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Okun's Law in Malta: Lessons Learnt from a Sectoral Perspective*

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Abstract

Using data for the period between 1993 and 2012, we show that there exists a negative and significant relationship between Malta's output and its unemployment rate. More importantly, we show that over the past decade - and contrary to the general perception - the unemployment rate has been more sensitive to developments in the services sector than to those in the manufacturing sector. We use different equation specifications and the youth unemployment rate to show that the impact of developments in the manufacturing sector on the unemployment rate occurs mainly via firing while developments in the services sector affect the unemployment rate via the hiring of new entrants in the labour market. On the basis of these findings, a number of policy recommendations are drawn.

JEL classification codes: E24, E32

Keywords: Okun's Law, Malta, Unemployment, Output

1 Introduction

The Great Recession which started in the U.S. in 2007 and whose impacts have prolonged beyond 2013 has had a great impact on social wellbeing, particularly in countries where the unemployment rate reached historically high levels. This has been evident in countries such as Greece, Spain and Portugal where the unemployment rate - at one stage or another - rose to above 20%. The situation led governments all over the world to look for ways of boosting aggregate demand which, in turn, would be expected to bring unemployment rates back to "normal" levels.

During that period, the Maltese economy proved to be relatively resilient (EPD, 2009). However, in 2009 the number of unemployed persons increased by as much as 1,300 (or 20%) as the economy shrunk by 2.9%. At the time, the Maltese Government focused on supporting *manufacturing* companies in distress by offering subsidies to retain workers (Grech and Borg 2012; Rizzo, 2013). Such a sector-specific, firm-targeted approach was perhaps one of the few ways in which the Maltese Government could intervene to contain the negative impact of the recession on unemployment. Indeed, Malta's high marginal propensity to import as well as the loss of exchange rate targeting as a policy tool following Malta's membership in the Economic and Monetary Union (EMU) significantly limit the Government's ability to influence aggregate demand.[1] It is these constraints that make it all the more important for researchers and policymakers to understand the relationship between output and unemployment, which in macroeconomics is generally referred to as Okun's Law.

Within this context, this study has two aims:

- to verify the existence of a negative short-run relationship between Malta's output and its unemployment rate; and
- to gauge the sensitivity of the unemployment rate to developments in the manufacturing sector relative to those of the services sector.

On the basis of the findings, the paper makes a set of policy recommendations that could help Maltese policymakers combat cyclical unemployment.

[1] Malta's high marginal propensity to import weakens the effect of widespread expansionary fiscal policy because significant portions of any additional government expenditure would leak out of the Maltese economy through imports.

2 What is Okun's Law?

The first documentation of the study of the relationship between output and unemployment dates back to the work of Arthur Okun published in 1962. He originally estimated two versions of the relationship: a *difference* version and a *gap* version.[2]

The *difference* version relates a country's output growth to changes in its unemployment rate:

$$\Delta u = \alpha + \beta \Delta Y \tag{1}$$

where Δu is the change in the unemployment rate and ΔY is real output growth. The parameter β (which is commonly referred to as the Okun coefficient) is a measure of the elasticity of the unemployment rate with respect to output while the parameter α shows the change in the unemployment rate when there is no change in real output. It follows that $-\frac{\alpha}{\beta}$ represents the minimum level of output growth needed to maintain a constant unemployment rate. Notably, this implies that the unemployment rate might increase even if real output growth is positive.

In a slightly modified specification, the *gap* version relates the gap between the actual and natural rate of unemployment to the gap between actual and potential output:

$$(u - u^*) = \beta \left(\Delta Y - \Delta Y^*\right) \tag{2}$$

where u^* is the natural rate of unemployment and ΔY^* is potential output growth. This means that for a negative β, any real output growth rate below the potential growth rate would be associated with an unemployment rate above the natural rate of unemployment. Note that the two versions of Okun's law are the same if we assume that the natural rate of unemployment is constant and that potential output grows at a constant rate.

Okun estimated the two equations using data for the period between 1947 and 1960 for the U.S. economy and found that for an additional 1% of Gross National Product (GNP), the unemployment rate was 0.3 percentage points lower. Similar estimates for the Maltese economy for the period post-1995 show that a 1% increase in the Gross Domestic Product (GDP) is associated with a decline of 0.1-0.15 percentage points in the unemployment rate (see, for example, Cazes *et al.*, 2011; ECB, 2012a; ECB, 2012b; CBM, 2013).

[2] Alternative specifications such as the dynamic version and the production function approach have been used in other studies. For a review see Stock and Vogler-Ludwig (2010).

However, much controversy has surrounded Okun's Law in recent years with many claiming that Okun's Law may have "broken down" since the start of the global financial crisis, with unemployment going up by substantially more or less than expected in various economies (see, for example, Gordon, 2011; Meyer and Tasci, 2012). Others, such as Ball *et al.* (2013), have claimed that "the relationship is strong and stable by the standards of macroeconomics". In either case, their evidence supports the view that shifts in aggregate demand cause short-run fluctuations in the unemployment rate. Thus, in contrast to the beliefs of neoclassical economists and in line with pure Keynesian thinking, both views implicitly assume some degree of wage rigidity.[3] This thinking, however, has been almost forgotten for the past three decades as a result of the wide-spread adoption of Real Business Cycle (RBC) models. Nonetheless, its relevance is once again at the fore of modern macroeconomics following New Keynesian thinking which assumes that prices and wages are sticky in the short run but flexible in the long run. Ultimately, irrespective of one's beliefs, the recent surge in studies estimating the Okun coefficient (or its stability over time) has ensured that Okun's Law remains a major theme in modern macroeconomics.

