation differentials

To study in more detail the underlying forces behind Malta's inflation differentials, we applied a structural model to decompose these differentials into the three main theories identified in the literature and to shed light on the inflation process in Malta.<sup>14</sup>

One of the key equations within this modelling framework is the NKPC, as in equation (1), whereby inflation is assumed to depend on its lagged values (to capture inertia in price-setting behaviour), expectations of future inflation and real marginal costs. The latter term depends on a number of factors such as real wages, productivity and relative prices movements. A cost-push shock is added to capture the effect of other variables that affect inflation, such as commodity prices, that are not explicitly included in the model.

According to the estimated model, price and wage setting behaviour in Malta is less sticky than in the euro area. The average price duration in Malta is estimated at around 1.5 to 2.5 quarters, compared to between 2 and 4 quarters in the euro area. Turning to the labour market, the average duration of wage contracts in Malta is estimated at slightly less than one year compared to around six quarters in the euro area. The range of these estimates is broadly in line with the findings of the ESCB's Inflation Persistence Network and the Wage Dynamics Network.<sup>15</sup>

Price indexation in Malta, that is, the degree of backward-lookingness in the inflation equation, was found to be broadly similar to that observed in the euro area but wage indexation is higher.<sup>16</sup> The higher estimates

<sup>14</sup> Details of the model are available in Micallef & Cyrus (2012). The model is an extension of the one developed by Rabanal (2009) to study this topic for another EMU country. The original model was extended to include cost-push shocks and labour market rigidities, thereby making it more suitable to the Maltese economy's structural characteristics. The model is estimated with Bayesian inference methods for the period 2000-2011 on the following nine observables: GDP, overall HICP inflation, Services inflation, wage growth for both Malta and the euro area and the 3-month Euribor interest rate, common for both economies.

<sup>15</sup> According to Altissimo et al. (2006), prices in sectors covered by the consumer price index in the euro area are unchanged on average between 4 and 5 quarters, compared to around 2 quarters in the US. The findings of the Wage Dynamics Network suggest an average duration of wages of around 15 months in the euro area. In Malta, the findings of the Wage Dynamics Report, summarized in Central Bank of Malta (2011), suggest that most of the changes in wages occur on an annual basis while around half of the respondents claim to change prices at least once a year.

<sup>16</sup> Differences in persistence could differ from the estimates presented in the previous section due to a number of factors, such as the use of quarterly data instead of monthly, a shorter estimation period and the use of a structural model instead of univariate regressions.

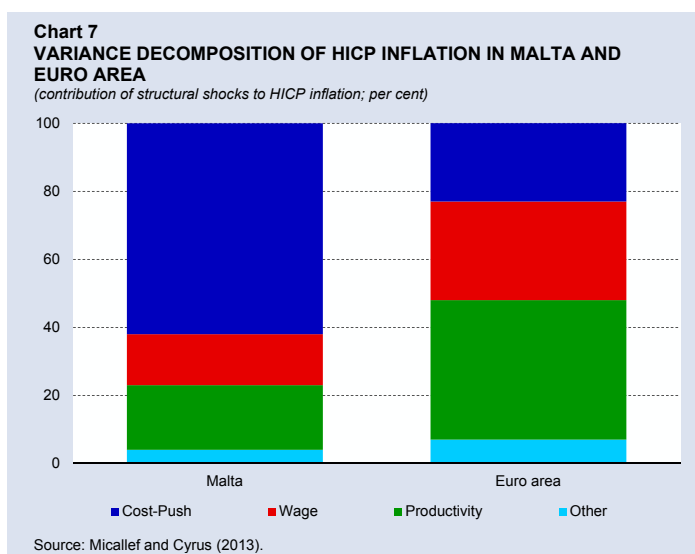
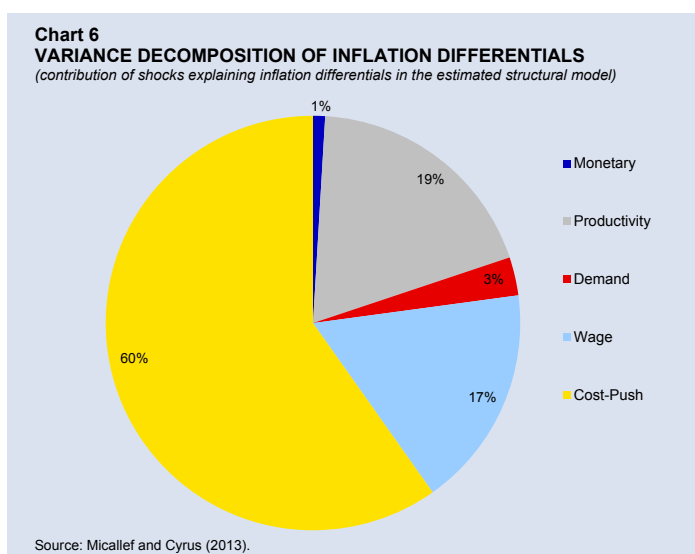
of wage indexation in Malta are in line with the authors' prior information given the partial wage indexation mechanism present in Malta.

Within the context of the structural model, these findings imply that inflation expectations play an important role in the price setting decisions in both economies and that Maltese firms are more sensitive to costs than their European counterparts.<sup>17</sup>

Estimates of the size of the shocks hitting the Maltese economy were generally found to be more pronounced than those observed in the euro area. Of particular importance for the purpose of this study is the size of the cost-push shock. In part, this can be explained by the small size of the domestic economy and its dependence on international trade. However, the fact that cost-push shocks were found to be highly correlated with international commodity prices and that both economies are net importers of commodities may suggest that this result could be driven by other factors, such as the market structures of the domestic importation and distribution chains. In turn, these could lead to differences in the pass-through, possibly both in terms of timing and magnitude, of foreign commodity prices to inflation in the two economies.

An interesting way to summarize the results of a structural model is to decompose the key variables of interest into the main shocks that are included in the model (variance decomposition). To facilitate the economic interpretation of the shocks, these are aggregated in five categories – productivity shocks, demand shocks, monetary shocks, wage mark-up shocks and cost-push shocks. Chart 6 performs this exercise by decomposing inflation differentials into these five main shock categories. According to this decomposition, cost-push shocks are predominant in explaining inflation differentials between the two economies. The role played by productivity and wage mark-up shocks is more limited, each explaining slightly less than 20%, while those of demand and monetary shocks are almost insignificant.

Chart 7 performs a similar exercise to compare the contribution of the different shocks in explaining HICP inflation in Malta and the euro area. In general, differences in the relative importance of shocks explaining



<sup>17</sup> Given a moderate degree of persistence, the important role of expectations follows from the fact that the coefficients on lagged and expected values of inflation are restricted to unity to ensure no long-run trade-off between inflation and economic activity. The higher sensitivity of inflation to real marginal costs is inversely related to the price stickiness parameter, which in Malta is lower than in the euro area.



the developments in HICP inflation can be explained in relation to differences in the size and structure of both economies. The high import content in domestic consumption implies that cost-push shocks, which mostly originate from abroad, are predominant in explaining HICP inflation in Malta, while in the euro area, which is a large and relatively closed economy, domestic factors, in the form of productivity and wages, play a more important role.

### 4.3 What determines higher costs?

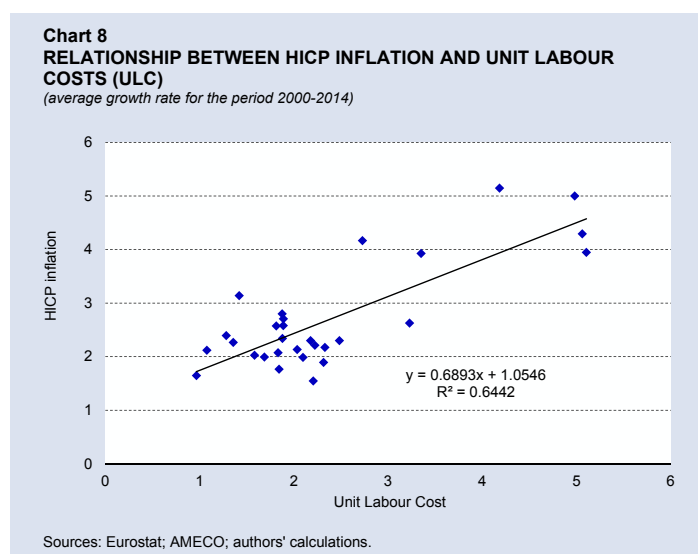
The importance of cost-push shocks and the sensitivity of inflation to costs suggest that market structures and the role of mark-ups along the distribution chain are key to understand the relatively higher inflation in Malta.

Chart 8 plots the average HICP inflation and growth rate in unit labour costs (ULCs) for 27 EU countries for the period 2000-2014.<sup>18</sup> The evolution of ULC is an important determinant of inflation and of changes in competitiveness, although the latter depends on a myriad of factors, encompassing both price and non-price (quality) elements. The cross-country empirical evidence in Chart 8 suggests that there is indeed a close relationship between HICP inflation and ULC growth. Over this period, ULC and HICP in Malta increased on average by 2.5% and 2.3% per annum, respectively. ULC growth in Malta has been higher on average compared to the euro area in both the pre-EU and post-EU membership period.

High ULC growth can be explained either by strong wage growth, low labour productivity or a combination of both. Average nominal wage growth in Malta averaged around 3.9% per annum before the crisis, compared to 2.7% in the euro area. After the crisis, however, wage developments in the two economies moved much more in line. On the contrary, growth in Malta's labour productivity after the crisis has declined significantly compared to the pre-crisis period due to the resilience of employment growth in Malta (Micallef, 2015).

In the literature, low competition in the services sector, particularly in the wholesale and retail industries, is usually attributed as one of the main factors hindering productivity growth (ECB, 2006). Estimates of productivity in the distribution sector and other sectors of the Maltese economy can be obtained from the EU Klems database. An important caveat is that sectoral developments in productivity in Malta have to be treated with caution due to the absence of appropriate price deflators, especially for the services sectors. According to this database, productivity developments in the wholesale and retail industries were significantly lower than the average for the whole economy.<sup>19</sup> Similar developments are usually documented for the euro area, especially when compared to the United States, with the difference in productivity growth in these sectors typically attributed to lower investment in ICT technologies.

Conventional economic theory posits a negative relationship between the degree of market competition and firms' profit levels. A commonly used indicator of market competition is the profit margin, calculated as the ratio of operating surplus to value added. An environment of high competition is generally associated with a market structure in



<sup>18</sup> Romania is excluded from the chart since it is a clear outlier, with average HICP inflation and ULC growth exceeding 10%.

<sup>19</sup> Productivity is defined as gross value added per hour worked.

which economic agents are price-takers, the absence of barriers to enter or leave the market and one in which firms cannot exploit increasing returns to scale. In such a structure, competition is believed to reduce prices to a level equal to the marginal costs of production. An important caveat is that it is generally difficult to draw strong conclusions from such indicators, as high profitability could be the result of lack of competition, for instance due to sheltered or protected sectors, but it could also be due to highly efficient firms operating in a competitive environment that spurs productivity gains, for example, by exploiting advances in ICT and economies of scale. Over long periods of time, however, high competition should reduce profits as more firms are attracted in a profitable industry. Given the size and structural characteristics of the Maltese economy, it is more likely that high profitability is indicative of low competition.

A sectoral analysis of the average developments in the profitability ratio between 2004 and 2012 suggests that the manufacturing sector, which is exposed to international competition, displays a profit ratio that is lower than the average for whole economy, whereas the opposite holds true for the wholesale and retail sector. Cross-country empirical evidence also suggests that there is a positive relationship between the profitability ratio and HICP inflation in the services sector for a number of EU countries, with low competition being usually associated with higher average inflation in the services sector.

Another commonly used indicator of market competition is the price-mark-up approach. The rationale behind this indicator is that, whereas high competition drives prices down to the marginal cost of production, firms in an imperfectly competitive market structure are able to charge a mark-up over their marginal cost of production. According to Central Bank of Malta (2011), more than 50% of firms in the wholesale and retail sector set prices according to costs and a self-determined profit margin reflecting the degree of market power, a share which is higher than the average for the whole economy. In addition, more than 40% of firms in the distribution industry are not likely to follow a competitor into a price cut, indicating a lower sensitivity to price competitiveness than the other sectors of the economy which could be indicative of low competitive pressures.

Estimates of product market mark-ups for Malta are relatively high compared to other EU countries.<sup>20</sup> One particular study finds that mark-up ratios are on average higher in the services industries than in the manufacturing sector, which is not surprising, given the latter is more exposed to international competition (Borg, 2009). At a sectoral level, mark-ups for the wholesale and retail sector have been found to be particularly high when compared with other EU countries.<sup>21</sup>

Anecdotal evidence suggests that port handling costs in Malta remain relatively high by international standards.<sup>22</sup> This constitutes a source of concern, especially in a small and open economy like Malta with a high degree of import content. Higher transport costs inflate the cost structure of domestic importers and trickle down the supply chain, eventually to the end-consumers through higher prices. They also have an adverse impact on the cost competitiveness of domestic firms, both the export-oriented ones as well as domestic retailers, as consumers shift towards cheaper online shopping.

## 5. Conclusion

A country that registers persistently higher inflation than its main trading partners will eventually suffer a deterioration in its external price competitiveness, with subsequent losses in output and employment. This is even more relevant in a monetary union, where asymmetric shocks cannot be corrected by changes in monetary or exchange rate policies but rather through structural policies and relative adjustments in prices and wages.

The relatively low estimate of persistence documented in this study reflects the fact that inflation in Malta fluctuated around a broadly constant mean since the mid-1990s. However, the average inflation rate of 2.5% is higher than the concurrent rate in the euro area. Structural reforms can make prices more responsive to

<sup>20</sup> Comparisons of product market mark-ups are available in Borg (2009) and ECB (2011a).

<sup>21</sup> An important caveat is that these findings are based on data from 1995 until 2005, and could therefore not adequately take into account the impact of post-EU membership developments and recent sectoral trends.

<sup>22</sup> Anecdotal evidence is based on meetings attended by the Bank's economists with the Malta Chamber of Commerce, Enterprise and Industry. Similar arguments were raised separately with meetings held with the section on shipping and bunkering (March 2012) and with the section of importers, distributors and retailers (August 2012).

changes in underlying factors, which should narrow the gap. In addition, within the context of the NKPC, the relatively low weight of intrinsic persistence assigns an important role to inflation expectations and cost considerations in the price formation process. In this regard, a more in-depth analysis on the cost structure of domestic firms and its relationship with their price setting behaviour constitutes an interesting area of research.

Finally, inflation differentials should not be analysed in isolation but rather assessed from a holistic perspective in which they are possibly a symptom of wider macroeconomic rigidities. Addressing these supply-side rigidities, for instance through policies designed to increase competition in some market segments or providing incentives to promote higher investment in ICT technologies in the distribution sector, are likely to spur productivity growth and enhance the economy's potential growth rate. In the process, this should exert downward pressure on prices.

