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THE PHILLIPS CURVE IN THE MALTESE ECONOMY

BOX 4: THE PHILLIPS CURVE IN THE MALTESE ECONOMY¹

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 1958.² 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.³

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.^{4,5} 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.⁶

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. It can be seen that 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

¹ Prepared by William Gatt, Senior Research Economist at the Economic Research Department. The views expressed in this article are the author's own and do not necessarily represent the views of the Bank. The author would like to thank Professor Josef Bonnici, Mr Alfred Mifsud, Mr Alexander Demarco, Dr Aaron Grech and colleagues for valuable comments and suggestions during an internal presentation.

² Phillips, A. W., "The Relation between unemployment and the rate of change of money wage rates in the United Kingdom, 1861–1957". *Economica*, Vol. 25 No 100, 1958, pp. 283-299.

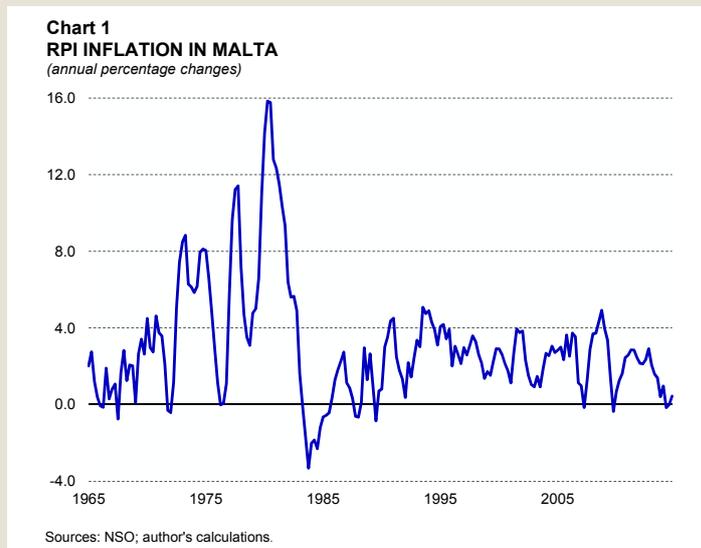
³ Favourable supply-side shocks, such as lower oil prices, on the other hand tend to boost economic activity and lower inflation. For instance, in Grech, O. and Micallef, B., "A structural macro-econometric model of the Maltese economy", *Working Paper version 2*, Central Bank of Malta, 2014, it is shown 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.

⁴ 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.

⁵ For a list of the important contributions to this field, see Kajuth, F., "Identifying the Phillips curve through shifts in volatility", *Journal of Macroeconomics*, Vol. 34, No 4, 2012, pp. 975-991.

⁶ See, for instance, Ball, L. M. and Mazumder, S., "Inflation dynamics and the Great Recession", *Working Paper WP/11/121*, IMF, 2011, and "The Phillips curve relationship in the euro area", *Monthly Bulletin*, ECB, July 2014, pp. 99-114.

of price controls, which were enacted to rein in price growth, particularly in household staples, such as bread. 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.⁷

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

It was noted above that the economy has been through two “regimes”: one having high and volatile inflation and another having more moderate price growth. It is therefore reasonable to expect that these structural changes may have affected the Phillips curve relationship

⁷ See Grech, A. G., “The evolution of the Maltese economy since independence”, *Working Paper* No 05, Central Bank of Malta, 2015. See <https://www.centralbankmalta.org>.

⁸ 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, B., “Developments in Malta’s structural unemployment”, *Quarterly Review* 2014:2, Central Bank of Malta, pp. 34-37, 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.

⁹ See “The dog that didn’t bark: Has inflation been muzzled or was it just sleeping?” *World Economic Outlook*, IMF, 2013, pp. 1-17, and Blanchard, O., Cerutti, E., and Summers, L., “Inflation and activity – two explorations, and their monetary policy implications”, *Working Paper* WP/15/230, IMF, 2015.