3 Okun coefficient estimates for Malta

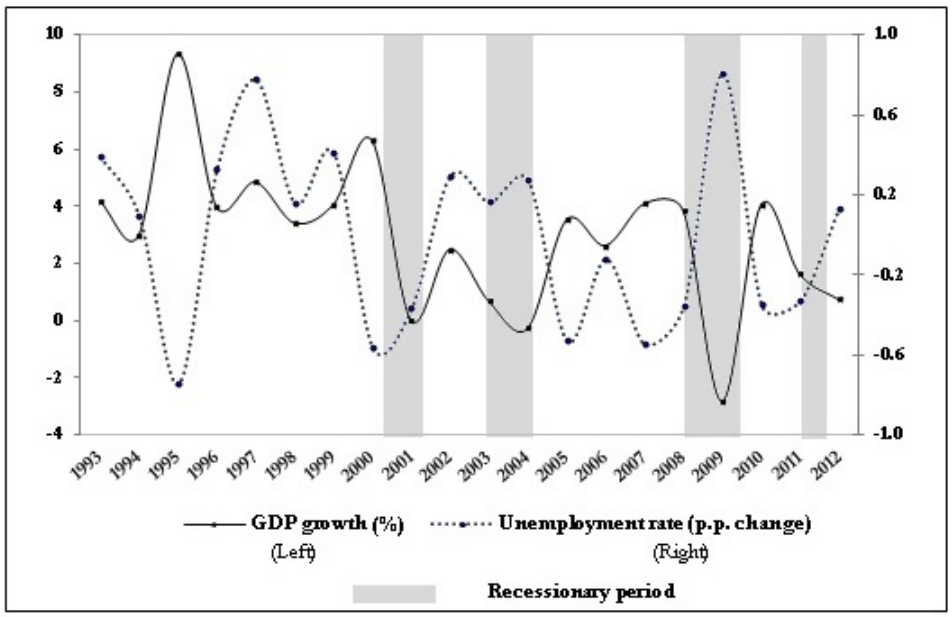
In an attempt to avoid the difficulties and controversies related to the estimation of potential output and the natural rate of unemployment, we estimate the Okun coefficient using the difference version of Okun's law.[4] This was applied to two data sets: one based on annual data with 20 observations spanning from 1993 to 2012 and another based on quarterly data with 52 observations spanning from the first quarter of 2000 to the last quarter of 2012. The unemployment rate was calculated as the share of unemployed in the country's labour force while output was measured by GDP. Both labour market and GDP data were obtained from the National Statistics Office (NSO), with the former based on the administrative records of the Employment and Training Corporation (ETC).

The data presented in Figure 1 shows that the period under analysis has been characterized by four recessions. In 2001 the Maltese economy experienced a mild recession due to a crash in the global IT industry. Later, in the 2003-2004 period, the Maltese economy experienced another mild recession due to a relatively weak international environment (especially in Malta's main trading partners). Then in 2009, the Maltese economy experienced a strong economic downturn amid the global economic crisis and another mild

[3] Following an aggregate demand shock, the economy can adjust in two ways: via a quantitative adjustment (i.e. changes in labour demand as reflected by changes in employment or hours worked) and/or via a price adjustment (i.e. changes in wages). Quantitative adjustments are more common due to the negative impact of lowering wage rate on the morale and productivity on staff (see, for example, Bewley, 1998).

[4] Experiments along these lines have led us to believe that using the gap version as an alternative to the difference version should not alter the conclusions of the paper.

Figure 1: GDP growth and changes in the unemployment rate (annual series)



recession in the early months of 2012 amid the uncertainty surrounding the euro area. During the remaining years of the period under analysis, Malta enjoyed healthy rates of real GDP growth.

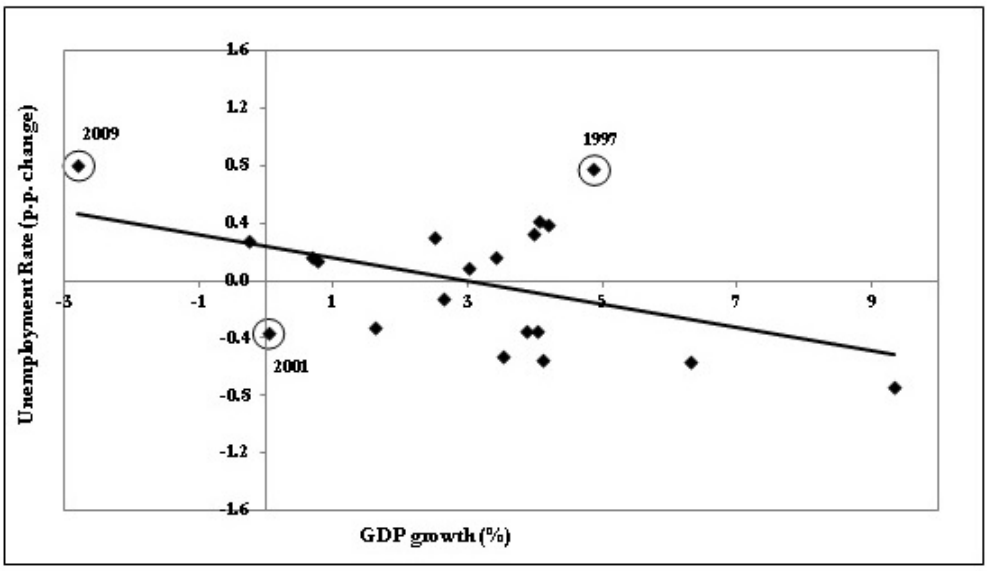
A closer look at Figure 1 also suggests that there may exist a negative relationship between the two variables of interest - the unemployment rate tends to increase when real GDP growth is relatively low and vice versa. Therefore, a priori we expect a negative and significant Okun coefficient.

3.1 Annual estimates

A plot of GDP growth against percentage point changes in the unemployment rate for the annual time series is presented in Figure 2. A simple line of best fit suggests that there indeed exists a negative relationship between the two variables. However, there is a potential outlier relating to 1997 (which was confirmed using studentized residuals).[5] During this year, real GDP grew by 4.9%, while the unemployment rate increased by

[5] A studentized residual is a statistical measure used to detect outliers. It is a quotient resulting from the division of a residual by an estimate of its standard deviation. In our analysis we considered a studentized residual of ± 2 as an outlier.