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# ANALYSING CORE INFLATION MEASURES FOR MALTA

William Gatt<sup>1</sup>

*This article discusses the role of core inflation in analysing underlying inflation developments and presents a set of estimates of core inflation for Malta. These estimates, although based on different methodologies, are highly correlated and reveal clear cyclical dynamics in the path of inflation. Further tests show that these measures of core inflation have some predictive power with respect to future headline inflation. The article then analyses developments in inflation in Malta and finds an element of convergence with euro area inflation. Improved competition in the goods market as well as favourable supply-side factors affecting the labour market both contributed to the observed convergence.*

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## 1. Introduction

In his 2006 Nobel prize lecture, Edmund Phelps stated that “the function of the central bank is the management of inflation expectations” (Phelps, 2007). Tasked with the duty of maintaining price stability, central banks need a reliable gauge for inflationary trends beyond indications given by the overall change in the official national price index. While headline inflation is an important indicator, it is bound to contain ‘statistical noise’, which can be both transitory (such as changing seasonality of price movements, fiscal shocks and changes in weather), as well as permanent (such as sampling and measurement bias, and quality adjustment). These elements may cloud the true signal about price movements that interests the monetary policy-maker (Cecchetti, 1997; Clark, 2001). Transitory changes would not require any immediate action in the conduct of monetary policy, whereas broad-based inflationary or deflationary pressures would (see ECB, 2001). For this reason, central bankers tend to resort to measures of core inflation – an approximation of so-called ‘underlying’ inflation, or price pressures – which are related to medium to long-run dynamics of the economy. Estimates of core inflation have been shown to possess good predictive power to forecast headline inflation, as well as leading to better estimates of structural relationships in the economy (Clark, 2001; Cristadoro et al. 2005; and Stavrev, 2006).<sup>2</sup>

There are various definitions of core inflation, and therefore different methods have been proposed over time to measure this signal.<sup>3</sup> Perhaps the most well-known measure of core inflation is ‘overall inflation excluding the effects of energy and food prices’, but many other measures exist, inspired by different definitions of this concept. For instance, Eckstein (1981) and Parkin (1984) argue that core inflation is equivalent to the steady state growth rate of unit labour costs. Another definition, given by Bryan & Cecchetti (1994), is “the long-run or persistent component of the measured index, which is tied in some way to money growth”. Similarly, Quah & Vahey (1995) define core inflation as “that component of measured inflation that has no medium to long-run impact on real output”, making reference to the long-run neutrality of money with respect to economic activity. As a result the methods proposed vary from pure statistical filters such as exclusion-based methods, to econometric methods based on Structural VARs, and a ‘mix’ of joint statistical and econometric techniques in between.

## 2. Core inflation in Malta

In this article a number of approaches to measuring core inflation are applied to the Harmonised Index of Consumer Prices (HICP). These include a variant of the ‘persistence-weighted’ (PW) inflation rate approach, a ‘trimmed mean’ (TM) inflation rate approach and an estimate of ‘trend inflation’ based on a trend-cycle decomposition.

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<sup>1</sup> Mr William Gatt is a Senior Research Economist in the Research Office of the Central Bank of Malta. He would like to thank Dr Aaron G. Grech for useful comments and suggestions. Any errors, as well as the views expressed here, are the author’s sole responsibility.

<sup>2</sup> Norman & Richards (2012) show that using a measure of core inflation in the estimation of a New Keynesian Phillips curve improves both the fit and the forecasting accuracy over other estimates based on headline measures.

<sup>3</sup> The Federal Reserve Bank, for example, publicly states that more than one measure of core inflation is used in its rate-setting analysis.

The PW methodology is motivated by the idea that persistent inflation dynamics should be given more weight in a measure of underlying inflation. Therefore, consumption basket sub-components for which shocks do not tend to be long lasting are given a small weight relative to others with more persistent inflation. The process to derive these weights formally involves regression analysis. The weights are established by estimating auto-regressive (AR) models for each sub-component, such as:

$$\pi_t^i = c + \rho^i \pi_{t-j}^i + \varepsilon_t \quad (1)$$

whereby  $\pi_t^i$  and  $\pi_{t-j}^i$  is current and lagged inflation in sub-component  $i$ ,  $c$  is a constant,  $\varepsilon_t$  is an error term and  $\rho^i$  is a measure of persistence. The latter is expected to be between 0 and 1, and higher estimates result in relatively higher weights to the corresponding sub-components.<sup>4</sup>

The PW methodology is applied to 81 HICP sub-indices. The weights were estimated using data spanning five years at a time on a rolling basis, that is, data for the period 1998-2002 were used to calculate the weights used for 2003, whereas data for the period 1999-2003 were used to calculate the weights for 2004, and so on.

Table 1 compares the weights for the main aggregates of HICP used in the official estimate with those derived from the persistence-weighted methodology. The weight given to energy and unprocessed food components falls by about one-half of their weight in the HICP, while that for service components falls by about one-tenth. Meanwhile, the weight for the non-energy industrial goods component, which includes a vast range of consumer goods, increases. It is interesting to note that the re-allocation of weights given by this method happens to be similar in spirit to the 'inflation excluding energy and food' also commonly used as a measure for core inflation, as the latter removes all weight from the energy and food components.<sup>5</sup> Energy and food components tend to be volatile and are hence judged by the technique to contain little information about underlying inflation.

Another popular technique used by central banks to derive measures of core inflation in an economy is the 'trimmed mean' (TM) inflation rate.<sup>6</sup> This technique, similar to the 'inflation excluding energy and food' measure, is an exclusion method since it strips selected sub-components away before calculating the weighted average inflation rate. This 'trimming' is guided by statistical logic. In any month the cross-sectional distribution of inflation rates across sub-components will roughly tend to follow the Normal distribution. Many of the inflation rates will cluster around the average inflation rate, while a few will be far away from the average,

**Table 1**  
**OFFICIAL AND PERSISTENCE-WEIGHTED HICP WEIGHTS**

*Percentage points; 2007-2015 averages*

	HICP Official	PW Estimates	Difference
Energy	6.8	3.9	-2.9
Unprocessed food	7.8	4.2	-3.6
Processed food	13.4	16.2	2.8
Non-energy industrial goods	30.6	39.3	8.7
Services	41.4	36.4	-5.0
	<b>100.0</b>	<b>100.0</b>	

Sources: Eurostat and author's calculations.

<sup>4</sup> The interested reader is referred to Cutler (2001) and Bilke & Stracca (2007). The estimated AR models were augmented with a more detailed specification for the error term to ensure well behaved residuals.

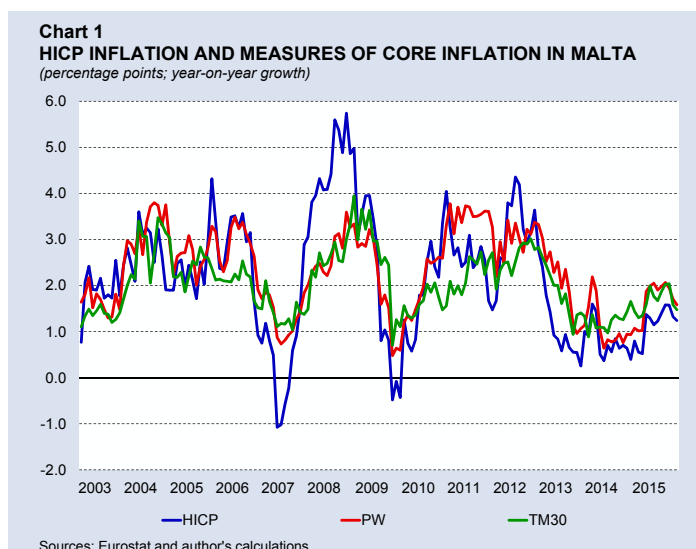
<sup>5</sup> As discussed by Clark (2001), core inflation measures such as 'HICP excluding Energy and Food' inflation offer the benefit of being more easily understood by the public and in addition are readily published by statistical institutes. Lafèche & Armour (2006) argue that these benefits satisfy practical criteria which a central bank should also consider.

<sup>6</sup> See, inter alia, Marques & Mota (2000) and Vega & Wynne (2001).

at the ‘tails’ of the distribution. However, as discussed in the literature, this distribution tends to be skewed to one side from time to time, such that the tails do not balance out (Bryan & Cecchetti, 1994). This creates a bias in the calculation of the average inflation rate and can be a source of volatility, as the skewness can also change between different periods.<sup>7</sup>

A way of overcoming this is to remove part of the distribution that lies at the tails, such that the average inflation rate is calculated from a less dispersed distribution. How much to trim is an empirical question. Trimming too little will not

improve the measure of inflationary trends by much, while trimming too much runs the risk of throwing away important information.<sup>8</sup> At the same time, measures of core inflation are expected to be less volatile than the official inflation rate. Therefore, the trade-off is handled such that, while a significant proportion of the distribution is retained, the resulting time series must be reasonably less volatile than headline inflation. With these considerations in mind, the 30% TM was used as a suitable measure of core inflation for the case of the Maltese economy, a level of trimming which is frequently used in practice.<sup>9</sup> This means that 15% of both the upper and lower parts of the distribution were removed each month from the calculation.<sup>10</sup> Chart 1 displays two measures of core inflation: the 30% TM (TM30) and the PW inflation rates. The results indicate that core inflation measures are less volatile than headline inflation and tend to display clearer cyclical dynamics.<sup>11</sup>



The TM measure correlates strongly with the PW measure despite the difference in methodology. This confirms the robustness of these measures and their success in removing the noise from the data. They better hint at developments in underlying inflation, especially during the period 2007-2010, in which inflation was particularly volatile.

Core inflation can also be considered as the long-term trend in inflation. Such a concept, which is an unobservable variable, can be inferred by performing a trend-cycle decomposition on headline inflation using an Unobserved Components Model. This is a univariate time-series technique which breaks down a variable as the sum of three components:

$$\pi_t = \tau_t + c_t + i_t \quad (2)$$

whereby  $\pi_t$  is headline inflation,  $\tau_t$  is the long-run trend of inflation,  $c_t$  is the cyclical variation of inflation around the trend and  $i_t$  is an irregular component, which absorbs short-term volatility in the data which do

<sup>7</sup> This argument holds even in the case when inflation is a weighted average of inflation rates across the various sub-components, such as is the case for the HICP.

<sup>8</sup> Despite this risk, the ‘weighted median’ inflation rate, which is composed only of the inflation rate that happens to fall at the median of the distribution (the 50th observation across the cross-section), is also used by some central banks with success. See Clark (2001).

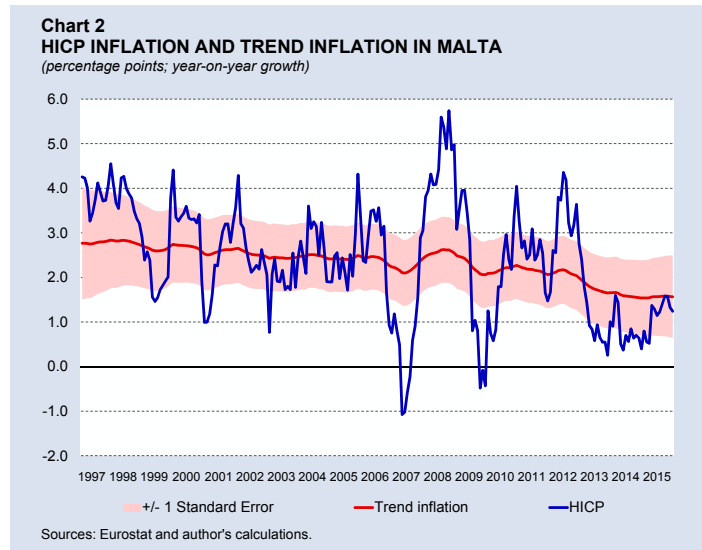
<sup>9</sup> See, for example, National Bank of Poland (2014).

<sup>10</sup> This implies that 12 indices from each end of the distribution are removed each month. Since this method does not require data to initialise the sequence, the estimate can be calculated as from the first observation for the year-on-year growth rate, which is January 1997.

<sup>11</sup> The estimate of PW core inflation starts in 2003. This is because, although the first observation in the HICP database is for January 1996, 12 monthly observations were used to calculate year-on-year growth rates, and another 12 observations were “lost” in the estimation of the AR model due to the lagged component. Therefore, data available for the first estimate of persistence were for the period 1998-2002.

not relate either to the trend or the cycle.<sup>12</sup> The long-term trend is modelled as a variable that can change smoothly over time, while the cycle is allowed to fluctuate around the trend.<sup>13</sup>

The results of this decomposition can be seen in Chart 2, which shows the long-term evolution of inflation  $\tau_t$  with respect to headline HICP inflation. The results show that long-term trend inflation has followed a slow downward trajectory over the past 19 years, from around 3% in the late 1990s to under 2% by 2015.<sup>14</sup>



### 3. Does core inflation lead headline inflation?

As noted above, core inflation measures have been shown to have good predictive power in terms of headline inflation, and thus can be considered as leading indicators. The estimates for Malta presented above can also be tested in this regard, with two commonly used methods in the literature (Clark, 2001; Cutler, 2001; Vega & Wynne, 2001; Lafèche & Armour, 2006).

The first method involves estimating the Root Mean Squared Error (RMSE) between headline inflation at horizon 'h' and core inflation at time t, given by:

$$RMSE = \sqrt{\frac{\sum(\pi_{t+h} - \pi_t^{core})^2}{T}} \quad (3)$$

whereby  $\pi_{t+h}$  is headline HICP inflation at horizon 'h',  $\pi_t^{core}$  is a measure of core inflation and  $T$  is the number of observations over which the estimate is calculated. The RMSE above was calculated for 3 measures of core inflation, namely the 30% TM (TM30), PW inflation and trend inflation (TREND). Each RMSE was expressed as a ratio of the RMSE of predicted future headline inflation in the absence of a measure of core; that is, using current headline inflation only. The results across different forecast horizons, from 1 to 12 quarters (3 years) ahead, are shown in Chart 3. All measures of core inflation generate a relative RMSE which is less than 1 at most horizons, implying gains in predictive power compared to using just headline inflation. In general it appears that core inflation measures have some predictive power for inflation starting from 2 to 3 quarters ahead, and tend to have the most information about inflation 1 year ahead.

Another approach is to test an econometric relationship between expected changes in future headline inflation and the current gap between core and headline inflation, given that core inflation can be regarded as an 'attractor' after transitory shocks die out, where:

$$(\pi_{t+h} - \pi_t) = \alpha + \beta(\pi_t^{core} - \pi_t) + \varepsilon_t \quad (4)$$

<sup>12</sup> This is a Beveridge-Nelson decomposition, which is estimated as a state-space model using Maximum Likelihood and the Kalman filter. See also Stock & Watson (2007) and Ascari & Sbordone (2014).

<sup>13</sup> More specifically, the trend is specified as a random walk, the cycle as an AR(2) process, and the variance of the trend is restricted to be one-tenth of the cycle.

<sup>14</sup> Since this is an estimate of an unobservable variable, 1 standard error bands are also shown to reflect the uncertainty behind the estimate.



This relationship states that in the long run headline inflation is related one-to-one to core inflation up to a constant:

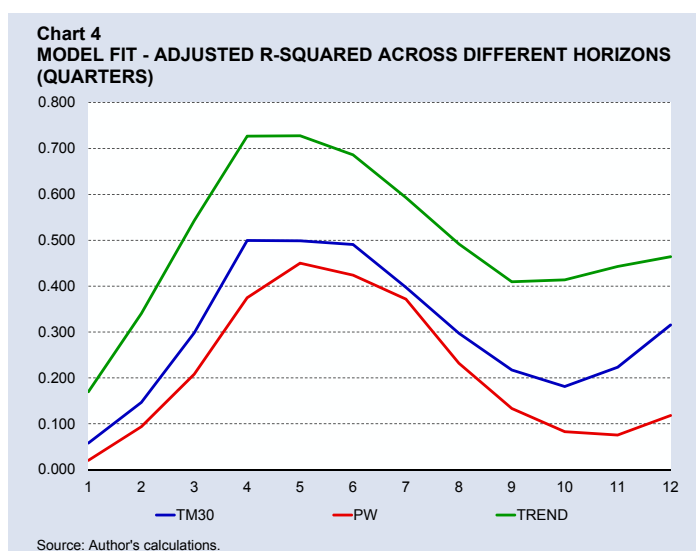
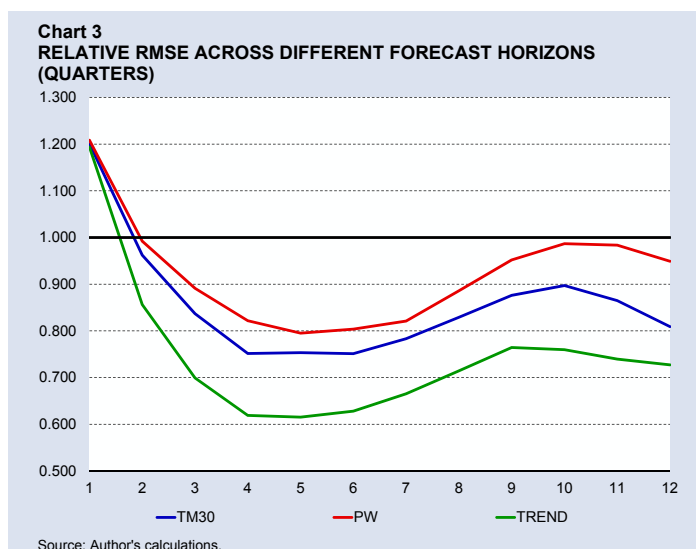
$$\pi = \frac{\alpha}{\beta} + \pi^{core} \quad (5)$$

and if there is no systematic bias ( $\alpha = 0$ ), headline inflation is equal to core inflation.<sup>15</sup> This model was estimated for the same core inflation measures as above, over the same horizon (1 quarter to 3 years). At most horizons the constant is not statistically different from zero while  $\beta$  is positive and significant across all measures; implying that in the long run the core inflation measures are useful and unbiased predictors of headline inflation.<sup>16</sup> Chart 4 shows the fit of the estimated econometric model, based on the adjusted R-squared, across different horizons.<sup>17</sup> The fit peaks between 4 to 5 quarters, which supports the conclusion reached above that core inflation measures are mostly informative about 1 year ahead developments in headline inflation.

