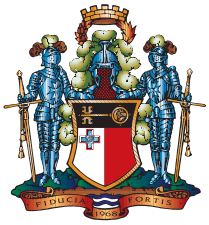

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DETERMINANTS OF LABOUR PRODUCTIVITY IN MALTA FROM A FIRM-LEVEL SURVEY

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BOX 3: DETERMINANTS OF LABOUR PRODUCTIVITY IN MALTA FROM A FIRM-LEVEL SURVEY[1]

There is a broad consensus among economists that productivity plays a key role in economic success and is the main driver of per capita economic growth in the long-run.

The Maltese economy has been one of the best performing members of the euro area after the global financial crisis. Growth has been job-rich with the increase in employment after the crisis being four times higher than that achieved in the decade before the crisis. However, the changing structure of the Maltese economy has increased the complexity in the analysis of productivity. The main sectors generating growth since EU membership have similar value added multipliers across the two decades but much higher employment multipliers. In addition, the absence of sectoral price deflators renders an in-depth analysis of sectoral productivity particularly challenging at a time when it is being increasingly recognised that economy-wide measures of productivity need to be complemented by sectoral and, if available, firm-level developments.

This Box adds to the empirical literature on productivity in Malta by exploiting information from a firm-level survey carried out by the Central Bank of Malta in 2014 as part of the Wage Dynamics Network (WDN) project.[2] This survey provides rich evidence, directly from firms, with a detailed breakdown by sector and size classes that are not available from existing statistics. Using this dataset, developments in labour productivity compared to costs are investigated within an empirical multivariate framework that controls for the firm's characteristics, its workforce and environment, as well as the nature of shocks hitting the firm.

Literature review

In the neo-classical growth model, labour productivity depends on total factor productivity (TFP) and capital deepening. Within this class of models, improvements in TFP growth or technological progress are the key determinants of long-run growth. Modern growth theories, which seek to explain TFP within the model, point to the importance of innovation, such as investment in research and development (R&D), in driving productivity growth.[3]

The literature has identified a broad set of factors that explain cross-country differences in productivity or TFP growth. In these studies, macroeconomic and institutional factors, trade openness and policies that enhance the quality of human and capital stock are commonly found to play an important role in raising productivity growth.[4] For instance, a number of studies find that a skilled workforce tends to promote innovation, which, in turn, raises productivity.[5] Similarly, investment in information and communication technology (ICT) and in research and development (R&D) is commonly found to play a crucial role in explaining

[1] Prepared by Brian Micallef. The author is the Manager of the Research Department. Any errors, as well as the views expressed in this article, are the author's sole responsibility. The views expressed in this Box are those of the author and should not be interpreted as reflecting the views of the Central Bank of Malta.

[2] The fieldwork for the WDN survey, consisting of face-to-face interviews with 178 firms, was conducted in 2014 for the reference period 2010-2013. Despite covering only the three-year period in the aftermath of the 2009 recession, the analysis in this Box still remains policy relevant given its focus on the 'structural' characteristics underpinning labour productivity in Malta.

[3] Romer, P. (1990), "Endogenous technological change", *Journal of Political Economy*, Vol. 96, pp. 71-102.

[4] Barro, R. (2001), "Human capital and growth", *American Economic Review,* 91, No. 2 (May), pp. 12-17.

[5] Sondermann, D. (2012), "Productivity in the euro area: any evidence of convergence?", Working Paper No. 1431, European Central Bank.

productivity performance.[6] Turning to the micro evidence, studies point to large differences in productivity among firms even within narrowly defined industries.[7] Using a harmonized cross-country firm-level database, the Competitiveness Network documents a large degree of heterogeneity in terms of firm productivity and size, both within and across countries.[8] Productivity distribution tends to be highly skewed across countries, with a small percentage of high productivity firms and thick left tail of low productive ones.