Figure 2: GDP growth against changes in the unemployment rate (annual series)



a significant 0.8 percentage points. These seemingly contradicting developments reflect a simultaneous increase in the size of the services sector and a shrinking manufacturing sector whose laid off workers were largely unable to find employment in the growing services sector. This could have been the result of (i) skill mismatches between the laid off workers and those required by the services sector and/or (ii) lower labour requirement per one euro of GDP in the services sector when compared to the manufacturing sector.[6]

Noting this exceptional circumstance and in an attempt to abstract from mixing cyclical with structural adjustments, we experiment with a version of equation (1) which includes a dummy variable for 1997. Nonetheless, in Table 1 we also report estimates for the original equation (1) excluding the dummy variable. In addition, Table 1 also reports estimates with adjusted labour force data to capture developments related to part-time employment. The rationale for this adjustment is the inappropriate treatment of part-time employees in ETC's definition of the labour supply (see Appendix A). Specifically, for regression results under columns (iii) and (iv), the labour force data has been adjusted to *include* persons whose primary job is on a part-time basis.

The results show that there exists a negative and significant relationship between the unemployment rate and output growth. The degree of confidence in the estimates of the

[6] Point (ii) is based on the observation that labour productivity in the services sector (s) is higher than that in the manufacturing sector (m), i.e. $\frac{N_s}{Y_s} < \frac{N_m}{Y_m}$, where N is the number of employees in sector $i \in [m, s]$.

Table 1: Estimates of the Difference version of Okun's Law (annual data)

	LF excl. PT		LF incl. PT	
Δu	(i)	(ii)	(iii)	(iv)
constant	**0.239**	**0.232****	**0.191**	**0.185**
	(0.112)	(0.075)	(0.164)	(0.117)
ΔY	**-0.080****	**-0.095****	**-0.073****	**-0.087*****
	(0.041)	(0.008)	(0.043)	(0.008)
D_{97}		**1.006****		**0.940****
		(0.014)		(0.012)
R^2	21.1%	45.2%	20.9%	45.9%

*,**,*** *represent the 90, 95 and 99 percent level of significance respectively*

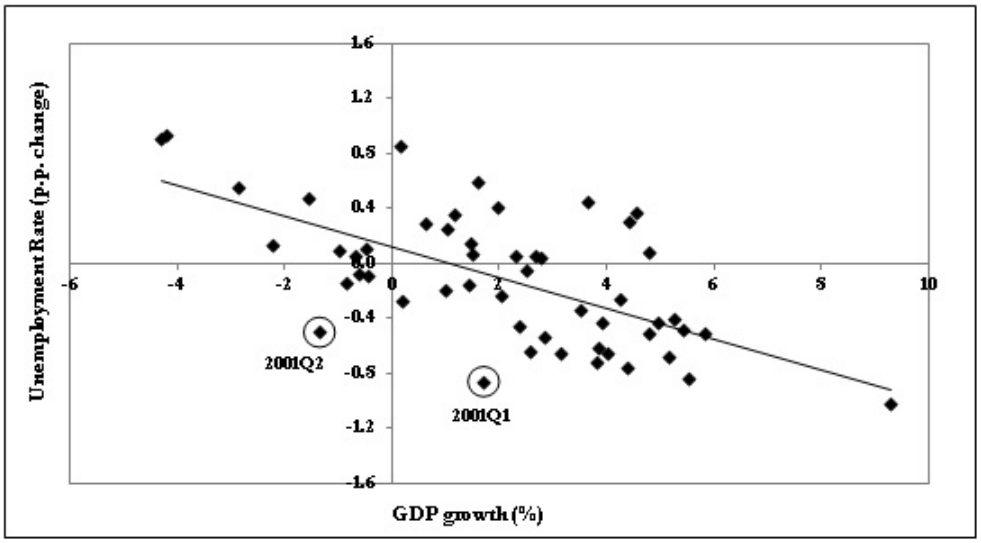
β coefficient is at the 99% level for regressions (ii) and (iv) and at the 90% level for regressions (i) and (iii). If we focus on regression (ii) - which estimates the original difference version of Okun's Law but also includes a dummy variable for the year 1997 - the results show that every 0.1 percentage point decline in the unemployment rate is associated with a 1% increase in output growth. Notably, if we exclude the dummy variable that captures supply-side adjustments to the economy, the estimated Okun coefficient would still be negative but marginally smaller. As expected, regressions (iii) and (iv) which were meant to better capture variations in the unemployment rate yield marginally lower but not significantly different Okun coefficients.[7]

3.2 Quarterly estimates

In an attempt to address concerns related to the small size of the annual dataset, we use a quarterly series which includes 52 observations relating to the period between 2000 and 2012. A cursory glance at Figure 3 shows that the negative relationship between output growth and the unemployment rate seems to hold for the quarterly dataset too. However, there seems to be two potential outliers relating to the first and second quarters of 2001. In fact, Figure 3 shows that a *very* significant decrease in the unemployment rate was recorded in the first quarter of 2001 despite an output growth rate lower than 2%. In the second quarter, a further decline in the unemployment rate was recorded even though the economy contracted. The observed decline in the unemployment rate during these two quarters was largely the result of the positive growth rate recorded by the services sector

[7]Since ETC's definition of the labour force excludes part-time employment, the unadjusted unemployment rate is greater than the adjusted unemployment rate (due to the latter having a greater denominator). Thus an additional unemployed person will have a greater impact on the unadjusted unemployment rate than on the adjusted unemployment rate, which mathematically results in a higher beta coefficient in the case of the unadjusted unemployment rate.