#### 4. Conclusion

The results for long-run trend inflation may be used to examine the extent of convergence in consumer price inflation over time in Malta with those in the euro area. Trend inflation in Malta has fallen, suggesting an improvement in the competitiveness of the local economy. Moreover the correlation between headline euro area and domestic HICP inflation has risen from -0.01 in 2007 to 0.62 in 2015.<sup>18</sup> This convergence can be attributed to many factors.

After becoming a member of the European Union in 2004, and subsequently adopting the euro in 2008, the Maltese economy experienced an increase in the number of suppliers for tradable goods, and households could perform a better search, at a lower cost, for products. The rapid penetration of internet access in households (whereby the proportion of households with internet access doubled, from 41% 2005 to 82% in 2015<sup>19</sup>) also assisted this increase in trade via e-commerce.



<sup>15</sup> The long run solution is arrived at by dropping time subscripts in equation (4) and simplifying. The stochastic error term  $\varepsilon$  is equal to 0 by definition in the long run.  
<sup>16</sup> Inference is based on Newey-West standard errors, which are robust to residual autocorrelation.  
<sup>17</sup> The adjusted R-squared has an upper limit of 1, implying a perfect fit.  
<sup>18</sup> This estimate is based on a moving window of 10 years; that is, using data from 1998-2007 for the first estimate, data from 1999 to 2008 for the second, and so on.  
<sup>19</sup> Source: Eurostat.

Indeed, as can be seen in Chart 5, whereas in 2005 only 34% of Maltese households with internet access had made an online purchase anytime during the previous 12 months, less than the euro area average, the trend quickly reversed and since 2009 the proportion in Malta exceeded that of the euro area. This implies progressive downward pressure on price mark-ups in the Maltese economy over time and, hence, on underlying inflation.

Meanwhile, domestic price pressures were also reduced as a result of efficiency gains in the supply side of the economy via improvements

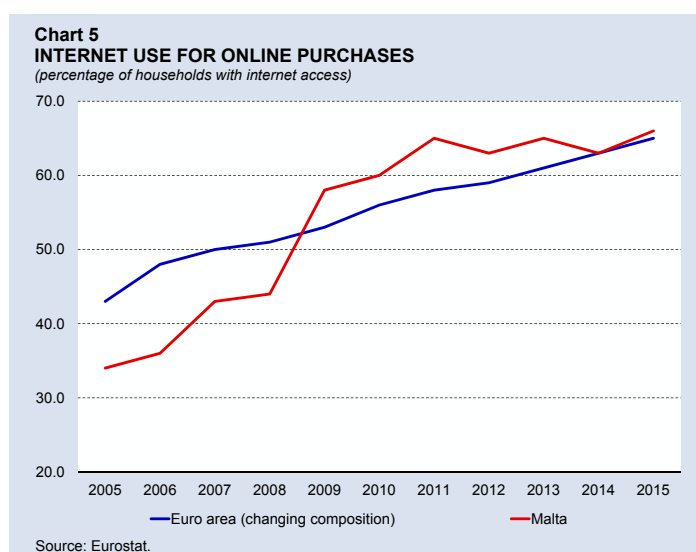
in the functioning of labour markets. An increase in female participation rates, as well as an increase in part-time and temporary work, contributed to improve labour-market matching. Furthermore, the shift of workers from manufacturing to other more competitive sectors in the economy possibly also contributed to better allocation of labour resources.<sup>20</sup> An inflow of workers from both within and outside the EU also supported potential growth, especially since 2005 (Grech, 2015). The increase in labour resources, wage-bargaining at firm level and a more flexible, qualified labour force are all favourable supply side factors, which improved the competitiveness of the economy and hence reduced domestic production cost pressures.

Taken together, these developments go some way to explain the apparent increased synchronisation. These findings motivate further studies on the relationship between core inflation in Malta and inflation in the euro area, which can be analysed from various aspects of the economy.

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<sup>20</sup> See Micallef, B. (2013a, b).



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## **PART IV**

# **MONEY AND THE TRANSMISSION MECHANISM IN MALTA**



# THE DEMAND FOR CURRENCY IN MALTA

Aaron G. Grech<sup>1</sup>

*This article studies the demand for currency in Malta in the light of the existing theoretical and empirical framework. It argues that the commonly applied analytical framework needs to be tweaked for it to better explain the reasons underpinning the relatively high currency demand in Malta compared with other euro area countries. In particular the presence of a large tourism sector is likely to be boosting demand beyond what one would expect. That said, there is scope for policies which could lead to lower demand for notes, such as measures to facilitate the use of electronic means of payment.*

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## 1. Introduction

Money serves four main purposes, namely as the main medium of exchange in a modern economy, a store of value, a unit of account and a source of deferred payment. Like any commodity, demand for currency, the most liquid form of money, is mainly driven by price and income variables. Currency is needed to conduct transactions, but holding cash has its cost as its value is eroded by inflation while no interest is earned on it.

In traditional classical theories like Fisher's quantity theory, money does not have any intrinsic utility and serves only as a means of facilitating exchange (Fisher, 1911). The quantity of money is related to the volume of transactions multiplied by the price level of goods and services traded by means of the velocity of circulation. The latter, while assumed to be stable in the immediate future, is deemed to move over time due to changing preferences and payment systems. Therefore, demand for money in this view is solely driven by transactions demand and by changes in payment system arrangements or in consumer payment habits.

In contrast, another strand of the literature, known as the Cambridge approach, argued that money demand played a more substantive role (Pigou, 1917; Marshall, 1923). Rather than being determined by the volume of transactions and by the payments system, currency was seen as demanded in its own right, as a store of value that is convenient and secure. These economists emphasised the role of interest rates, wealth and inflation in helping to determine the demand for money. This was more rigorously defined by Keynes (1936), who developed the concept of precautionary demand (that is, money kept for contingencies) and of speculative demand (that is, currency holdings seen also as a reflection of portfolio choices and expectations). These ideas influenced and were, to some extent, incorporated in many other later theories, such as those developed by Friedman in the late 1950s.<sup>2</sup>

Given the importance of understanding the precise nature of money demand, especially the stability or not of this function for monetary policy purposes, many empirical studies have been undertaken in this area (Laidler, 1993). While all studies start with a basic relationship between real money balances to a scale (or transactions demand) variable and an opportunity cost variable, the role allocated to particular variables tends to differ according to the theoretical inclination of the authors (Sriram, 1999). However, most recent studies tend to include the lagged value of the dependent variable as an explanatory variable to better explain its short-term dynamics. These partial adjustment models assume that agents are always in the process of adjusting their current cash holdings to the desired long-run level (Gordon, 1984). On the other hand, the definition of the dependent variable tends to differ, ranging from real currency in circulation or broader monetary aggregates in absolute terms, to ratios of monetary sub-aggregates to broader aggregates, or to measures of total payments.<sup>3</sup>

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<sup>2</sup> Friedman (1956).

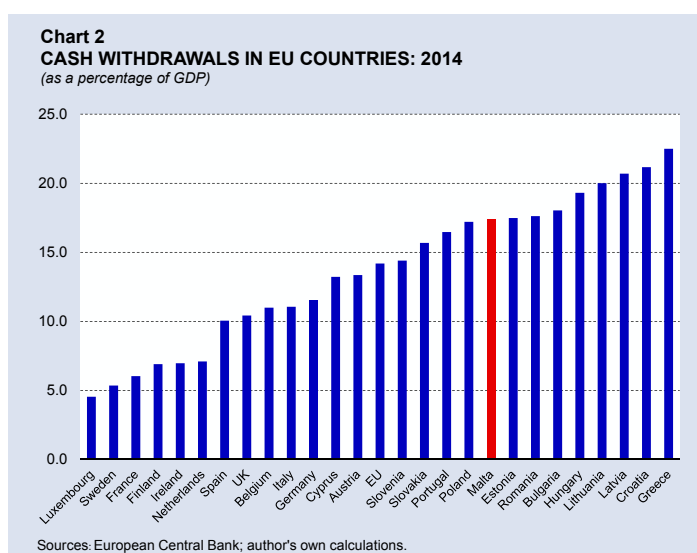
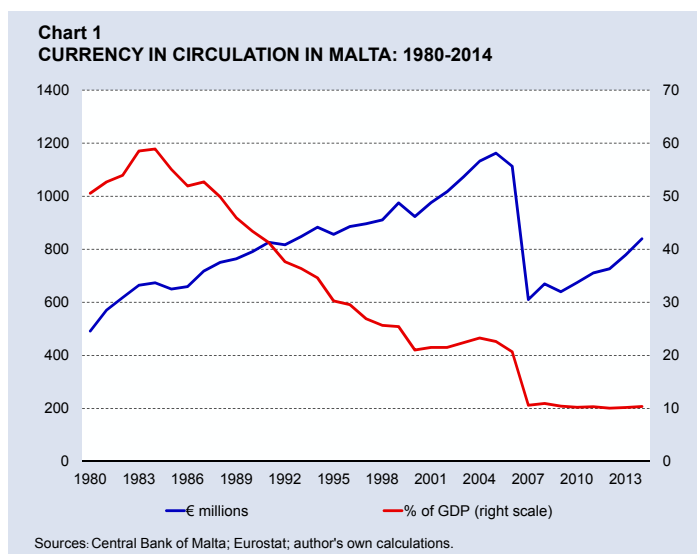
<sup>3</sup> For instance, recently some authors are using the ratio of the flow of cash withdrawn from bank accounts to total non-cash payments. See for instance, Ardizzi, Petraglia, Piacenza & Turati (2012).

This article studies the demand for one particular component of the money stock, currency, in Malta in the light of the theoretical and empirical issues described above. In particular, it will argue that the commonly applied analytical framework needs to be tweaked slightly for it to explain better the reasons underpinning the relatively high currency demand in Malta compared with other euro area countries.

## 2. Currency demand in Malta

The amount of currency in circulation in Malta, which can be taken to be equivalent to the amount demanded, more than doubled in absolute quantity between 1980 and 2005, its historic peak. However, as can be seen in Chart 1, except in the early 1980s, there has been a steeply declining trend when compared with nominal GDP.<sup>4</sup> This ratio nearly halved over the decade 1986 to 1995, possibly reflecting the very rapid development of the local banking sector and financial liberalisation, which led to increasing use of non-cash payments. After remaining relatively stable for another decade, the ratio of currency in circulation to nominal GDP halved again in 2007 ahead of the adoption of the euro and the associated cash conversion process. Since then it has remained relatively stable.

However, the amount of banknotes issued by the Central Bank of Malta is significantly greater than the value of euro banknotes allocated to the Bank in accordance with the European Central Bank's banknote allocation key, which in turn is based on the Bank's share in the ECB's capital.<sup>5</sup> In addition, the demand for higher denomination banknotes, such as the €200 and €500 notes, is rising and also exceeds that in the rest of the euro area.<sup>6</sup> Moreover, holdings of currency are still very high in Malta, especially when compared with advanced Western European countries.<sup>7</sup> The implied velocity of currency in circulation in Sweden is more than three times higher than in Malta, for instance. In 2014 cash withdrawals from ATMs were equivalent to €3,870 for every adult Maltese. This is just above the average observed in the EU in absolute terms. However, when one translates this in terms of GDP per capita, the amount for Malta is 70% higher than the EU average. As can be seen from Chart 2, cash withdrawals in Malta from ATMs remain relatively high.



<sup>4</sup> A similar trend is observed when looking at the ratio of currency in circulation to M2, a monetary aggregate which, besides currency holdings, includes overnight deposits and other short-term deposits. Note that the ratio of M2 to GDP has, on the other hand, increased consistently since the 1980s.

<sup>5</sup> The regulation setting out this allocation can be downloaded at: [http://www.ecb.europa.eu/ecb/legal/pdf/l\\_03520110209en00260030.pdf](http://www.ecb.europa.eu/ecb/legal/pdf/l_03520110209en00260030.pdf)

<sup>6</sup> These data were obtained from the ECB's Statistical Data Warehouse. See <http://www.ecb.europa.eu/stats/payments/paym/html/index.en.html>

<sup>7</sup> On the other hand, the ratio of M2 to GDP is in line with those in countries like Germany, France and Italy.



### **3. Factors underpinning currency demand in Malta**

There are a number of reasons why cash still remains so popular in Malta. Possibly, the most important is Maltese consumers' payment preferences. A survey carried out by the Central Bank of Malta in 2014<sup>8</sup> indicated that whilst there are age differences in the use of non-cash payment methods, 89% of those aged 25 to 34 still stated that cash is their main payment instrument. Use of cash was also found to depend on the level of education and income, but again the gradients were not that pronounced. The median value of cash held for daily purchases by those surveyed was €50, with over a tenth of respondents stating that they tend to retain €100 cash for daily use. The survey indicated that cash users opted for this payment method as they consider it easy to use and relatively fast.

Besides consumer preferences, this could also reflect those of retailers. The fragmented nature of the retail market in Malta, possibly combined with the uneven impact of bank charges on small retail outlets, could be a contributing factor for the popularity of cash.<sup>9</sup> Convenience may also play a role, as the availability of ATMs in Malta is quite low on a per capita basis, standing at less than half the euro area average. This could lead consumers to maintain higher cash balances.

Despite it probably becoming less important over the years, the relative thinness and weak liquidity of the local financial markets may also contribute to high domestic cash balances. Although the household saving rate in Malta has declined, households have accumulated considerable financial wealth over time. In fact, on a per capita basis, the average Maltese household holds twice the financial assets of the average euro area household (Caruana & Pace, 2013). For a considerable period of time, these savings mostly ended up either as cash or bank deposits on account of strict capital controls and the unavailability of alternative assets, such as private debt securities, equity and private pension products. In recent years, Maltese households have had more investment options, both local and overseas, but cash may still have retained a larger-than-average share in their portfolio allocation.

Another possible cause could be the shadow economy, that is, "market-based production of goods and services, whether legal or illegal, that escapes detection in the official estimates of GDP" (Smith, 1994). A sizeable shadow economy would boost the demand for currency since cash-based transactions are harder to trace. Many US economists in the 1960s and 1970s,<sup>10</sup> who tried to rationalise the rise in currency demand in the post-war period, noticed that standard price and income variables did not have much explanatory power. They therefore introduced tax burden or government regulation variables, arguing that higher demand for cash was being driven by a desire to operate in the shadow economy. They found that these additional explanatory variables were, indeed, significant.