Studies have also looked at the link between financing constraints and productivity, especially during and after the financial crisis. Financial market imperfections could amplify financial constraints during a recession due, for instance, to collateral constraints and debt overhang.

Within-firm differences in productivity can be classified in two broad categories.[9] The first set of determinants include factors that operate within the firm, such as managerial talent, the quality of labour and capital inputs, product innovation and the organisational structure of the firm's production units. The second set of factors refers to environmental determinants, such as the productivity spillovers from knowledge transfer, the degree of competition in labour and product markets and the impact of regulation. This category affects productivity by incentivising producers to become more efficient or, alternatively, by shifting economic activity towards more efficient ones.

There are also complementarities between micro and macro factors. For instance, strong competition and flexible labour markets allows firms to adopt better people management practices.[10] Multinational firms have a strong positive effect on management practices and their influence is felt throughout the countries in which they operate. On average exporters are 20% more productive than non-exporters in the same sector, although there are wide cross-country differences.[11]

The survey

The analysis is based on a survey conducted by the Central Bank of Malta in 2014 that was designed in close collaboration with other EU central banks as part of the WDN project for the reference period between 2010 and 2013. The survey focused on changes in the economic environment after the crisis as well as various pricing and wage setting practices. It also contained questions both on developments in labour productivity as well as on a number of covariates that can be proxied for some of the main drivers of productivity identified in the literature.

A total of 271 companies were selected from the Business Register of the National Statistical Office to participate in the survey. Companies were selected to ensure a stratified

[6] Griffith, R., Redding, S., & van Reenen, J. (2004), "Mapping the two faces of R&D: productivity growth in a panel of OECD industries", *The Review of Economics and Statistics*, Vol. 86(4), pp. 883-895.

[7] Bartelsman, E., Haltiwanger, J., & Scarpetta, S. (2013), "Cross-country differences in productivity: the role of allocation and selection", *American Economic Review*, 103 (1): pp. 305-334.

[8] The Competitiveness Network (CompNet) is a research network of the European System of Central Banks. Further details are available in Lopez-Garcia, P., di Mauro, F., & the CompNet Task Force (2015), Assessing European competitiveness: the new CompNet micro-based database, Working Paper 1764, European Central Bank.

[9] Syverson, C. (2010), "What Determines Productivity?" *Journal of Economic Literature,* 49(2), pp. 326-365.

[10] Bloom, N., Sadun, R., & Van Reenen, J. (2012), "Americans do IT better: US multinationals and the productivity miracle", *American Economic Review*, 102 (1), pp. 167-201.

[11] Berthou, A., Dhyne, E., & the CompNet Task Force (2015), "Assessing European firms' exports and productivity distributions: the CompNet trade module", Working Paper 1788, European Central Bank.

sectoral representation in three employment brackets: 10-49, 50-199 and those with more than 200 employees. Firms with less than ten employees, public corporations and those operating in the agriculture and fisheries sectors were excluded. Firms falling within the top decile of each sector by employment were included since these capture the main developments in the labour market. The fieldwork lasted from May till July 2014 and was carried out using face-to-face interviews. 178 companies agreed to participate in the survey, implying an overall response rate of 66%. These firms employ around one-third of the target population, with coverage being strongest in the financial sector and manufacturing.[12]

Productivity and its determinants

Firms were asked the following question on developments in productivity: "*How did average productivity per employee (compared to labour costs per employee) evolve in your firm during 2010-2013?*" Respondents were asked to choose from the options *'strong decrease'*, '*moderate decrease*', '*unchanged*', '*moderate increase*' and '*strong increase*'.

Around 33% of firms reported that growth in labour productivity exceeded labour costs during the reference period. Another 55% claimed unchanged developments. This implies that for almost 90% of firms the increases in labour costs were matched or even exceeded by gains in labour productivity. Improvements in productivity were especially pronounced in manufacturing and, to a lesser extent, in other market services, being reported by around 60% and 35% of firms, respectively. In terms of size classes, the improvements in productivity were slightly more pronounced in medium and large firms compared to smaller ones.