Figure 3: GDP growth against changes in the unemployment rate (quarterly series)



and the hoarding of labour by the manufacturing industry following a drop in demand for goods produced by the domestic semi-conductors industry. These two data points were confirmed to be outliers using studentized residuals. Thus, Table 2 presents the Okun coefficient estimates as per equation (1) in column (i) while column (ii) adds onto this equation specification a dummy variable for the first and second quarters of 2001.[8]

Two things stand out from the results based on the quarterly dataset. First, the estimates suggest that the unemployment rate would be expected to increase by around 0.1 percentage points for every 1% decrease in annual real GDP growth; noting that the dummy variable capturing the structural adjustment in the economy yields only a marginally stronger relationship between the unemployment rate and real output growth.[9] This result seems broadly consistent with the results obtained from the annual dataset, i.e. Malta has a negative Okun coefficient that ranges between 0.08 and 0.12.

[8] We include a dummy variable for the year 2001 in the quarterly regressions but not in the annual regressions because the significant declines in the unemployment rate recorded in the first two quarters of 2001 were followed by increases in the unemployment in the two subsequent quarters leading the annual average unemployment rate in 2001 to be close to the line of best fit of the annual estimates (or that suggested by our estimates of the Okun coefficient).

[9] Quarterly data adjusted for part-time employment have yielded similar results. Moreover, we also considered an equation specification with lagged GDP growth based on the assumption that that firms may react to changes in output growth with some lag. However, the resulting estimates show roughly similar results.

Table 2: Estimates of the Difference version of Okun's Law (quarterly data)

	(i)	(ii)
constant	**0.119***	**0.168*****
	(0.075)	(0.008)
ΔY	**-0.111*****	**-0.120*****
	(0.000)	(0.000)
D_{01}		**1.826*****
		(0.001)
R^2	40.7%	51.7%

$^{*},^{**},^{***}$ *represent the 90, 95 and 99 percent level of significance respectively*

Second, the ratio $-\frac{\alpha}{\beta}$ - which represents the level of output growth needed to maintain a constant unemployment rate - was estimated at 1.4 when using quarterly data (covering the period 2000-2012) but at 2.4 when using annual data (covering the period 1993-2012).[10] Since the quarterly dataset only captures developments post-2000, this might suggest that the Maltese economy required lower output growth to maintain a stable unemployment rate in the latter years of the period under analysis. This would imply that there has been a change in the output-unemployment relationship at the turn of the century caused either by a change in the intercept (α) or by a change in the Okun coefficient (β), or a combination of the two. This is not surprising since Okun's law is simply an empirical observation used as a rule of thumb rather than a structural feature of the economy.

Although testing for the stability of α and β is beyond the scope of this paper, we note that the change in the ratio $-\frac{\alpha}{\beta}$ was probably the result of changes in *both* α and β. A comparison of the annual and quarterly estimates suggests that β increased marginally over time whereas α declined, both leading to a lower $-\frac{\alpha}{\beta}$ ratio. These developments may be the result of a number of factors, but the more important ones relate to changes in *labour force* and *productivity growth* (see Appendix B). In fact, data shows that there have been significant changes in both these variables. Average labour force growth declined by around 0.5 percentage points when the post-2000 period is compared to the nineties. At the same time, productivity proved to be relatively volatile contributing in no small way to changes in both α and β . In line with potential output estimates for the Maltese economy (see Ministry for Finance, 2013), these developments led to a situation which requires a lower output growth rate to maintain a constant unemployment rate.

[10] Both estimates are based on the specification with dummy variables.

3.3 Potential explanations for a low Okun coefficient

On the basis of the estimates presented in Section 3.1 and Section 3.2, we note that the Okun coefficient estimates for Malta are low by international standards (see, for example, Cazes *et al.*, 2011; ECB, 2012a; ECB, 2012b; CBM, 2013). Indeed, in the average EU country, a 1% decline in aggregate output is associated with an increase in the unemployment rate of 0.3 percentage points - almost three times as sensitive as that of Malta. Within this context, β is understood to be determined by a number of factors which relate to labour market flexibility. Amongst others, the Okun coefficient is sensitive to the ease with which firms can fire and hire workers; the extent to which firms can adjust wages; and the firms' ability to reduce employees' working hours.[11]

However, the more important reason for the observed low Okun coefficient is the hoarding of labour.[12] If firms expect a drop in demand to be only temporary, then hoarding labour would be the optimal choice as they factor in the avoidance of additional costs that would have to be incurred if they had to hire new workers later on.[13] This is at times complemented by government support to firms to retain workers during periods of deficient demand. For example, Grech and Borg (2012) report that during the 2009 recessionary period, the Maltese Government subsidised companies in distress to refrain from firing workers by offering financial aid for training related to new business lines, the conversion of tax credits into investment aid and assistance in tracking new investment opportunities.[14]

An alternative potential and partial explanation for a low Okun coefficient suggested by ECB (2012) is the tradition of lifetime employment. This is probably very much the case for a significant proportion of the Maltese labour force, specifically that part made up of the older generations. Often in such cases, when output falls, employers are reluctant to fire workers such that the response of the unemployment rate to changes in GDP growth is relatively low. This is also the case for public sector employees whose share in Malta's total employment is greater than that of most other EU countries and whose employment is typically sheltered from periods of deficient demand in the real economy.

[11] *Greater flexibility* to fire employees during recessionary periods would be expected to result in a *higher unemployment* rate and thus a *higher Okun coefficient*. In the other two cases, *lower flexibility* would be expected to result in a *higher Okun coefficient*. In fact, in a labour market with rigid wages, a decrease in output that leads to lower labour demand would be expected to result in higher unemployment than a similar decline in output in a labour market with higher wage flexibility. Similarly the limited ability to reduce working hours may lead employers to opt for labour shedding.

[12] This labour hoarding phenomenon is perhaps best observed in the pro-cyclicality of productivity where firms hire relatively few workers during booms (such that they have to be more productive) and fire relatively few workers during recessions (such that they are less productive).

[13] In fact, during the 2009 recessionary period, the Times of Malta reported that a number of firms reduced working hours by operating on a four-day week basis. MEA (2009) also reported that many employers decreased overtime during the crisis.

[14] Grech and Borg (2012) reported that during the 2009 financial crisis, the Government declared that government support schemes saved 2000 jobs.