Incidentally, a similar argument was made in Malta in the 1970s in relation to 'cash-hoarding'.<sup>11</sup> There are a number of estimates of the size of the shadow economy in Malta.<sup>12</sup> Some are the result of cross-country studies, undertaken by the European Commission, which estimate the size of Malta's shadow economy at around a quarter of GDP.<sup>13</sup> Interestingly, these results are very similar to those found in earlier studies conducted by Maltese economists.<sup>14</sup>

One frequently ignored determinant of the use of cash in Malta is the large size of the inbound tourist industry. In parallel with the situation in one part of any monetary union, the currency stock in one country within a multi-country monetary union, such as the euro area, includes the amount issued by the national central bank, plus the net amount that is carried in or out by visitors.

<sup>8</sup> See Central Bank of Malta (2015).

<sup>9</sup> See MCCA (2015).

<sup>10</sup> For instance, Cagan (1958) and Guttman (1977).

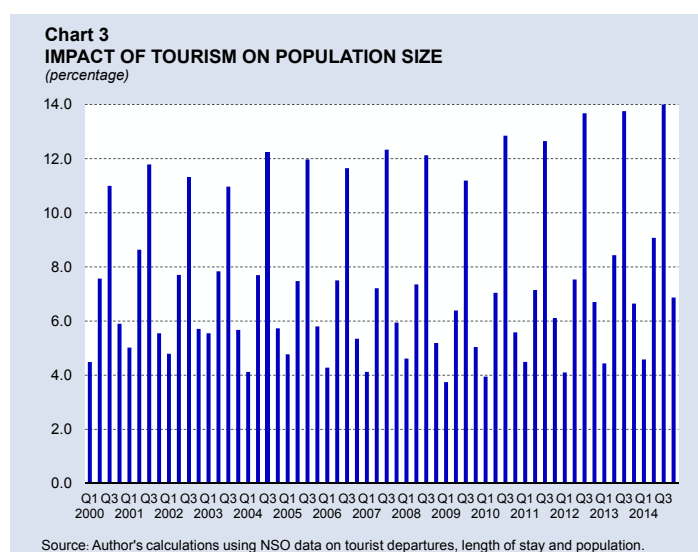
<sup>11</sup> See Delia (1978).

<sup>12</sup> These studies tend to follow the approach developed by Tanzi (1983).

<sup>13</sup> See Schneider (2007) and Kearney & Schneider (2012). According to these studies, Malta has one of the largest shadow economies, equivalent to between two and three times the euro area average.

<sup>14</sup> See Cassar (2001) and Briguglio (1989).

In 2014 more than 1.7 million tourists visited the Maltese islands, more than four times the size of the resident population. Chart 3 quantifies this impact by converting the number of tourists into an equivalent resident using data on the average length of stay of tourists. Thus, if on average tourists stay 7.5 days in a month, they are treated as equivalent to a quarter of a resident. Using this approach one finds that there have been points at which the local population has been boosted by nearly a seventh as a result of incoming tourists.<sup>15</sup> Incidentally, the latest available ECB payment statistics suggest that in 2014 €0.2 billion were withdrawn from ATMs in Malta by means of cards issued outside the country, equivalent to one-eighth of the total amount withdrawn using cards issued in Malta. A similar proportion is reported in Cyprus. In contrast, across the euro area this ratio stood at less than 3%.



#### 4. Estimation

To study the extent to which these different factors drive the demand for currency in Malta, two currency demand specifications, both modelled in error-correction form, were applied to Maltese data.

In the first specification the dependent variable is currency in circulation as a ratio of M2. In the second the dependent variable is currency holdings deflated using the GDP deflator. Note that both specifications differ slightly in two ways from those used in literature. A linear trend was included to account for growing financial sophistication (such as the increasing use of electronic payments). Two dummy variables were used to capture the impact of one-off shocks, namely a significant change in monetary data compilation in 2003 along with the adoption of the euro in 2008. In the latter case, while there was a large decline in currency in circulation, this resulted from the euro changeover, and evidence suggests that people quickly reverted to previous patterns of behaviour.

The results of these regressions, shown in Table 1, suggest that the increase in population caused by tourists does play a significant role in determining both the short-run and long-run dynamics of currency demand in Malta.<sup>16</sup> The tax ratio, computed as the sum of income tax paid by households, social security contributions and VAT as a share of GDP, also appears to play a role in determining currency demand. As expected, an increase in the tax burden raises the demand for cash, with this effect being significant in the long run. In line with theory, demand for currency is also affected by its opportunity cost, with the real deposit interest rate exerting a relatively strong impact both in the short term and in the long term. An increase in real deposit rates lowers the demand for currency.

Currency holdings are positively related to household financial wealth, proxied by the sum of Malta Government Stock outstanding. This suggests that Maltese households allocate a share of their financial asset portfolio to currency, with an increase in their financial wealth being accompanied by higher cash holdings.

<sup>15</sup> Arrivals are quite seasonal, peaking in the third quarter of the year. This implies that on an annual basis, the impact falls to 5%, on average. This is still much higher than the 0.6% impact of incoming tourism on the European Union's population. Only Cyprus faces a similar situation to Malta in this respect.

<sup>16</sup> Note that the seasonal dummies were found to be significant, implying that besides the fluctuations in population size due to tourism, there are other seasonal determinants of the demand for money in Malta, such as the increase in consumption around Christmas.

**Table 1**  
**CURRENCY DEMAND SPECIFICATION RESULTS FOR MALTA<sup>(1)</sup>**

	Specification 1: Dependent = Currency/M2	Specification 2: Dependent = Currency/deflator
Constant	-0.56 ***	-4.04 ***
dlog(Touristeq <sub>t</sub> )	0.02 ***	0.13 ***
d(IR <sub>t</sub> )	-0.02 ***	-0.19 ***
d(FW <sub>t</sub> )	0.05 ***	0.28 *
dlog(VT <sub>t</sub> )	0.07 ***	0.46 *
Log(Dependent <sub>t-1</sub> )	-0.14 ***	-0.11 ***
Log(Touristeq <sub>t-1</sub> )	0.03 ***	0.13 ***
IR <sub>t-1</sub>	-0.01 *	-0.02 **
TR <sub>t-1</sub>	0.06 *	0.48 *
Log(VT <sub>t-1</sub> )	0.11 **	0.58 *
Log(FW <sub>t-1</sub> )	0.06 ***	0.38 ***
Log(DOW <sub>t-1</sub> )	-0.01 **	-0.00
Trend	-0.01 ***	-0.01 ***
Dmondata	-0.03 ***	-0.05 *
Dintro	-0.02 ***	-0.31 ***
<b>Adjusted R<sup>2</sup></b>	0.87	0.92
<b>Standard Error of regression</b>	0.00	0.02
<b>Durbin-Watson</b>	1.65	2.10

<sup>(1)</sup> Sample is 2000Q1 to 2014Q4. Data were not seasonally adjusted, but seasonal dummies (results not shown here for conciseness) were included in the estimation. Interest rate data are CBM measures, and not MIR data.

\*\*\* denotes significant at 1% level, \*\* at 5% level and \* at 10% confidence level.

Dependent variable in specification 1 is currency holdings as a share of M2; it is real currency holdings in specification 2, VT is transactions demand (i.e. GDP per capita), IR is the real deposit rate, TR is the tax ratio, Touristeq measures the impact on population size of tourist arrivals, FW is total government bonds and DOW is the level of the Dow Jones index. Dintro is a dummy for the adoption of the euro and dmondata is a dummy for a change in methodology of monetary statistics in 2003.

Source: Author's calculations.

Table 1 also suggests that transactions demand plays a role in determining the demand for currency, with the coefficient on GDP per capita being significant in both the short and the long term. Finally, there is some evidence that the attractiveness, or not, of foreign investment assets could slightly affect currency holdings in Malta. In one specification, the latter are negatively related to the level of the Dow Jones stock index (used here as a proxy for the return on foreign investment).

## 5. Conclusion

The estimates shown above must, however, be interpreted and used with due caution. Despite the popularity of estimating demand for money functions, there are several issues to keep in mind. For instance, the currency demand equation could be incorrectly specified. This is particularly true when there are structural breaks in the demand for cash, such as changes in payment preferences or in payment systems. A further major issue is correctly accounting for the abrupt change in the relative size of currency in circulation as a result of the adoption of the euro.

Following euro adoption, it is almost impossible to assess with a good degree of certitude how many banknotes (and coins) are circulating at any one time in the Maltese economy as euro banknotes (and coins) can be brought in from overseas by both locals and visitors, while those issued in Malta can be taken and used abroad.

In terms of policy implications, these results suggest that the Maltese economy is likely to continue to use more currency than larger economies in the short to medium term. Moreover, the impact of a large tourism sector in raising currency demand merits further investigation.

The demand for cash could be reduced if more transactions are carried out using electronic means. The latter development would be facilitated if payment preferences of the Maltese population change significantly. This could be aided by modified bank charges, particularly on smaller operators in the retail and tourism sectors. Efforts to discourage the shadow economy, for instance by strengthening tax enforcement and by creating the right incentives to formalise activity, could also contribute.<sup>17</sup> The faster development of the local financial sector, for example through the establishment of a private pension industry, should widen the investment options for Maltese savers. Coupled with the continued high level of regulatory oversight, this should gradually help reduce reliance on currency as a store of wealth.

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<sup>17</sup> There are much wider benefits resulting from a smaller shadow economy. The latter not only leads to resource misallocation in an economy, with too many self-employed or small firms in the traditional sectors (i.e. construction, agriculture and retail trade), but also boosts unnecessarily the level of prices (as margins need to be higher to make up for low turnover), as well as to unfair competition with operators in the formal economy. For more on this topic, see Singh, Jain-Chandra & Mohammad (2012).

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# INTEREST RATE PASS-THROUGH IN MALTA

Brian Micallef, Noel Rapa and Tiziana M. Gauci<sup>1</sup>

*This article presents econometric estimates of the pass-through from changes in the official interest rates to retail lending and deposit rates in Malta. We find evidence of incomplete pass-through in Malta, even in the long run. The pass-through was further reduced in the aftermath of the financial crisis for deposit rates as well as for lending rates charged to non-financial corporations (NFCs). The long-run pass-through to household lending rates was hardly affected. Cross-country comparison suggests that the pass-through to NFCs is one of the lowest in the euro area but that to households is broadly in line with the median for euro area countries. The inclusion of banking sector indicators to the baseline model helps to explain part of the drop in the pass-through registered after the crisis, although the main conclusion of incomplete pass-through remains unaltered.*

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## 1. Introduction

The transmission of changes in the policy rates set by central banks to retail bank rates applied to loans and deposits is an essential link in the monetary policy transmission mechanism. This is especially important in Malta where the overwhelming majority of businesses are small and medium-sized enterprises (SMEs), which are typically more dependent on bank financing than larger firms (Bonello, 2010).

This article presents econometric estimates of the pass-through from changes in official interest rates to retail bank lending and deposit rates in Malta between 2000 and 2014. Prior to 2008, the Central Bank of Malta was responsible for the conduct of monetary policy, with a pegged exchange rate serving as the nominal anchor. Following Malta's entry into the euro area on 1 January 2008, monetary policy is set by the Governing Council of the European Central Bank (ECB) with the primary objective of maintaining price stability in the euro area as a whole over the medium term.

A number of studies have investigated the role of structural variables in determining the strength of the interest rate pass-through mechanism. Most of these studies document a high degree of heterogeneity across countries, with a generally higher pass-through in advanced economies than in emerging or low income ones. The literature finds that both an economy's financial framework and other structural characteristics, like regulatory institutions and exchange rate regime, influence the speed and magnitude of the interest rate pass-through (Saborowski & Weber, 2013; Gigineishvili, 2011). In the banking sector, low asset quality (measured by the share of non-performing loans in total assets), high concentration in the banking sector and banks' holdings of ample liquidity are found to be important factors that limit the transmission of policy to retail rates. A weak regulatory environment and a high share of foreign currency loans in total loans also tend to weaken the pass-through. In addition, countries with fixed exchange rates and small island states are inclined to have weak pass-through compared with countries with a flexible exchange rate regime and with larger, more developed economies (Gigineishvili, 2011).

Although the immediate pass-through of market interest rates to bank retail rates is incomplete in the euro area, in the long run the pass-through is higher (de Bondt, 2002; ECB, 2009). The pass-through differs across bank products, as well as across euro area countries, even prior to the financial crisis. Sorensen and Werner (2006) find that bank rates on corporate loans appear to adjust more fully, followed by rates on mortgage loans and time deposits. On the contrary, the adjustment of rates on consumer loans and on current account deposits seems to work less efficiently.

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The financial crisis has led to a fragmentation of financial markets in the euro area, driving retail rates in stressed economies above those in unstressed countries. The transmission from policy to money market rates in some countries has been weakened due to increases in risk premia. These also had an adverse impact on the pass-through to rates on retail bank products (Hristov et al., 2012). In addition, Aristei and Gallo (2012) find that interest rates on loans to non-financial corporations (NFC) were found to be more affected by changes in the interbank rate than loans to households, both in times of high volatility and in normal market conditions.

The relatively few studies about Malta suggest that interest rate pass-through is incomplete. For instance, the International Monetary Fund points out that the transmission of ECB policy rates to domestic housing interest rates is sluggish and incomplete (IMF, 2012). This is confirmed in a further study published by the IMF in 2015. This low pass-through is attributed to the heavy reliance of banks on deposit-funding, limited competition in the banking sector and, possibly, to an increasing share of non-performing loans. According to Grech and Micallef (2014), who use the Central Bank of Malta's macro-econometric model, the long-run pass-through from policy rates to lending rates ranges from around 60% to 70%.

The contribution of this article is threefold. First, econometric evidence of pass-through from policy rates to bank lending and deposit rates for households and NFCs in Malta is presented. To do this, a monthly database of policy, money market and retail domestic bank lending and deposit rates from 2000, is developed. In this database, use is made of both retail interest rates published by the Central Bank of Malta and those harmonised among the euro area countries (MIR).<sup>2</sup> For Malta, the latter set of statistics is only available since 2008; the series was extended backwards using information about retail rates published by the Bank, which, in some cases, extend to 1999.

Evidence of incomplete pass-through in Malta, even in the long run, is found. Estimates point to a reduction in the pass-through for deposit rates and lending rates to NFCs since the onset of the financial crisis. The long-run pass-through with respect to lending rates to NFCs declined from 70% in the pre-crisis period to 45% in the full sample. The long-run pass-through from policy to household lending rates was, however, hardly affected by the crisis. The pass-through to deposit rates ranges from around 40% to 70% in the period between 2000 and 2007, though it has declined after 2008, reflecting a drop in the responsiveness of local deposit rates to the monetary easing by the ECB.

Second, a comparison of the developments in the domestic pass-through to retail rates since the onset of the financial crisis with those in other euro area countries is made. Cross-country comparisons reveal a substantial degree of heterogeneity in terms of the pass-through since the onset of the financial crisis.

Thirdly, in view of the heterogeneity of pass-through results both when comparing across countries as well as between different time periods, we extend the baseline model to allow for changes in both the health of banking sector as well as changes in the risk exposure of Maltese banks. Results show that at least part of the fall in the pass-through estimates recorded after the financial crisis can be explained by the inclusion of financial soundness indicators although the main conclusion of incomplete pass-through remains unaltered.

## **2. Domestic interest rate developments between 2000 and 2014**

Chart 1 shows the policy rates set by the Central Bank of Malta and the ECB since 2000. Within the context of the fixed exchange rate regime prior to the adoption of the euro, the central intervention rate in Malta was set at a premium compared with the rate on the main refinancing operations (MRO) set by the ECB. In the run-up to euro adoption, the spread between the two gradually narrowed. From 2008 onwards, official interest rates were set by the Governing Council of the ECB.

<sup>2</sup> Monetary financial institutions' interest rates (MIR) statistics on outstanding amounts are used in the analysis. This is because statistics on new business exhibit a high degree of volatility in the case of monetary financial institutions (MFI) resident in Malta. Interest rates on outstanding amounts cover resident MFI euro-denominated deposits belonging to households and NFCs resident in Malta and loans extended to them. The household sector includes also non-profit institutions serving households.