Table 1
ECONOMETRIC ESTIMATES OF THE PHILLIPS CURVE

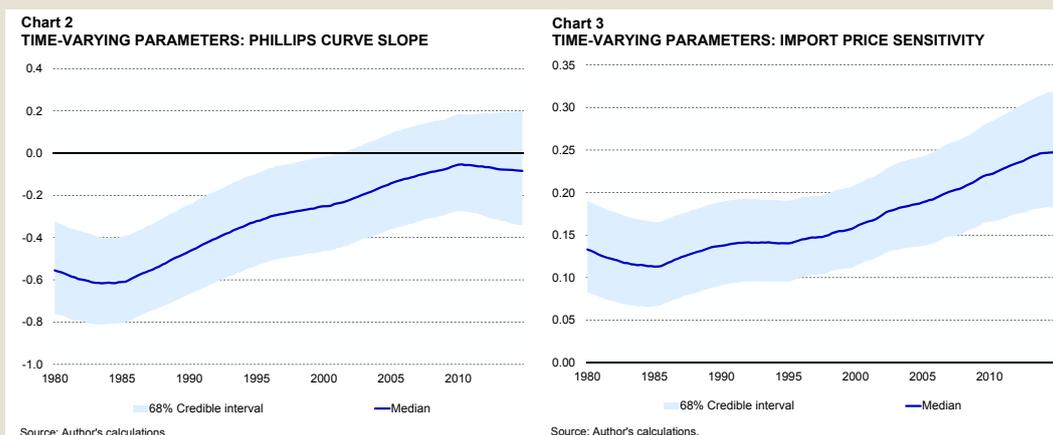
	Full sample 1966Q4 - 2014Q4	Sub-sample 1 1966Q4 - 1995Q4	Sub-sample 2 1996Q1 - 2014Q4
α	-0.48 **	-0.58 **	-0.28
γ	0.11 **	0.13 **	0.30 **
ρ_1	1.05 ***	1.09 ***	0.91 ***
ρ_2	-0.21 ***	-0.21 ***	-0.34 ***
c	0.30 **	0.10	1.11 **
Adjusted R ²	0.860	0.867	0.638
Standard error of regression	0.857	1.408	0.675
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.

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 more flexible model, which allows the parameters to change over time.^{10,11} Charts 2 and 3 show the estimated evolution of the slope of the Phillips curve and the import price sensitivity over time.¹²



¹⁰ While in the first set of results presented the parameters were treated as fixed, in this framework they were modelled as random walks. The model also allows for changes in the variance of inflation over time (stochastic volatility), and is estimated using Bayesian techniques. More details can be found in a forthcoming working paper.

¹¹ This follows the practice in recent studies. See Álvarez, L. J. and Urtasun, A., "Variation in the cyclical sensitivity of Spanish inflation: an initial approximation", *Economic Bulletin*, Bank of Spain July-August 2013, Stevens, A., "What inflation developments reveal about the Phillips curve: implications for monetary policy", *Economic Review*, National Bank of Belgium, Vol. III, 2013, pp. 67-76, and the references cited in Footnote 9 above.

¹² For technical reasons, the results are available from 1980 onwards.

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

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.¹³ 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.¹⁴ These factors tend to weaken the link between economic activity and inflation, yielding a flatter Phillips curve.¹⁵ 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.¹⁶

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 2013.¹⁷ 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. 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”.¹⁸ 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.

¹³ 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, S. and Paloviita, M., “Updating the euro area Phillips curve: the slope has increased”, *Research Discussion Paper*, No 31, Bank of Finland, 2014, and Riggi, M. and Venditti, F., “Failing to forecast low inflation and Phillips curve instability: A euro-area perspective”, *International Finance*, Vol. 18 No 1, 2015, pp. 47-68.

¹⁴ See Yellen, J. “Perspectives on monetary policy”, *Speech* delivered at the Boston Economic Club on 6 June 2012, and Ball, L., Mankiw, G. N. and Romer, D., “The New Keynesian economics and the output-inflation trade-off”, *Brookings Papers on Economic Activity*, Vol. 1, 1998, pp. 1-82.

¹⁵ There is also further evidence (not presented) 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 to an overheating economy.

¹⁶ See *Wage Dynamics Report*, 2010, available at https://www.centralbankmalta.org/updates/Downloads/pdfs/wage_dynamics_report.pdf.

¹⁷ See Micallef, B. and Caruana, K., “Wage dynamics network survey”, *Annual Report*, Central Bank of Malta, 2014, pp. 56-61.

¹⁸ For a discussion see Lewis, J. and Saleheen, J., “Tailwinds from the East: how has the rising share of imports from emerging economies affected import prices?” *Working Paper* No 506, Bank of England, 2014.