Overall, estimates based on both the annual and quarterly datasets show that β is negative, significant and low by international standards, reflecting strong pro-cyclical productivity resulting from the hoarding of labour motivated by a combination of cost avoidance, the tradition of lifetime employment and financial support from the Maltese Government.

4 Manufacturing versus Services[15]

The analysis presented in Section 3 shows that the significant restructuring which the Maltese economy underwent throughout the period under analysis may have had a bearing on the Okun coefficient estimates based on the annual and quarterly datasets. This was in part dealt with by the use of dummy variables for the years in which the growth rates of the manufacturing sector and the services sector moved strongly against each other - specifically in 1997 and 2001. However, such a strategy may fail to reveal important information about the relationship between the unemployment rate and sectoral growth developments. This sectoral perspective is particularly important due to very different developments observed in the manufacturing and the services sectors during the period under analysis. Indeed, Figure 4 shows that the services sector generally enjoyed positive growth (with the exception of 2009) while the manufacturing sector was characterized by several periods of negative growth. This troubled performance of the manufacturing sector over the past two decades has led to more frequent firing relative to the services sector as well as repeated intervention by Government to assist companies within the sector in times of economic distress. Consequently, the general perception of economic commentators and the media more generally is that increases in the unemployment rate are largely the result of developments in the manufacturing sector.

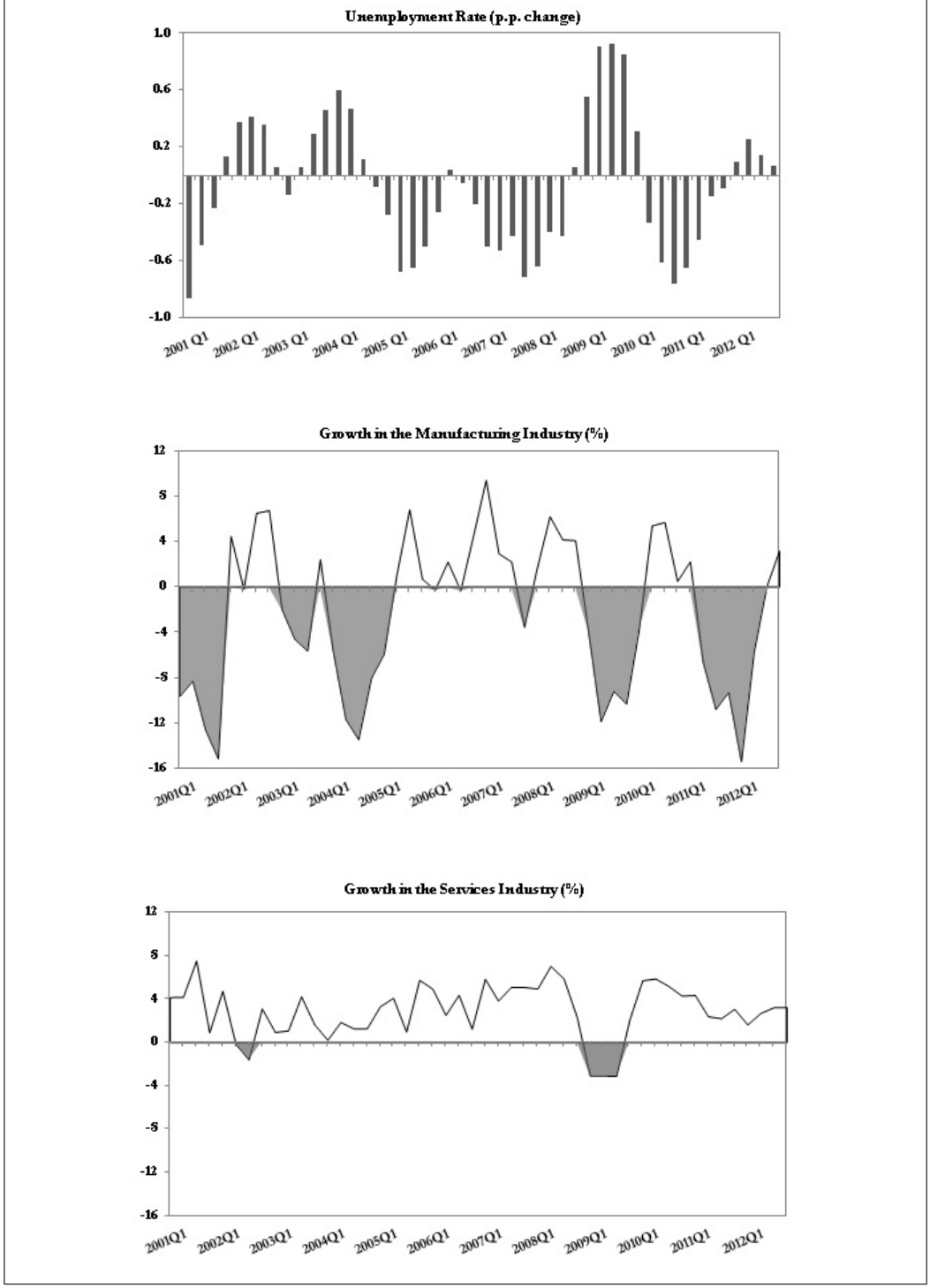
We analyse this hypothesis by estimating a slightly modified version of Okun's law which makes a distinction between the two sectors (see Appendix C):

$$\Delta u = \alpha + \beta_s \lambda_s \Delta Y_s + \beta_m \lambda_m \Delta Y_m \tag{3}$$

where β_s and β_m represent the responsiveness of the unemployment rate to the growth in output of the services and manufacturing sectors, λ_s and λ_m represent the respective weight of each sector's contribution to total GDP while ΔY_s and ΔY_m represent real GDP growth in the services and manufacturing industries respectively.

[15]The term manufacturing is here used loosely to represent all sectors whose activity is classified as direct production. These include agriculture, fishing, quarrying, manufacturing itself, utilities and construction. The manufacturing sector makes up circa 55% of the total direct production employment while the direct production makes up around 25% of total employment.