## Interest rate pass-through in Malta

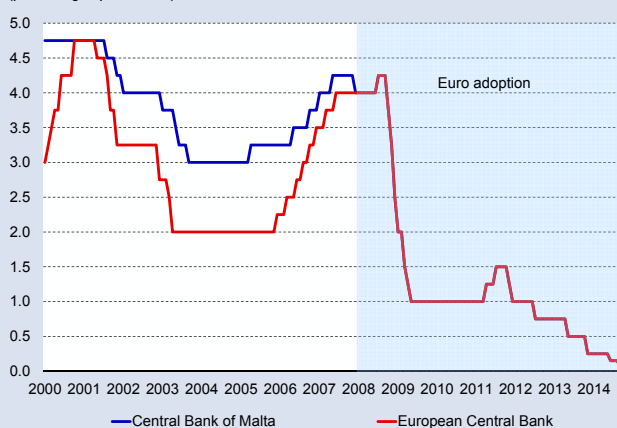
Following the collapse of Lehman Brothers in the latter half of 2008, the ECB, among other measures, cut interest rates sharply. It lowered the MRO rate by 325 basis points to 1.00% by May 2009. By the end of 2013, the ECB had reduced the rate down to 0.25%. Two further cuts were implemented in 2014 with the rate on the main refinancing operations falling to a record low of 0.05%.

The money market plays an important role in the transmission of policy rates to retail rates, particularly because of the role of the interbank market in the allocation of funds. In normal times changes in the policy rate are transmitted, almost one-to-one, to money market rates, such as the EONIA and the EURIBOR (see Chart 2).<sup>3</sup> Money market rates in Malta for pre-2008 are based on interbank market offered rates. In the pre-euro period, the interbank market in Malta was characterised by thin trading, with interbank rates set by the Central Bank of Malta on the basis of quotes received from the participating banks. From January 2008 onwards, the overnight, one-month and three-month rates consist of the EONIA, one-month EURIBOR and three-month EURI-BOR, respectively.

The widening spread between official rates and EURIBOR from mid-2007 onward indicates the loss of confidence in the banking system within the euro area, with banks becoming more reluctant to lend to each other in the interbank market. The ECB responded to these market tensions by injecting liquidity into the markets through conventional and unconventional measures.<sup>4</sup> In particular, the ECB provided longer-term liquidity in the amounts required by bidding banks at exceptionally low costs in an attempt to facilitate the transmission of credit to the real economy. Reflecting this high level of liquidity, money market rates tended to be lower than the policy rate.

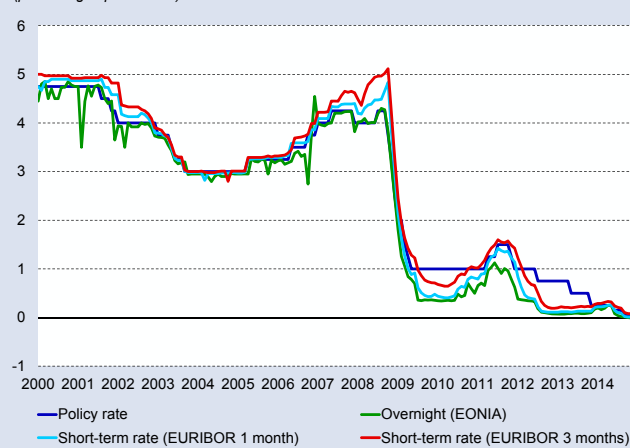
Given the thinness of the interbank market in Malta and in the light of the collapse of interbank activity across the euro area during the crisis, this article will shift focus away from money market rates, and instead study the relationship between policy rates, on the one hand, and retail bank rates on the other. Changes in policy rates ultimately affect interest rates that are relevant for households and businesses, which eventually,

**Chart 1**  
**POLICY INTEREST RATES**  
(percentages per annum)



Source: Central Bank of Malta.

**Chart 2**  
**MONEY MARKET INTEREST RATES**  
(percentages per annum)



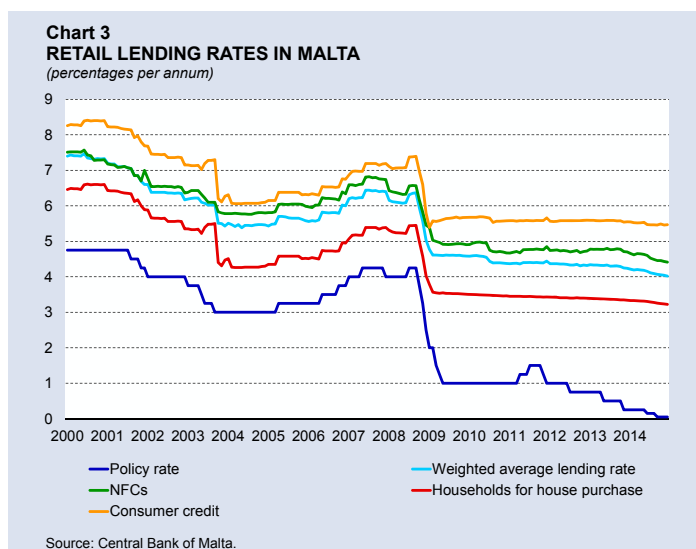
Source: Central Bank of Malta.

<sup>3</sup> EONIA is the benchmark interbank reference rate computed on the basis of interest rates applied to the overnight transactions denominated in euro between banks in the European Union and the European Free Trade Association countries. EURIBOR is calculated for interbank deposits, with a maturity ranging from one week and 12 months, as the average of the daily offer rates of a representative panel of prime banks.

<sup>4</sup> The ECB's initial response to the financial crisis is documented in ECB (2010).

and along with a number of other channels, influence consumption, saving and investment decisions of economic agents.<sup>5</sup> In turn, these decisions affect aggregate demand and, eventually, consumer prices.

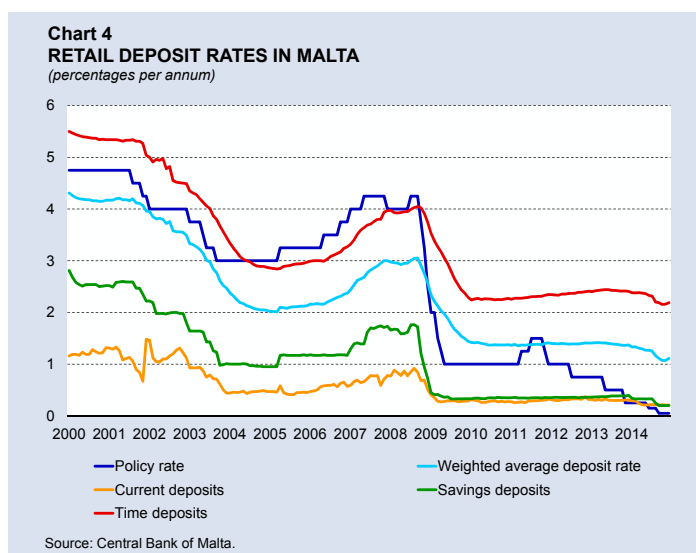
Chart 3 illustrates the policy rate and four different lending rates in Malta. The latter include the bank lending rate to NFCs, to households for mortgages and consumer credit and a weighted average lending rate covering all lending to corporates and households. Since 2008, these rates are represented by MIR rates. The series was extended backwards prior to 2008, using the corresponding bank lending rates compiled by the Central Bank of Malta.



Retail lending rates in Malta tend to move in line with the policy rate set by the central bank. During the period reviewed, the lending rates charged by resident banks to households for house purchases were always the lowest among the various lending rates, followed by lending to NFCs and consumer credit rates. Since the start of the financial crisis and the associated monetary easing by the ECB, the spread between the policy rate and various bank lending rates has widened significantly, suggesting a weakening in the transmission mechanism.

The spread between the lending rate to NFCs and that on consumer credit, which was relatively stable at around 30 basis points between 2004 and 2007, increased to around 80 basis points since 2008, suggesting that banks have reassessed upwards the risks associated with consumer credit to households compared with lending to NFCs.

Chart 4 illustrates the policy rate and four different deposit rates in Malta. The retail rates refer to those on current deposits, saving deposits and a weighted average of these three rates.<sup>6</sup> These rates are extracted from the



<sup>5</sup> Other channels include the exchange rate, credit and asset price channels and the formation of expectations. ECB (2004) summarises the key features of the monetary policy transmission mechanism and the ECB's monetary policy strategy. ECB (2010) describes how some of these channels may have become impaired during the financial crisis.

<sup>6</sup> Current deposits refer to deposits which are convertible into currency and/or which are transferable on demand without significant delay, restriction or penalty. Savings deposits refer to balances placed without a fixed maturity that can be withdrawn only subject to prior notice or the imposition of a penalty. Time deposits refer to fixed-term deposits that cannot be withdrawn prior to maturity unless a penalty is incurred.

Bank's retail interest rate statistics.<sup>7</sup> Like lending rates, deposit rates tend to move in line with the policy rate, though to a somewhat lesser extent.

Chart 4 shows that in the pre-crisis period, the weighted average deposit rate in Malta was always below the policy rate. Since 2009, however, the weighted average deposit rate has been above the policy rate (with the exception of a short period of time in 2011), and this is mainly owing to the evolution of the rate on time deposits. The spread between the rate on time deposits and the policy rate has widened to an average of 160 basis points since 2009, compared with a slightly negative spread in the three years preceding the financial crisis. The rates on current and savings deposits have remained below the official policy rate for most of the period under consideration. However, the situation was reversed towards the end of 2013 when the policy rate was reduced to record lows. Interestingly, the spread between the rates offered on current and savings deposits, which averaged around 70 basis points between 2004 and 2007, closed by the end of 2012.

### 3. Econometric estimates of interest rate pass-through

The previous section has shown that retail rates tend to move with the policy rate but not necessarily proportionally. In this section, we investigate this claim in more detail, focusing on the post-financial crisis period for which the evidence suggests that banks in Malta have responded to policy rate changes in a different manner compared with the pre-crisis period.

Empirical studies on the transmission from changes in the policy or money market rates to retail rates are usually based on a marginal cost pricing model equation:

$$rr = \beta_0 + \beta_1 pr$$

where  $rr$  and  $pr$  stand for retail and policy rates, respectively. The equation indicates that changes in policy rates are transmitted to retail rates. The long-run pass-through coefficient is represented by  $\beta_1$  and  $\beta_0$  refers to a mark-up. Pass-through would be complete if  $\beta_1 = 1$ . This, however, would require full information and perfect competition in the banking sector as well as risk-neutral banks. Empirical studies typically find that the pass-through is incomplete, i.e.  $\beta_1 < 1$ , implying that banks have some degree of market power and the demand for bank products is inelastic with respect to retail rates. That is, a reduction, say, in deposit rates brings about a less than proportionate drop in deposits. According to Aristei & Gallo (2012), this could result, for instance, from asymmetric information costs and the existence of switching costs, which make it harder for bank customers to move their business from one bank to another.

The above equation refers to the long-run equilibrium relationship. However, the short-run relationship between policy rates and market rates is subject to lags relating to rigidities. The latter could be related to adjustment costs or to the uncertainty faced by banks about the future development of market interest rates. The dynamic adjustment is usually described by an error correction process, or alternatively, by an autoregressive distributed lag (ARDL) model. This paper applies the latter method and the results are applied to the estimation of the pass-through. Our estimates of interest rate pass-through are based on an ARDL model presented by Cottarelli & Kourelis (1994), which takes the following form:

$$\Delta rr_t = \alpha + \sum_{j=1}^{j^*} \varphi_j \Delta rr_{t-j} + \sum_{k=0}^{k^*} \gamma_k \Delta pr_{t-k} + \varepsilon_t \quad (1)$$

where  $rr$  and  $pr$  stand for retail and policy rates, respectively;  $j^*$  and  $k^*$  indicate the optimal lag lengths,  $\alpha$  is the constant term,  $\gamma_0$  measures the short-term pass-through and  $\varepsilon_t$  is the error term. According to this model, retail rates are determined by their own past values and by contemporaneous and lagged values of

<sup>7</sup> The collection of these deposit rates was terminated by the Central Bank of Malta in December 2012. Published interest rates are since referring to MFI interest rates. Contrary to lending rates, it is not straightforward to disentangle backwards MIR deposit rates in order to distinguish between households and NFCs. Whereas MIR rates, both on lending and on deposits, are categorized between households and NFCs, only the lending rates of the Bank's retail rates follow this classification. The Central Bank of Malta's deposit rates are classified according to whether they are current, savings or time deposits. From this classification, it is very difficult to identify an appropriate deposit rate to households and NFCs from the Bank's statistics for the pre-2008 period.

the policy rate. A value less than 1 for  $\gamma_0$  indicates a sluggish adjustment in the short run. The coefficients  $\varphi_j$  and  $\gamma_k$  can be used to compute the long-run pass-through:

$$\beta = \frac{\sum_{k=0}^{k^*} \gamma_k}{\left(1 - \sum_{j=1}^{j^*} \varphi_j\right)}$$

with  $\beta$  measuring the long-run pass-through. The long-run pass-through will be complete if  $\beta=1$ , implying that changes in the policy rate are fully transmitted to retail rates.

Since all interest rate series are integrated of order 1, the model is estimated in first differences to avoid spurious estimates. The data set includes monthly observations from January 2000 to December 2014.<sup>8</sup> We consider four different lending rates: those charged to NFCs, to households for mortgages, to households for consumer credit and a weighted average lending rate. Data on MIR deposit rates distinguish between households and NFCs and also include a weighted average series. In addition, four different bank rates are considered: on current deposits, saving deposits, time deposits along with a weighted average of those three rates.

The use of the policy rate as the explanatory variable in the estimation is more appropriate than the money market rate, at least in the Maltese context. This follows from thin trading in the domestic interbank market during the pre-2008 period (as already mentioned), with published interbank rates not always representing actual transactions.

The equations are estimated using ordinary least squares and the number of lags is chosen to ensure the absence of serial correlation in the residuals.<sup>9</sup> The results are summarized in Table 1.

**Table 1**  
**ESTIMATION RESULTS OF BASELINE MODEL**

*Explanatory variable: policyrate*

		Full sample 2000-2014		Pre-crisis period 2000-2007	
		Impact <sup>(1)</sup>	Long-run	Impact	Long-run
MIR Lending rates	Weighted average	0.31	0.53	0.26	0.67
	NFCs	0.21	0.45	0.34	0.70
	Mortgages	0.25	0.49	0.22	0.47
	Consumer credit	0.30	0.43	0.22	0.47
MIR Deposit rates	Weighted average	0.07	0.36	0.09	0.72
	Households	0.06	0.36	0.09	0.72
	NFCs	0.12	0.38	0.09	0.72
Central Bank of Malta Deposit rates	Weighted average	0.09	0.40	0.09	0.72
	Current	0.16	0.16	0.24	0.48
	Savings	0.16	0.34	0.23	0.56
	Time	0.05	0.44	0.07	0.56

<sup>(1)</sup> The impact multiplier estimates the short term pass-through. For example, an impact multiplier of 0.5 implies that if the policy rate changes by 1 percentage point, the bank retail rate will change by 0.5 percentage points within the same month.

Note: MIR deposit rates in the pre-crisis period were extended backwards using the average weighted deposit rate published by the Central Bank of Malta. Hence, the pass-through estimates for the MIR deposit rates for the period 2000-2007 are the same as the weighted average deposit rate from the Central Bank of Malta series.

<sup>8</sup> The estimation is based on "Outstanding Amounts" statistics. While "New Business" statistics are in several respects more appropriate, they exhibit a high degree of volatility, which would adversely affect the estimation of the pass-through coefficients.

<sup>9</sup> Dummy variables were inserted in a number of equations to capture possible breaks in the series mostly in 2002 and 2003.

To assess the possible impact of the financial crisis on the pass-through, the equations are estimated over two different samples, one covering the full period and another restricted to the pre-crisis period (i.e. until end-2007). Estimates are presented for both the impact and the long-run multiplier. A coefficient equal to 1 implies that all changes in the policy rate are transmitted fully to the retail rate.

The econometric analysis indicates that the long-run pass-through is less than 1 in both periods. This is consistent with the literature, which finds that small countries with fixed exchange rate regimes and high banking sector concentration tend to have a lower pass-through. As expected, the pass-through from policy to retail rates is not instantaneous, with impact multipliers being lower than the long-run multipliers in all cases.

Impact multipliers are generally higher for lending rates than for deposit rates. This result could be driven by institutional factors, because domestic loans are normally contracted at variable rates, whereas term deposit rates can only be altered for new business or when existing deposits are renewed.

A decline in the pass-through to NFCs with regard to lending rates when the financial crisis is included in the sample is observed. This applies both to the impact and the long-run pass-through coefficients. The long-run pass-through declined from 70% in the pre-crisis period to less than 50% in the full sample. The long-run pass-through from policy to household lending rates, both for house purchases and consumer credit, was almost unaffected by the financial crisis. For these categories, the long-run pass-through is estimated between 40% and 50%.

Turning to deposit rates, the long-run pass-through also declined when post-2008 data were included in the sample. This was valid for all three categories of deposits considered. Impact multipliers for deposit rates are generally quite low, standing around 10% to 20%.

The long-run pass-through to deposit rates depends on the maturity: deposits with longer maturities tend to exhibit a higher pass-through than those with shorter maturities. Before the financial crisis, the long-term pass-through to savings and time deposits was around 60% but declined to around 40% in the full sample. The corresponding pass-through for current deposits dropped from around 50% to 20%. Given that interest rates on current deposits were already low, there was little room for them to fall further in response to the decline in the policy rate.

The decline in the long-run pass-through of bank deposits can be partly explained by the behaviour of time deposits, which have not only been less responsive in the 2008-2009 monetary easing compared with previous monetary cycles but then rose despite the monetary easing by the ECB.

#### **4. Comparison with other euro area countries after the financial crisis**

What follows is a comparison of developments in interest rate pass-through in Malta since the start of the financial crisis with those in other euro area countries. Two different estimates of pass-through are compared: the first calculates the pass-through on bank lending and deposit rates from September 2008, when the MRO rate stood at 4.25%, until December 2010, by which time the rate had been standing at 1.00% for 20 months. The second comparison calculates the pass-through until December 2014, thus encompassing the subsequent rate cuts that brought the MRO down to 0.05%. The choice of this time period is intended to cover a sufficient length of time for changes in policy rates to be transmitted to retail rates.

The pass-through coefficients in this section are calculated by comparing the change in the relevant retail rate from September 2008 until end-2010 and end-2014, respectively, with the change in the policy rate during the same period. For example, the domestic lending rate to NFCs on outstanding amounts was reduced by 189 basis points between September 2008 until the end of 2010, compared with a 325 basis point reduction in the policy rate. In this case, the pass-through is equal to 0.58 or 58.0%.

As expected, one observes a high degree of heterogeneity among euro area countries, as many factors could have influenced cross-country differences in interest rates.<sup>10</sup> Hence, the identification of a limited set of factors explaining these differences is not straightforward. This is important to keep in mind when making cross-country comparisons.

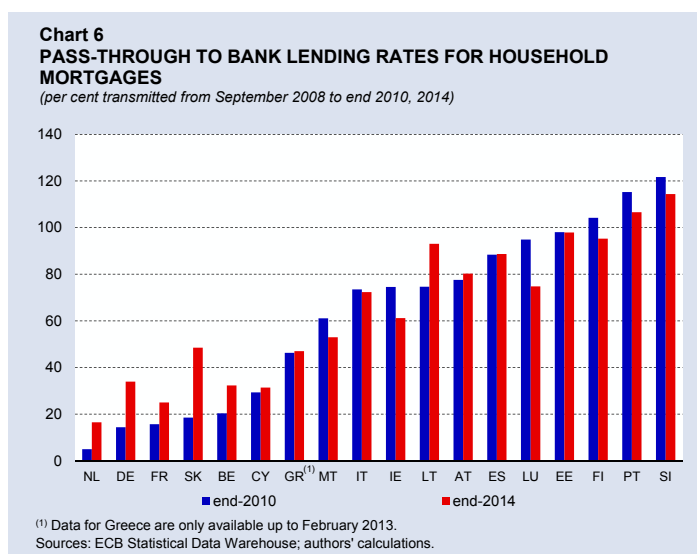
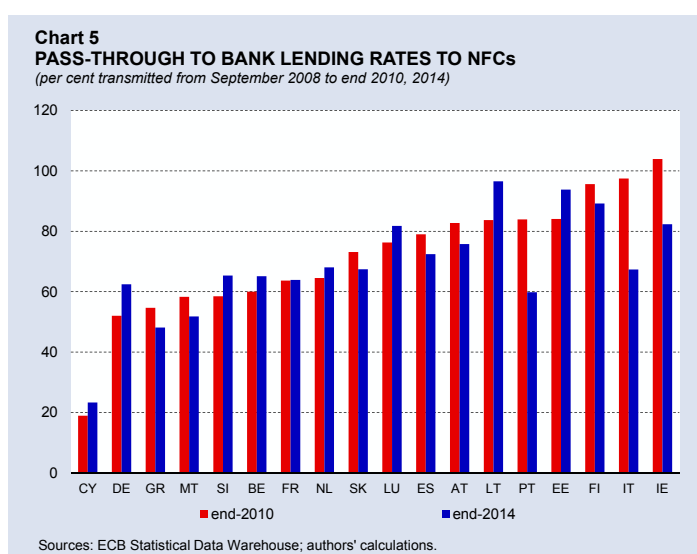
Moreover, the analysis in this article is only limited to the pass-through from the policy rate to retail rates. A more in-depth treatment of the subject would also focus on and compare the level of retail interest rates charged in each country. For instance, as at end-2010, interest rates on outstanding amounts to NFCs charged by banks in Slovenia and Belgium stood at 4.5% and 3.5%, respectively, despite these two countries having broadly similar pass-through estimates.<sup>11</sup>

Charts 5 to 9 are based on MIR rates on total outstanding amounts across euro area countries. These rates cover MFI interest rates on deposits from, and loans to, euro area residents. Data were obtained from the ECB's Statistical Data Warehouse.

Chart 5 compares the proportion of the change in the MRO that was transmitted to the rates charged on loans to NFCs. The figure shows an estimated pass-through of around 50% for Malta for the period 2008-2014. Though not directly comparable, this is broadly in line with the econometric results presented in the previous section, with the pass-through being lower post-2008 compared to that prevailing before the crisis. The pass-through for Malta stands out as being one of the lowest in the euro area.

Pass-through estimates for the stressed economies such as Italy and Portugal declined significantly when computed for the period ending in 2014 as compared with 2010, suggesting that the ECB rate cuts after 2012 were not transmitted to NFCs. Indeed, interest rates in these two countries were higher at the end of 2014 as compared to end-2010.

Chart 6 plots the pass-through for the lending rate to households for mortgages. Again, the pass-through in Malta stands between 50% and 60%, broadly in line with the median for the euro area countries. This Chart reveals substantially more heterogeneity among



<sup>10</sup> Cross-country differences may arise from different collateral practices, non-interest expenses and differences in the fiscal and regulatory frameworks. See ECB (2006) for more details.

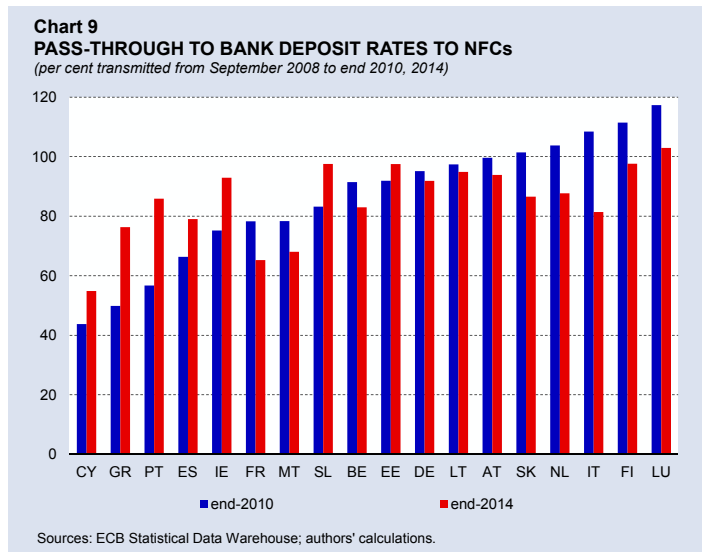
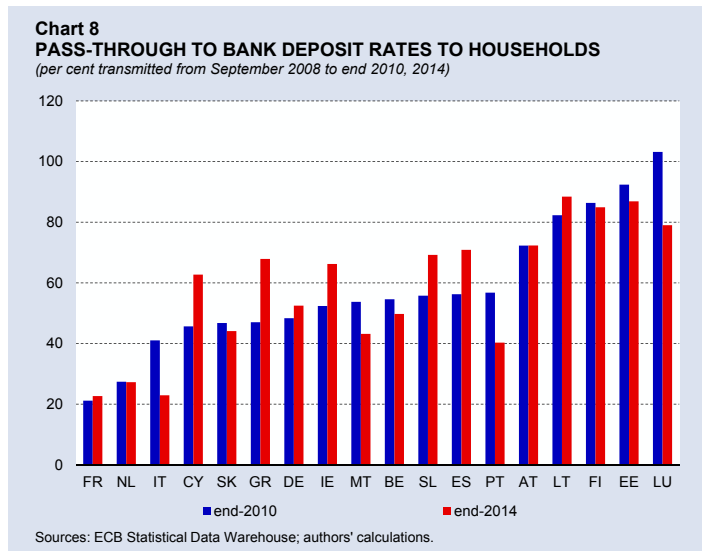
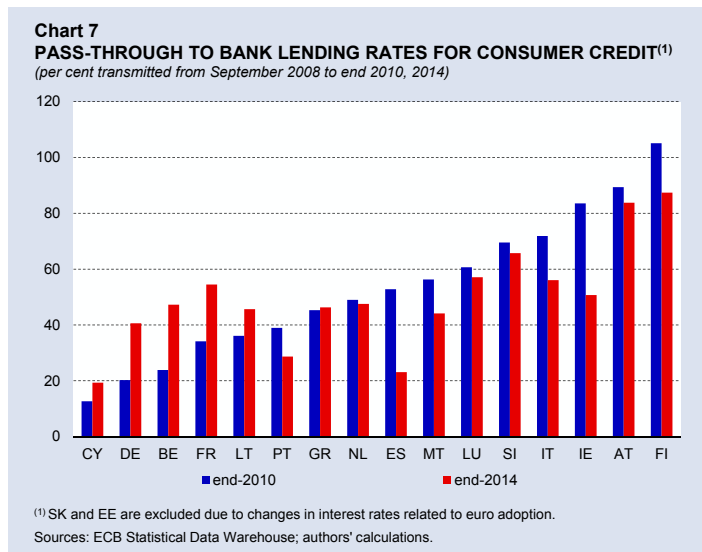
<sup>11</sup> A deeper analysis on this subject is available in Bonnici (2013).

euro area countries, highlighting possible differences in the housing market. These include varying preferences for owner-occupancy against renting, or the nature of mortgages offered, like fixed versus floating rates. On one hand, the pass-through to mortgage interest rates in countries like Germany, France and the Netherlands was very sluggish, standing at less than 20%. Lea (2010) explains that this is to be expected given that most mortgages are of a fixed rate nature in these countries. At the other end of the spectrum, the pass-through in countries like Finland, Portugal and Slovenia exceeded 100%.

Chart 7 plots the pass-through from policy rates to lending for consumer credit. As in the previous case, the pass-through in Malta ranges between 40% and 60%, broadly in the middle of the range for euro area countries. Again, pass-through in this lending category exhibits significant heterogeneity among euro area countries, with Cyprus and Finland standing at the extremes, with a pass-through below 20% and close to 100%, respectively.

Charts 8 and 9 plot the pass-through to rates on bank deposits belonging to households and NFCs, respectively. As with lending rates, one observes a substantial degree of heterogeneity among euro area countries. In Malta's case, the pass-through from the policy rate to the deposit rates amounted to around 54% for households and 78% for NFCs, when calculated until the end of 2010. However, a slight decline in the pass-through in both rates when the sample is extended to the end of 2014 is observed, suggesting a drop in the responsiveness of domestic deposit rates to monetary easing by the ECB.

It is interesting to note that the pass-through to households' deposit



rates in Italy and Portugal, declined considerably during between 2010 and 2014. It is likely that, in spite of falling policy rates, banks in these countries had to raise deposit rates to limit outflows and to secure a stable source of funding, as wholesale funding became more difficult to obtain.

## 5. Extending the baseline model

The heterogeneity of pass-through coefficients across countries and time periods imply that banks' interest rate setting may not exclusively depend on the policy rate set by the monetary authority but could also be affected by banking sector characteristics that may thus vary from time to time. Literature on determinants of interest rate pass-through has suggested that amongst other factors, the soundness of the financial sector can have profound effects on the monetary policy transmission mechanism. Indeed, Gambacorta (2008) argues that following a change in the policy rate, retail rates are not only affected directly through the traditional direct interest rate channel, but also through the effects such a change in policy might have on the financing conditions of banks. This indirect effect will most likely depend on the health of the banking sector causing a varying degree of interest rate pass-through. The same author proposes two channels through which changes in the health of the banking sector can affect the degree of interest rate pass-through, the indirect interest rate channel (captured by either the bank lending or bank equity theory) and the credit risk channel.

According to the bank lending theory, exogenous drops in bank deposits cannot be completely offset through other forms of finance. Therefore following a negative liquidity shock, banks would find it cheaper to restore their liquidity position by increasing lending rates than to issue new debt. Moreover, given that banks are willing to protect their interest rate margins such a shock would also positively impact lending rates. The bank equity theory predicts that following a reduction in their capital adequacy ratio (CAR), either due to credit defaults or other losses, banks will find it too costly to recapitalize through the issue of new shares.<sup>12</sup> Therefore they will opt to reduce their risk weighted assets either directly through credit rationing or by increasing bank lending rates also helping to increase their equity through higher profits. Lastly, retail rates also depend on the riskiness of the credit portfolio of banks. This channel predicts that an increase in the credit risk of some asset classes will prompt banks to re-allocate their portfolio towards less risky assets either directly through rationing or by increasing lending rates in order to compensate for the higher percentage of loans that have to be written off. These theoretical predictions have been confirmed by the empirical literature studying the heterogeneity of interest rate pass-through. Amongst others, Sorensen & Werner (2006) and Gigineishvili (2011) find evidence that both the liquidity and solvency position of banks, together with the exposure to credit risk, can affect the degree of interest rate pass-through.

In order to capture the effects that changes in banking sector health might have on the degree of interest rate pass-through, this section modifies the baseline equation (1) in two respects. First, while reduced form ARDL pass-through models (such as the one used in the previous sections) provide a good summary evaluation of the pass-through of policy-rate changes to retail rates, they are not adept in explaining why banks might change their pricing behaviour thereby modifying the sluggishness with which retail rates react to changes in the market interest rates. Thus following de Bondt et al. (2005) the ARDL model (1) is re-specified as an error-correction model.

Secondly, two new channels are added to the baseline model to allow for the effects of the indirect interest rate channel and the credit risk channel on the pricing of retail bank products.<sup>13</sup> With regards to the indirect interest rate channel, the bank lending theory is tested by augmenting the baseline model with the Loan to Deposit ratio (LDR). Given their reliance on deposits as a means to finance their lending activities, the LDR is an especially appropriate liquidity indicator for Maltese banks.<sup>14</sup> In line with Miani et al. (2012) solvency

<sup>12</sup> Literature shows that even if the capital requirement is not binding at a specific point in time, low-capitalised banks may find it optimal to forgo profitable lending in order to lower the risk of future capital inadequacy. Therefore banks will seek to retain some optimal level of CAR which is above the minimum required by regulatory bodies. For a more in-depth discussion see Van den Heuvel, S. (2002).