Figure 4: Change in the unemployment rate, manufacturing and services output



The results are presented in Table 3. Columns (i), (ii) and (iii) show the elasticity of the unemployment rate with respect to developments in each of the two sectors ($\beta_i \lambda_i$) while columns (v), (vi) and (vii) show estimates of the weighted β-coefficients (β_i).[16] The $\beta_i \lambda_i$ estimates represent the change in the unemployment rate that is associated with a 1% increase in the output of sector i. On the other hand, the β_i estimates show the change in the unemployment rate associated with an increase in sector i's output equivalent to 1% of total GDP.[17]

In line with the Okun coefficient estimates presented in Section 3, all estimates show that there is a negative and significant relationship between the unemployment rate and output growth. However, there exist some important differences between the two sectors. Indeed, column (i) suggests that the manufacturing industry has a relatively low impact on the unemployment rate when compared to the services sector. This result may be somewhat surprising given the general perception that the unemployment rate is more sensitive to developments in the manufacturing sector. In part, this could be the result of the manufacturing sector's relatively small share in total GDP - which in 2012 stood at 18.5%. However, even after accounting for the effect of each sector's share in total GDP, the weighted β-coefficient for services is greater than that for manufacturing (see column (v)). Specifically, the estimates suggest that an increase in the services sector's output equivalent to 1% of total GDP is associated with a simultaneous 0.118 percentage points decrease in the unemployment rate. On the other hand, an increase of equivalent magnitude in the output of the manufacturing sector is associated with a 0.091 percentage points decrease in the unemployment rate.

One potential explanation for this result is the labour-hoarding behaviour that is typical of manufacturing firms and encouraged by Government through subsidies in times of deficient demand. Indeed, MEA (2009) reports that during the 2009 recession, a large number of manufacturing firms have *not* resorted to redundancies in the hope that the situation improves in the medium-term. The second important factor that explains the stronger impact of the services sector on the unemployment rate is the services sector's crucial role in absorbing new entrants into the labour market. Indeed, a closer look at the data shows that the larger share of the new entrants into the labour force tend to find employment within the services sector. Consequently, when the growth rate of the services sector slows down, a number of new entrants - who would have alternatively found employment in the services sector - might end up registering for employment.

[16] The $\beta_i \lambda_i$ estimates are obtained by multiplying the weighted β-coefficient with the respective sector's weight in GDP (λ_i) which is presented in column (iv).

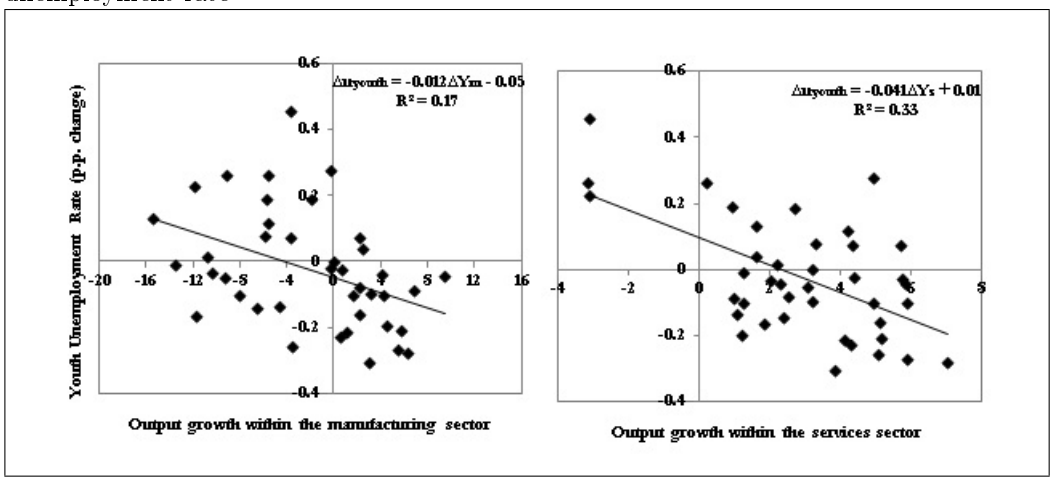
[17] For the manufacturing sector to increase its output by an amount equivalent to 1% of total GDP, it requires a growth of about 4%. On the other hand, the services sector would have to grow only by around 1.25%. Thus the weighted β-coefficient for the manufacturing sector (β_m) shows by how much the unemployment would be expected to decrease if the manufacturing industry were to register a growth rate of around 4%, whereas the β-coefficient for the services sector (β_s) shows by how much the unemployment would be expected to decrease if the services sector were to register a growth rate of around 1.25%.

Table 3: Estimates of β_i and λ_i in the modified version of Okun's Law

	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)
	$\beta_i\lambda_i$			λ_i	β_i		
constant	**0.098**	**0.083**	**0.215*****		**0.126**	**0.113**	**0.223*****
	(0.215)	(0.279)	(0.008)		(0.106)	(0.133)	(0.004)
$\Delta Y_{s,t}$	**-0.084*****		**-0.067*****	**0.754**	**-0.118*****		**-0.092*****
	(0.000)		(0.001)		(0.000)		(0.000)
$\Delta Y_{m,t}$	**-0.024*****		**-0.010**	**0.246**	**-0.091*****		**-0.041***
	(0.001)		(0.151)		(0.000)		(0.088)
$\Delta Y_{s,t-1}$		**-0.079*****	**-0.059*****	**0.754**		**-0.113*****	**-0.073*****
		(0.000)	(0.003)			(0.000)	(0.004)
$\Delta Y_{m,t-1}$		**-0.026*****	**-0.026*****	**0.246**		**-0.102*****	**-0.082*****
		(0.000)	(0.000)			(0.000)	(0.001)
R^2	41.1%	42.9%	56.7%		41.8%	44.4%	59.1%
Adj. R^2	38.7%	40.5%	53.0%		39.4%	42.2%	55.6%

*, ** and *** represent the 90, 95 and 99 percent level of significance respectively

Figure 5: Output growth in the manufacturing and services sector against changes in the unemployment rate



Along these lines, we hypothesize that the manufacturing sector affects the unemployment rate mainly via firing (which typically occurs with a lag) while the services sector affects the unemployment rate mainly via hiring (the impact of which is felt immediately). To test this hypothesis, we make use of lagged explanatory variables and find that developments in the services sector have an immediate impact on the unemployment rate while developments in the manufacturing sector affect the unemployment with a lag of one quarter. This is evident by comparing column (i) to column (ii) and column (v) to column (vi). This is further confirmed by the results in columns (iii) and (vii) which represent a specification of equation (3) that includes both current and lagged output growth for the two sectors. In both cases (when accounting and when neglecting the effect of the size of the industry), the estimates confirm that the services sector has a greater impact in the current period while the manufacturing sector has a greater impact with a lag of one quarter. Thus, the results support the argument that the services sector affects the unemployment rate mainly via hiring while the manufacturing sector affects the unemployment rate mainly via firing.

To further confirm the hypothesis that growth slowdowns in the services sector are important contributors to increases in the unemployment rate, we make use of youth unemployment rate data. If we assume that youths constitute a large share of new entrants into the labour market and if slowdowns in the growth of the services sector are indeed a major cause of a higher unemployment rate, then we should observe a stronger relationship between the youth unemployment rate and output growth in the services sector than between the youth unemployment rate and output growth in the manufacturing sector. Figure 5 shows that this is indeed the case: a simple line of best fit reveals that the relationship between the youth unemployment rate and growth in the services sector is

stronger than the relationship between the youth unemployment rate and growth in the manufacturing sector. Specifically a 1% increase in the growth of the services sector is associated with a 0.04 percentage points decline in the youth unemployment rate while a 1% increase in the growth of the manufacturing sector is associated with only a 0.01 percentage points decline in the youth unemployment rate. In addition, the R-squared - which measures the dispersion of the data from the fitted regression line - is also higher for the services sector, suggesting that more of the variation in the youth unemployment rate is explained by developments in the services sector.

5 Conclusions and policy recommendations

This study uses regression analysis in an attempt to verify the existence of a negative relationship between output and unemployment; and to gauge the relative sensitivity of the unemployment rate to developments in the manufacturing and the services sectors.

5.1 Main findings

In line with the existing literature, we find that the Okun coefficient for Malta is negative, significant and low by international standards. We estimate that the unemployment rate is 0.1 percentage points lower for every 1% increase in Malta's output growth. This estimate is particularly low when compared to similar estimates for EU and euro area countries where on average an increase of 0.3 percentage points in the unemployment rate is associated with a 1% decline in GDP. This is probably the result of a number of factors relating to labour market and wage flexibility, including the ease with which firms can hire and fire labour; the firm's ability to reduce employees' working hours; the degree of downward wage rigidity; and the share of public sector employment in total employment. Another potential reason is the hoarding of labour during periods of deficient demand which is locally known to be motivated by: (i) the avoidance of additional costs that would have to be incurred if employers had to hire new workers when demand returns to normal conditions; (ii) the tradition of lifetime employment which makes employer-employee relationships so strong such that employers are reluctant to fire workers in times of deficient demand; and (iii) financial support by the Maltese government to retain workers during recessionary periods to avoid negative social consequences.

This labour hoarding phenomenon – which is known to be predominantly practiced in the manufacturing sector – is one of two main reasons underlying the most important result of this study: *the impact of the manufacturing sector's performance on the unemployment rate is significantly smaller than that of the services sector.* Specifically, our estimates suggest that a 1% decrease in the output of the services sector is associated

with an increase in the unemployment rate of 0.08 percentage points while a 1% decrease in the output of the manufacturing sector is associated with an increase of 0.02 percentage points in the unemployment rate. This runs contrary to the general perception that the unemployment rate is more sensitive to developments in the manufacturing sector than to those in the services sector. The estimates suggest that this is true even after accounting for the asymmetry in the size of the two sectors: a decrease in services output equivalent to 1% of total GDP is associated with an increase in the unemployment rate of 0.12 percentage points whereas a decline in the output of the manufacturing sector of similar magnitude is associated with an increase in the unemployment rate of 0.09 percentage points. This suggests that labour hoarding in the manufacturing sector may have contributed towards mitigating the impact of negative developments in the manufacturing sector on the unemployment rate.

A second reason underlying this result is the services sector's crucial role in absorbing new entrants into the labour market. Indeed, data shows that the larger share of new entrants into the labour force find employment within the services sector. Consequently, when the growth rate of the services sector slows down (as is typical during recessionary periods), a number of new entrants - who would have alternatively found employment in the services sector - might end up registering for employment. Hence during recessionary periods, developments within the services sector may be important contributors to increases in the unemployment rate despite less frequent firing within this sector.

We support this finding in two ways. First, we show that the relationship between the youth unemployment rate and developments in the services sector is stronger than the relationship between the youth unemployment rate and developments in the manufacturing sector. Since youths typically constitute a significant share of new entrants into the labour market, this finding supports the hypothesis that growth slowdowns in the services sector do lead to a higher unemployment as they absorb less entrants into the labour market. Second, we run a sectoral specification of the output-unemployment relationship including lagged explanatory variables and find that developments in the services sector had an immediate impact on the unemployment rate while developments in the manufacturing sector affected the unemployment rate with a lag of one quarter. This further supports the hypothesis that that the manufacturing sector generally affects the unemployment rate via firing (which typically occurs with a lag) while the services sector affects the unemployment rate via hiring (the impact of which is felt immediately).

Overall we believe that the paper contributes to the existing literature by showing that over the past decade (and contrary to the general perception) the unemployment rate has been more sensitive to developments in the services sector than to those in the manufacturing sector. This has important policy implications (see Section 5.2). Finally, we think that the results from this study should not be interpreted in isolation and should be complemented with the existing literature as well as further research on issues such as

the stability of the relationship over time; asymmetries between boom and bust periods; and the impact of wage and labour market flexibility on the Okun coefficient.