<sup>13</sup> The bank lending and bank equity theories provide two different propositions of how the indirect interest rate channel works. Therefore they can be seen as two mutually exclusive ways of how to model the cost of funding channel of commercial banks. They are therefore introduced into two separate models.

<sup>14</sup> By 2014, more than 56% of core banks' assets consisted of credit issued to households and NFCs. Also, 85% of the funding needs of these banks were financed by attracting deposits from the private sector.



and credit risk are proxied by the CAR and non-performing loans (NPLs) ratios of core banks, respectively. The extended estimating equations will therefore take the following form:

$$\Delta rr_t = \beta + \sum_{j=1}^{j^*} \delta_j \Delta rr_{t-j} + \sum_{k=0}^{k^*} \omega_k \Delta pr_{t-k} + \sum_{l=0}^{l^*} \varphi_l \Delta npl_{t-l} + \sum_{m=0}^{m^*} \sigma_m \Delta IIC_{t-m} + \rho ect_{t-1} + \varepsilon_t \quad (2)$$

$$ect_t = rr_t - (\theta + \vartheta pr_t + \mu IIC_t + \tau NPL_t) \quad (3)$$

Where  $ect_t$  is the residual of the long-run equation, that is the stationary deviation from the average equilibrium relation,  $NPL_t$  is the non-performing loan ratio of either households, NFCs or both, and  $IIC_t$  is the indirect interest rate channel indicator. Under Model 1 (capturing the bank lending theory), the latter will be proxied by the LDR while CAR will be used as a solvency indicator for Model 2 (capturing the bank equity theory).  $\omega_0$  measures the pass-through on impact while  $\vartheta$  measures the long-run pass-through.

Table 2 shows the estimation results of the two model extensions estimated on the full sample period.<sup>15</sup> When compared to the results derived from the baseline model estimated over the full sample, the two model extensions show an increase in the pass-through estimates for most of the retail rates considered. Despite this increase, however, the estimates of the extended models are still lower than those derived from the baseline specification estimated on the pre-crisis sample.

This shows that at least part of the reduction in the pass-through exhibited after the crisis can be attributed to changes in the liquidity and solvency positions of Maltese banks as well as to an increase in non-performing loans. Nevertheless, the main conclusion of incomplete-pass-through implied by the baseline model remains unaltered.

**Table 2**  
**ESTIMATION RESULTS OF EXTENDED MODELS**

*Explanatory variable: policyrate*

		Bank Lending Theory Model 1		Bank Equity Theory Model 2	
		Impact <sup>(1)</sup>	Long-run	Impact	Long-run
MIR Lending rates	Weighted average	0.35	0.61	0.35	0.56
	NFCs	0.34	0.59	0.33	0.56
	Mortgages	0.40	0.56	0.22	0.55
	Consumer credit	0.41	0.46	0.22	0.42
MIR Deposit rates	Weighted average	0.18	0.52	-	-
	Households	0.18	0.51	0.12	0.42
	NFCs	0.21	0.58	-	-
Central Bank of Malta Deposit rates	Weighted average	0.21	0.52	-	-
	Current	0.11	0.17	0.11	0.48
	Savings	0.25	0.42	-	-
	Time	0.20	0.52	-	-

<sup>(1)</sup> The impact multiplier estimates the short term pass-through. For example, an impact multiplier of 0.5 implies that if the policy rate changes by 1 percentage point, the bank retail rate will change by 0.5 percentage points within the same month.

Note: MIR deposit rates in the pre-crisis period were extended backwards using the average weighted deposit rate published by the Central Bank of Malta.

<sup>15</sup> Similar to the baseline model, dummy variables were inserted in a number of equations to capture possible breaks. In line with de Bondt et al. (2005) we use the Engle and Granger cointegration approach. Results that reject the hypothesis of cointegration are excluded from the table.

Comparing the baseline results with those derived from Model 1, one notes that the largest pass-through increments were registered in the deposit rate equations. This implies that the pass-through of deposit rates is more susceptible to changes in the liquidity position of Maltese banks as well as to changes in the risk environment they operate in. Moreover, the divergence in the long run pass-through estimates of lending and deposit rates evidenced by the baseline model is substantially reduced when one allows for changes in the liquidity position of and credit risk faced by the Maltese banking system.

Contrary to the bank lending theory model, the bank equity model fails to produce statistically significant results for most of the deposit rate equations. This might indicate that while changes in the Maltese banking sector liquidity position are able to explain developments in both lending and deposit rates, shifts in the solvency position of Maltese banks are only able to explain variations in the lending rates charged by Maltese banks. This finding suggests that when Maltese banks are faced with a fall in their CAR, they do not experience the need to increase their deposit rates so as prevent falls in deposits. This might be due to the fact that the capital adequacy ratio of Maltese core banks is significantly higher than the minimum required by the regulatory authority and are therefore perceived as safe by Maltese depositors. On the other hand, a worsening in the liquidity position measured by an increase in the LDR, prompts banks to increase their interest rate on deposits to secure a stable source of funding. This result is not surprising especially when considering that in absence of a more developed financial market, the Maltese banking system is heavily dependent on deposits to finance its lending activities. This result suggests that the reduction in the pass-through exhibited by deposit rates after the crisis was to some extent due to the rise in the LDR of banks that occurred in conjunction with the monetary easing phase of 2008-2009.

## **6. Conclusion**

The pass-through constitutes an essential link in the monetary policy transmission mechanism through which changes in policy rates set by the central bank affect economic activity, and ultimately prices. This article has presented econometric estimates of the pass-through from policy rates to bank lending and deposit rates in Malta. We find evidence of incomplete pass-through from policy to retail rates in Malta, both in the short and long run. As expected, this pass-through takes time, and impact multipliers were lower than the long-run multipliers. Impact multipliers were generally higher for lending rates than for deposit rates, reflecting institutional factors.

Focusing on lending rates charged to NFCs, the estimated pass-through for Malta is one of the lowest in the euro area. The sluggish pass-through as well as the relatively high borrowing costs for domestic NFCs could adversely affect the borrowing and investment decisions of firms, especially SMEs, for which bank lending constitutes an important funding source. The pass-through for household mortgage loans and consumer credit remained broadly in line with the median for the euro area countries. Over the full sample period, pass-through estimates for the deposit rates are on average slightly lower than that for lending rates.

Evidence of a reduction in the interest rate pass-through in the aftermath of the financial crisis has been found. This was especially true for deposit rates as well as for lending rates to NFCs. Cross-country comparison suggests that the pass-through to NFCs is one of the lowest in the euro area but that to households is broadly in line with the median for euro area countries.

Finally, in an attempt to explain the determinants of this drop in pass-through, the baseline model was extended to include effects of changes in the liquidity and solvency position of banks. Results from the extended models show that at least part of the fall in pass-through registered after the financial crisis can be explained by the inclusion of financial soundness indicators although the main conclusion of incomplete pass-through remains unaltered. Results show that developments in the liquidity position and credit risk faced by banks are relevant to both lending and deposit rate pass-through. On the other hand, changes in the solvency position of the banking system seem to be relevant only to the setting up of lending rates.

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## **PART V**

# **THE ROLE OF GOVERNMENT IN MALTA**



# FISCAL MULTIPLIERS IN THE MALTESE ECONOMY

Brian Micallef, Owen Grech and Ian Borg<sup>1</sup>

*This article employs three approaches to estimate the size of the fiscal multiplier in Malta: a structural vector-autoregression model, the Central Bank of Malta's macro-econometric model and a calibrated large-scale dynamic stochastic general equilibrium model. The results indicate that first-year multiplier estimates for government spending range between 0.73 and 0.93, whereas for taxation, the range is between 0.03 and 0.30. These are relatively small estimates compared with larger economies, possibly reflecting Malta's greater propensity to import, which results in a higher demand leakage. The results suggest that a fiscal adjustment strategy based on a combination of expenditure and tax measures may have a lower short-run cost compared with purely expenditure-based consolidation. Moreover, to be growth friendly, the strategy should aim to minimise these short-run negative effects by being coherent, credible and well communicated so as to properly shape expectations.*

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## 1. Introduction

The recent global financial crisis has triggered a renewed interest in fiscal policy and its impact on economic activity. A key consideration of this impact is the size of the fiscal multiplier. The latter is generally defined as the ratio of a change in output to an exogenous change in the fiscal instrument, such as government spending or taxation, with respect to their respective baselines (Batini et al., 2014). In addition to their importance for policy design, recent studies have shown that a better understanding of fiscal multipliers can play an important role in improving the accuracy of macroeconomic forecasts (Blanchard & Leigh, 2013).

Despite the extensive literature, however, there is still no consensus on the size of the fiscal multiplier. Generally, estimates of multipliers are found to differ across countries and fiscal instruments. In addition, estimates may also differ according to the methodology used.

The empirical and theoretical literature suggests that the size of the multiplier can be affected by the structural characteristics of the economy. For instance, countries with a high propensity to import tend to have lower multipliers as the demand leakage from imports is more pronounced. Similarly, multipliers are usually smaller for countries with a flexible exchange rate regime, as currency movements can offset the impact of fiscal policy on activity. Countries whose debt levels are high also tend to have lower multipliers since fiscal consolidation can exert positive credibility and confidence effects on private demand and could even lower the risk premium on debt. On the contrary, countries with more rigid labour markets tend to have higher fiscal multipliers as less flexible wage setting usually amplifies the response of output to shocks. The size of automatic stabilisers also matters, with larger stabilisers tending to lower multipliers as the response of transfers and taxes may offset part of the initial shock.

More recent studies have emphasised the role of conjunctural or cyclical factors, mainly focusing on the state of the business cycle and the degree of monetary accommodation. For instance, studies usually find that fiscal consolidation can be more contractionary if made during a recession than during an expansion (Auerbach & Gorodnichenko, 2012). Similarly, multipliers can potentially be larger when the transmission of monetary policy is impaired by, say, the zero lower bound (ZLB) on interest rates and, hence, the impact of fiscal contraction cannot be cushioned by accommodative monetary policy.<sup>2</sup>

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<sup>2</sup> Using a DSGE model with the ZLB constraint, Christiano et al. (2011) have shown that the fiscal multiplier can exceed three.

Differences in the size of the multiplier also originate from the methodology used (Spilimbergo et al., 2009; Leeper et al., 2011). The spectrum of approaches employed ranges from empirical models, such as vector auto-regressions (VAR) to structural and theoretically-driven ones, such as dynamic stochastic general equilibrium (DSGE) models. A recent strand in the literature extended the analysis to allow for non-linearities or state-dependent multipliers. Finally, some studies employ a narrative approach, using information from budget documents to directly identify exogenous policy changes (Romer & Romer, 2010).

Despite these differences, some of the findings from the literature are fairly robust across a variety of models. Studies generally report first-year multipliers to be lower than 1 in normal times but could potentially be above unity in abnormal circumstances, such as when the economy is in a severe recession or when monetary policy is constrained by the ZLB. Multipliers associated with government spending are generally higher compared with taxes, as part of the impact of tax changes is dampened by private saving behaviour. In a recent survey of the literature, one study reports an average multiplier of 0.75 for government spending and 0.25 for government revenues in advanced economies (Mineshima et al., 2014). Finally, there is broad consensus that medium to long-term benefits from well-designed fiscal consolidation strategies usually come at the expense of temporary losses in output (Kilponen et al., 2015).

Against this background, this article employs three approaches to estimate the size of fiscal multipliers in Malta. It also investigates selected topics from the literature, such as differences in the size of multipliers arising from temporary and permanent shocks, the role of the ZLB and of liquidity-constrained households. Finally, the article compares estimates of Malta's multipliers with those from other EU economies and provides policy recommendations based on the main findings.

## 2. The models used

The first approach is based on a structural vector auto-regression (SVAR) using the Blanchard-Perotti (2002) method.<sup>3</sup> In this approach, the estimation of spending and tax multipliers requires the modelling of two basic blocks. The first is a fiscal block that includes government consumption and net taxes. The latter are defined as total revenues less transfers, subsidies and interest payments. The second is the macroeconomic block, which consists of gross domestic product (GDP) and its deflator as a measure of output and prices, respectively. The model controls for demand and prices in Malta's main trading partners as exogenous variables to reflect the small and open features of the Maltese economy.

The main advantage of the SVAR approach is that it requires minimum restrictions on the part of the econometrician, and hence, results are more data-driven. On the other hand, the primary limitation is that very few variables can be included in the model to maintain its statistical robustness.

The second approach relies on the Central Bank of Malta's macro-econometric model, which is a medium-sized traditional structural model.<sup>4</sup> Behavioural equations are mostly estimated, rather than calibrated, in error-correction form. Economic agents are assumed to have adaptive expectations, and thus the model is backward looking. The model includes a relatively detailed endogenous fiscal block, which disaggregates the government sector into a number of revenue and expenditure categories (Grech, 2014). The use of a detailed structural model allows for a better understanding of the channels through which fiscal policy shocks are transmitted to the real economy.

The third approach relies on simulations using a DSGE model calibrated for Malta.<sup>5</sup> The latter class of models are derived from micro-foundations with forward looking expectations. In this case, estimates of the size of fiscal multipliers are derived from a multi-country model with nominal and real rigidities, and a detailed fiscal block in which Malta is modelled as a small and open economy in a monetary union.

<sup>3</sup> Borg (2015) provides a detailed discussion behind the choice of Blanchard-Perotti type restrictions as opposed to the other identification restrictions available in the literature.

<sup>4</sup> Grech & Micallef (2014). The model is built around the neoclassical synthesis, with sluggish adjustment of wages and prices in the short run and also some inertia of real variables in response to shocks.

<sup>5</sup> An overview of the model and its calibration for Malta is available in Micallef (2013). The technical description of the EAGLE model is available in Gomes et al. (2010).



In all three approaches, shocks to government consumption and taxation are considered. Each shock is scaled such that it amounts to 1.0% of GDP to facilitate the comparability of the results. To ensure consistency across all approaches, the average multiplier for the first year is reported.

The simulated shocks to the policy instrument are dictated by the relative richness of the fiscal block of each model. The parsimonious structure of the SVAR model implies that only shocks to aggregate variables (that is, government consumption and net taxes) are presented. In a separate specification of the SVAR model, however, a distinction is also made between public consumption and investment. The other two models have a more detailed fiscal block and hence, the simulations are implemented on disaggregated fiscal instruments. For instance, in the macro-econometric model, the government consumption shock refers to real intermediate consumption, whereas on the revenue side a distinction is made between direct and indirect taxes.<sup>6</sup> Simulations using the DSGE model are applied to government consumption on the expenditure side, and to households' labour income tax and the consumption tax rate on the revenue side.

### 3. Estimates of multipliers for Malta

Table 1 summarises the first year multipliers from the three different approaches. The main channels in each model are described in detail below.

#### 3.1 Expenditure multipliers

Despite the differences in methodology, the range of estimates for the short-term government consumption multiplier presented in Table 1 is quite narrow, ranging from 0.73 to 0.97. In each case the average multiplier for the first year is lower than 1, in line with findings in the literature, which implies that a €1 change in government consumption would lead to crowding out effects, such that the rise in output is lower than the initial shock.<sup>7</sup>

In the SVAR approach, a positive shock to government consumption leads to a contemporaneous response in GDP, which exhibits hump-shaped dynamics that peak in the second quarter. The response of output, which remains statistically significant for around two years, causes a persistent increase in the price level. Estimates from a disaggregated VAR model, that substitutes GDP with private consumption and investment,

**Table 1**  
**FISCAL MULTIPLIERS FOR MALTA USING THREE DIFFERENT METHODS**

*Impact on GDP in Year 1 to a 1.0% of GDP increase in the different fiscal variables*

*Per cent deviation from baseline*

	SVAR	Macroeconometric model	DSGE
<b>Expenditure</b>			
Government consumption	0.97	0.78	0.73
Government investment	0.61	0.18	
<b>Revenue</b>			
Total taxation	-0.30		
Direct taxes		-0.03	-0.09
Indirect taxes		-0.12	-0.15

Source: Authors' calculations.