5.2 Policy recommendations

Our estimates have shown that increases in the unemployment rate recorded during periods of sluggish economic growth were mainly the result of two factors: (i) job losses in the manufacturing sector and (ii) slowdowns in the absorption rate of new entrants into the labour market by the services sector. The distinction between the two is important because they require very different policy responses:

1. Government would do well to continue dealing with the potential firing of workers in the manufacturing sector by offering firm-targeted financial support because this seems to have worked well in the past (as evidenced by a low β_m coefficient). This is particularly important because these are often workers whose skills are not easily transferable to other sectors of the Maltese economy and would therefore risk becoming long-term unemployed.

2. During recessionary periods, Government could adopt measures that help new entrants in the labour market find employment in a relatively short time by, for example, increasing apprenticeship opportunities within the public sector or by paying a proportion of the training costs for apprentices in the private sector. By helping new entrants in the labour market getting employed sooner, Government would be limiting the negative and permanent impact of the recession on the country's long-run potential output.

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Appendix A: Labour force adjustment

ETC's definition of the labour force includes full-time employees and the number of unemployed. On the basis of this definition, the unemployment rate is given by:

$$u_{unadj} = \frac{\overline{U}}{L_{ETC}} = \frac{\overline{U}}{N_{FT} + \overline{U}}$$

where u_{unadj} is the unadjusted unemployment rate, $\overline{U}$ is the number of unemployed persons, N_{FT} are full-time employees and L_{ETC} is the labour force as defined by ETC.

One problem with this definition of the labour force is that it excludes part-time employees. Thus, we redefine the labour supply such that it captures developments related to part-time employment. On the basis of this new definition, the unemployment rate is given by:

$$u_{adj} = \frac{\overline{U}}{L_{adj}} = \frac{\overline{U}}{N_{FT} + N_{PT} + \overline{U}}$$

where u_{adj} is the adjusted unemployment rate, L_{adj} is the size of the adjusted labour force and N_{PT} is the number of employees whose primary job is part-time.

To understand the underlying reason for this adjustment, consider the case of an employee shifting from full-time to part-time employment. If we use ETC's definition of the labour force (L_{ETC}), we would observe a higher unemployment rate. On the other hand, if we use the adjusted measure of the labour force (L_{adj}), the unemployment rate would remain unchanged. Essentially, the discrepancy between the two measures reflects either a reduction in working hours or a voluntary shift to part-time employment, none of which leads to a higher number of unemployed persons.

Alternatively, consider the case where a full-time employee is fired. Then we would observe an increase in the unemployment rate both when using ETC and the adjusted definition of the labour force. However, the increase in the case of the former definition would be greater. Thus, we adjusted the definition of the labour force to "correct" for this deficiency in the measure of the unemployment rate.

Appendix B: The theoretical link between the unemployment rate and output growth

Okun showed that there exists an empirical relationship linking a country's output growth to its unemployment rate. In this section we look at the algebraic relationship between these two variables by following Chatterji and Wickens (1982). We first show how the unemployment rate is linked to labour force and employment growth. We then look at the relationship between output growth and employment growth and finally we combine the two relationships.

B.1 The relationship between the unemployment rate, labour force and employment growth

By definition, the unemployment rate (u) is the ratio of the total number of unemployed persons ($\overline{U}$) to the labour force (L):

$$u = \frac{\overline{U}}{L}$$

If we let N represent the total number of employees, then:

$$u = 1 - \frac{N}{L}$$

Differentiating the unemployment rate u with respect to the labour force L:

$$\Delta u = -\frac{L\Delta N - N\Delta L}{L^2}$$

If we assume that $\frac{N}{L} \approx 1$, then we get:

$$\Delta u = -\left(\Delta N - \Delta L\right) \tag{4}$$

This suggests that the change in the unemployment rate is equivalent to the growth in the labour force less employment growth.

B.2 The relationship between Output and Employment growth

By definition, output (Y) is equivalent to the product of total employment (N) and productivity (P):

$$Y = PN$$

Rewriting this equation in terms of growth rates, we get:

$$\Delta Y = \Delta P + \Delta N$$

Or similarly:

$$\Delta N = \Delta Y - \Delta P \tag{5}$$

B.3 Linking the Unemployment rate with Output growth

Combining equations (4) and (5) we get:

$$\Delta u = -\Delta Y + \Delta P + \Delta L$$

This shows that changes in the unemployment rate are explained by the growth rate of output along with growth rates of the labour force and productivity. On the other hand, Okun's law expresses the relationship between unemployment and output growth as:

$$\Delta u = \alpha + \beta \Delta Y$$

At first glance, Okun's proposition does not seem to be affected by a change in labour force or productivity growth. However, a change in the growth rate of either variable would affect both the α and the β coefficient.

Appendix C: Sectoral equation specification

Okun's law relates changes in the unemployment to aggregate output growth:

$$\Delta u = \alpha + \beta \Delta Y$$

where u is the unemployment rate, Y is output and α and β are the estimated parameters. We use the following approximation to re-specify the equation above in terms of the various subsectors in the economy:

$$\Delta Y = \Delta \sum Y_i \approx \sum \frac{Y_i}{\sum Y_i} \Delta Y_i$$

where i represents either the manufacturing sector (m) or the services sector (s) and Y_i is the GDP related to sector i, noting that the weights $Y_i / \sum Y_i$ are moving shares rather than constants in order to ensure the accuracy of the approximation. Then the original Okun equation can be rewritten as:

$$\Delta u = \alpha + \beta \sum \frac{Y_i}{\sum Y_i} \Delta Y_i$$

Simplifying:

$$\Delta u = \alpha + \beta_m \frac{Y_m}{\sum Y_m} \Delta Y_m + \beta_s \frac{Y_s}{\sum Y_s} \Delta Y_s$$

Denoting the sector i's share in total output as λ_i:

$$\Delta u = \alpha + \beta_s \lambda_s \Delta Y_s + \beta_m \lambda_m \Delta Y_m$$