<sup>6</sup> The shock to direct taxes is distributed proportionately between households, corporations and social security contributions. Similarly, the shock to indirect taxes is distributed proportionately between VAT, excise taxes and other indirect taxation.

<sup>7</sup> These results are broadly in line with Cordina (1996). This study reports a government consumption multiplier of slightly above 1 in the first year that falls to 0.5 in the second year, and tapers off in later years owing to the substantial leakages from imports. Using a large scale traditional econometric model, Arpa & Vella (2015) reports short-term multipliers ranging from 0.40 to 0.70 although they note that there were specific cases when the multiplier exceeded 0.90.

show that while private investment declines following a government consumption shock, private consumption increases. The latter implies that there is a relatively high share of liquidity-constrained households.

In the Bank's macro-econometric model, the rise in government consumption results in an immediate increase in GDP. This leads to higher employment and wages, and hence disposable income, which, in turn, raises private consumption. Moreover, heightened economic activity also stimulates investment. These developments bring about a further rise in GDP, which is offset to some degree by higher imports. The increase in economic activity raises the output gap which, in turn, exerts upward pressure on prices. With foreign prices unchanged, higher domestic prices lead to a loss in competitiveness and, thus, to a decline in exports. Still, on balance, the effect on GDP is positive, which translates into lower unemployment. On the fiscal side, as a result of the increase in government consumption, government expenditure rises. Owing to higher macroeconomic bases, government revenue also rises, but the net effect is for the government-balance ratio to fall. This implies a deterioration in the deficit ratio, and consequently the government debt ratio increases.

The positive shock to government consumption in the DSGE model also leads to an increase in GDP. The higher demand for factor inputs leads to a rise in hours worked and, to a lesser extent, in real wages. These induce a positive income effect that only partially offsets the negative wealth effect associated with higher government spending. Both private consumption and investment are adversely affected by the negative wealth effect as households and firms expect future fiscal policy to be tightened. The response of overall consumption masks differences in the behaviour of two types of households in the model. Higher government expenditure leads to an increase in consumption by liquidity-constrained households, given the rise in real wages, which is, however, offset by the decline in consumption of non-constrained households due to the negative wealth effect as households anticipate higher taxes in future. The effects of government expenditure on inflation are small and, given the small country assumption, have no effect on the monetary policy stance of the monetary union central bank. With unchanged nominal interest rates, there is a small reduction in the real interest rate, which partially compensates for the negative wealth effect of optimising households.

Model estimates point to significant differences between government consumption and investment shocks. Estimates for the response of output owing to a government consumption shock from the Bank's macro-econometric model and the SVAR range between 0.78 and 0.97, whereas the range is somewhat wider for public investment, between 0.18 and 0.61. Differences between the two shocks can be attributed to the relatively higher import share of government investment relative to government consumption.

### 3.2 Revenue multipliers

Estimates for tax multipliers in Table 1 range from 0.03 to 0.30. Tax multipliers are not only smaller than 1 but also lower than those for government consumption, in line with most studies in the literature.<sup>8</sup>

In the SVAR model, an increase in net taxes of 1.0% of GDP leads to a contemporaneous decline in output. The response of the latter is hump-shaped, peaking in the second quarter and slowing down monotonically thereafter. Government consumption also declines, although with a lag. The reaction of prices to the shock is negative and becomes statistically significant in the third quarter, exhibiting a prolonged hump-shaped response.

Estimates from the macro-econometric and DSGE models suggest that the negative impact on economic activity arising from an increase in indirect taxation is more pronounced than that from higher direct taxes. In the former, the multiplier estimates range between 0.03 and 0.09, whereas in the latter, between 0.12 and 0.15. This reflects the fact that the rise in indirect taxes has a positive effect on prices, which leads to a deterioration in price competitiveness. On the contrary, higher direct taxes exert lower price pressures, which, in the absence of changes in foreign prices or the exchange rate, leads to an improvement in price competitiveness and, hence, exports of goods and services.

<sup>8</sup> Cordina (1996) also reports relatively low income tax multipliers. Following a permanent 2 percentage point increase in the personal income tax rate, real GDP settles at a lower level compared with the baseline as the decline in consumption and investment offsets the positive contribution of the expansion in exports and the drop in imports. These findings are also similar to those in Grech (2015).

#### 4. Selected topics in the literature

The use of a DSGE framework allows for an in-depth investigation of a number of potential factors that could affect the size of the fiscal multiplier. Differences in multiplier estimates can depend on the policy adopted by the authorities, such as the degree of monetary accommodation by the central bank, the state of the business cycle and the nature of the fiscal adjustment, making a distinction, for instance, between temporary and permanent shocks.

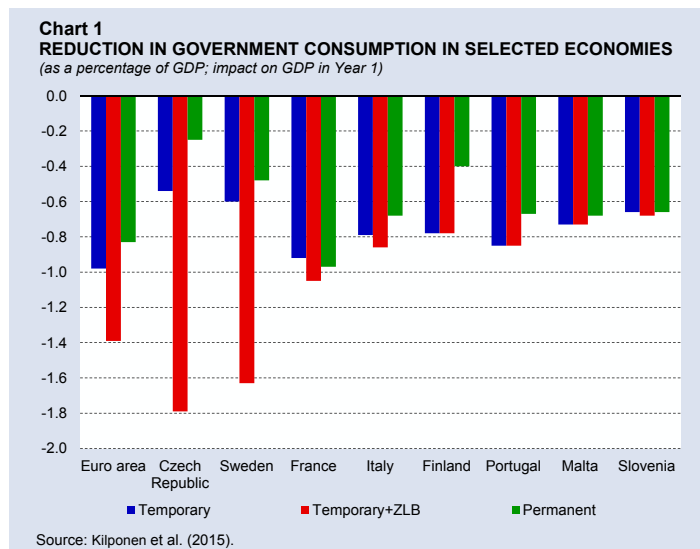
##### 4.1 Distinction between temporary and permanent shocks

Chart 1 compares the fiscal multiplier for a number of EU countries from a tightening of government consumption – both temporary and permanent – with the impact of the ZLB on nominal interest rates. A temporary shock is defined as a tightening of government consumption of 1.0% of GDP for two years, which then returns to baseline. In this case a distinction between situations when the ZLB is operational and when it is not, is made. Theoretically, a situation of constrained monetary policy could lead to higher fiscal multipliers compared with normal times. In the case of permanent shocks, the change in the fiscal variable continues indefinitely and does not return to baseline. This can be interpreted to constitute a “fiscal reform”, which permanently alters the fiscal structure of the economy.

Chart 1 shows that the ZLB on nominal interest rates only has a small effect on the multiplier for countries that belong to the euro area, especially small Member States like Malta. The effect on small economies is negligible because country-specific developments, such as GDP and inflation, only have a minor impact on aggregate activity and on inflationary pressures at euro area level. In contrast, the ZLB can have an important effect for the euro area as a whole and for countries outside the monetary union with an independent monetary policy. In the latter cases, the multiplier rises above 1 as the constant nominal interest rate, together with the fall in inflation, leads to a strong increase in the real interest rate that depresses private spending. This is in line with DSGE-based literature findings, which suggest that the ZLB is one of the most important reasons for a higher than normal short-term multiplier.

A permanent adjustment leads to slightly smaller short-run multiplier compared with a transitory reduction. This is due to the large positive wealth effect on households and firms, in which the permanent reduction in public consumption frees resources for private spending on a permanent basis, thereby inducing a larger crowding-in effect on private consumption and investment. Short-run multipliers are even lower when the fiscal room is used to reduce labour income taxes as the anticipation of lower future taxes induces households to gradually increase their labour effort.

Permanent fiscal shocks allow for an assessment of both short and long-run multipliers. In a permanent fiscal scenario, the long-run response of GDP depends critically on the instrument that is determined by the fiscal rule.<sup>9</sup> This is illustrated in Table 2, which compares two different simulations. In the first case the fiscal rule, that is, the instrument that adjusts in the long run after the fiscal space is created by the consolidation, is



<sup>9</sup> The fiscal rule is a technical instrument used in econometric models aimed to replicate, in a mechanical fashion, the Government's behaviour in managing fiscal policy to prevent public debt from following an unstable path that will lead to insolvency.

**Table 2**  
**SHORT AND LONG-RUN MULTIPLIERS WITH DIFFERENT FISCAL INSTRUMENTS**

*Impact on GDP; per cent deviation from baseline*

	Year 1	Year 2	Long-run
<b>Reduction in government consumption</b>			
Fiscal rule: Lump-sum transfers	-0.68	-0.37	-0.51
Fiscal rule: Labour income tax	-0.62	-0.21	0.30

Source: Authors' calculations.

specified in terms of non-distortionary lump-sum taxes. In the second case, the fiscal rule depends on distortionary labour income tax.

Financing matters a lot in the long run. When the fiscal space from the reduction in government consumption is used to permanently lower distortionary labour income taxes, the long-run multiplier becomes positive. The reduction in the labour tax rate provides an incentive to increase employment, thereby raising the productivity of capital, leading to relatively large supply-side effects on production and economic activity.

#### 4.2 The role of liquidity-constrained consumers

The results presented so far are based on the baseline calibration of EAGLE for the Maltese economy.<sup>10</sup> In this section, the sensitivity of the results with respect to some changes in the model's calibration aimed to mimic conditions along the business cycle, is analysed. More specifically, the sensitivity analysis tries to replicate a recessionary environment, reflected by a higher share of liquidity-constrained households, with the latter share being raised from 25% in the baseline case to 55%. It focuses on two scenarios, a permanent reduction in government consumption and a permanent increase in labour income taxes.

Table 3 shows that both the short and long-run multipliers become larger in absolute terms when there are more liquidity-constrained households, reflecting the fact that these households are less able to smooth

**Table 3**  
**SENSITIVITY TO A HIGHER SHARE OF LIQUIDITY-CONSTRAINED HOUSEHOLDS**

*Impact on GDP*

	Baseline	Higher share of liquidity-constrained households + 30 percentage point from baseline
<b>Permanent reduction in government consumption</b>		
<i>Lump-sum transfers in fiscal rule</i>		
Year 1	-0.68	-0.74
Year 2	-0.37	-0.41
Long-run	-0.51	-0.65
<b>Permanent increase in labour taxes</b>		
<i>Lump-sum transfers in fiscal rule</i>		
Year 1	-0.14	-0.19
Year 2	-0.33	-0.36
Long-run	-0.72	-0.80

Source: Authors' calculations.

<sup>10</sup> See Micallef (2013).

consumption than unconstrained ones. In both scenarios, however, the multipliers remain smaller than 1 in absolute terms.

#### 4.3 Cross-country comparison

Finally, a comparison of the estimates of fiscal multipliers for different spending and tax instruments with those in other EU economies is carried out. All results are obtained from DSGE models maintained within the European System of Central Banks (ESCB) using a harmonised exercise. The simulations consist in a reduction in government consumption and increases in households' labour income tax and the consumption tax rate. In all cases, the change in the policy instrument amounts to 1.0% of baseline GDP.

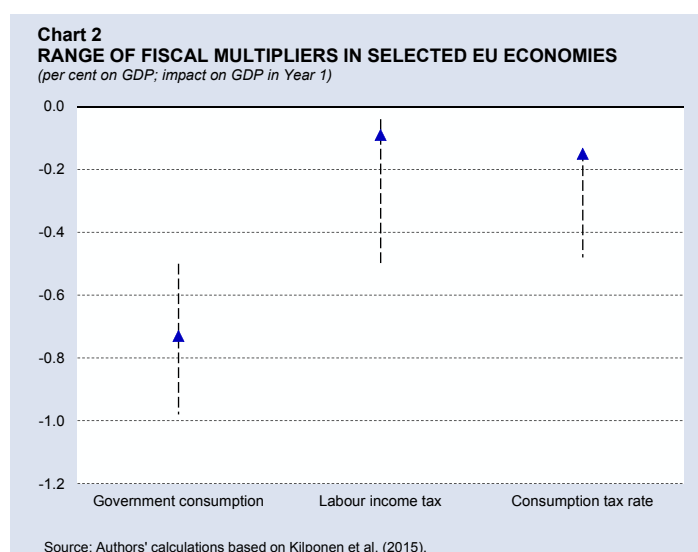


Chart 2 plots the first-year fiscal multiplier in Malta, together with the range of estimates for 14 other EU economies. A number of interesting conclusions emerge. First, short-term multipliers are smaller than 1 in absolute terms for all models, irrespective of the countries considered and the nature of the fiscal shock. Second, reductions in government consumption are typically associated with larger short-run GDP effects compared with increases in taxation. Third, multiplier estimates for small and open economies, such as Malta, are generally smaller than in larger economies. This could be due to a higher propensity for importation in small open economies, which tends to lower the multiplier as the demand leakage from imports is more pronounced.

## 5. Conclusion

This article provided estimates of multipliers in Malta for alternative fiscal instruments using three different methods. This exercise confirmed a common finding in the literature that there is no “single” fiscal multiplier: in addition to differences originating from the methodology used, multipliers are generally found to be country, time and instrument dependent. They are likely to differ depending on the structural characteristics of the economy and of conjunctural factors, such as the state of the business cycle or the degree of monetary accommodation to fiscal shocks.

Despite these differences, a number of conclusions that are in line with the stylised facts that emerge from the literature emerge. Short-run multipliers are smaller than 1 in absolute terms, irrespective of the methodology used or the nature of the fiscal shock. Spending multipliers, such as those related to a reduction in government consumption, tend to be larger than revenue multipliers. The short-term multipliers presented in this article for government spending range between 0.73 and 0.93, whereas for taxes, the range is between 0.03 and 0.30. Multipliers from indirect taxes tend to be larger than those from direct taxation owing to their impact on prices, and the latter's impact on output. Multipliers can become larger in a recessionary environment compared with normal times but estimates of multipliers for Malta still remain lower than 1.<sup>11</sup> The ZLB has a negligible impact on the multiplier for a small economy in a monetary union like Malta as country-specific shocks have little impact on euro area wide aggregates.

<sup>11</sup> This should not be interpreted to construe that fiscal policy is not an appropriate instrument to stabilise demand, especially during times of heightened uncertainty and slack in the economy. For instance, following the collapse of international trade in 2009, the Maltese government intervened at a micro-level by tailoring state assistance directly to those companies in difficulties, mostly in manufacturing and tourism. This temporary and targeted approach was deemed more appropriate than a broad-based fiscal stimulus package, which, in a small and open economy, would have leaked abroad through imports with a reduced effect on the domestic economy. Tailor-made assistance mainly took the form of financial aid for training concerning new business lines and the conversion of tax credits into investment aid. More generally, these measures were aimed at improving the competitiveness of the companies involved and to avoid mass redundancies.

Short-run multipliers are generally lower if the reduction in government consumption is permanently implemented instead of temporarily. In the case of permanent shocks, the long-run impact on GDP depends on how the budgetary room for manoeuvre is used following fiscal tightening. Long-run multipliers are negative when the fiscal space materialising after the tightening is used to adjust non-distortionary lump-sum taxes but become positive if distortionary taxation, such as the households' labour income tax rate, is reduced in the medium to long term. Given the anticipation effects, short-run multipliers are even lower when the fiscal space is used to lower distortionary taxes.

These findings lead to a number of policy recommendations. First, a fiscal adjustment strategy based on a combination of expenditure and tax measures may potentially have a lower short-run cost compared with purely expenditure-based consolidation. This is especially the case when there is ample spare capacity or when the economy is financially distressed. Second, once the public debt is permanently stabilised at a new lower level, the fiscal room created by the fiscal consolidation strategy should be exploited to reduce distortionary taxation on labor and capital. This should help to boost the economy's growth potential. Finally, a growth-friendly fiscal consolidation strategy would reduce the short-run negative effects of fiscal measures on economic activity. For this purpose, any fiscal consolidation plan needs to be coherent, credible and well communicated to properly shape the expectations of households and businesses.

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