The structural determinants of higher productivity are further investigated within an empirical multivariate framework. More specifically, the analysis is conducted using a probit model with the dependent variable being a binary variable that takes the value of 1 if the firm has registered a '*moderate*' or '*strong*' increase in productivity compared to labour costs between 2010-2013 and zero otherwise.

The probability of a firm registering an increase in productivity during this period is conditioned on a set of covariates that aim to capture the main determinants of productivity identified in the literature. The exact definition of the covariates is as follows:

1. ***Firm characteristics***: a set of variables that capture the sector of economic activity (manufacturing, construction, wholesale & retail trade and other services) and the size of the firm in terms of number of employees (10-49, 50-199, 200+);
2. ***Labour share***: the share of labour costs (e.g. wages, salaries, bonuses, social security contributions) in total costs (a continuous variable ranging from 0 to 1);
3. ***Workforce characteristics***: the share of high-skilled manual and non-manual workers; and the share of part-time and temporary employees in total employment (continuous variables ranging from 0 to 1);
4. ***Workforce stability***: a dummy variable that takes the value of 1 if worker flows (both entries and exits) decreased 'strongly' or 'moderately' in 2013 compared to 2010;
5. ***Outsourcing***: a dummy variable that takes the value of 1 for firms that have outsourced part of their activity during 2010-2013;

[12] Micallef, B., & Caruana, K. (2015), "Results of the 2014 Wage Dynamics Network for Malta", Central Bank of Malta. Available at: https://www.ecb.europa.eu/home/pdf/research/wdn/WDN_Country_Report_MT_final.pdf?7a1aa775335f737091e097051def82a8.

6. ***Adjusted labour input***: a dummy variable that takes the value of 1 for firms that needed to significantly reduce their labour input or alter its composition during 2010-2013;
7. ***Exposure to foreign markets***: the share of revenue generated by the firm in foreign markets (continuous variable ranging from 0 to 1);
8. ***Shocks***: a set of dummy variables that take the value of 1 for firms that reported a 'strong' or 'moderate' decrease in demand (demand shock), access to external finance (credit constraint shock) and availability of supplies from usual suppliers (supply shock); or a 'strong' or 'moderate' increase in uncertainty (uncertainty shock).

Table 1 reports the average marginal effects from the probit regressions.[13]

Table 1
DETERMINANTS OF FIRM LEVEL PRODUCTIVITY
Average Marginal Effects

	Probit (1)	Probit (2)	Probit (3)	Ordered Probit (4)	Ordered Probit (5)
Firm size					
10-49 (Reference group)					
50-199	0.082	0.066		0.026	
200+	0.055	0.034		-0.010	
Sector of economic activity					
Manufacturing (Reference group)					
Construction	-0.465 **	-0.468 **	-0.512 ***	-0.310 *	-0.342 **
Trade	-0.054	-0.099	-0.135	-0.168	-0.261 **
Other market services	0.060	0.001	-0.011	-0.008	-0.094
Production technology & workforce characteristics					
Share of labour in total costs	-0.387 **	-0.378 **	-0.414 **	-0.508 ***	-0.545 ***
Workforce stability	0.194 **	0.239 ***	0.230 ***	0.177 *	0.207 **
Share of part-timers and temporary workers	-0.161	-0.173		-0.150	
Share of high skilled manual workers	0.303 **	0.251 *	0.229 *	0.173	
Share of high skilled non-manual workers	0.060	0.048		0.090	
Restructuring, firm structure & competition					
Outsourcing	0.162 **	0.149 **	0.166 **	0.154 **	0.158 **
Labour force adjustment	0.042	0.101		0.127	
Exposure to foreign markets	0.013	0.038		0.001	
Nature of shocks					
Demand shock		-0.108		-0.210 **	-0.180 **
Uncertainty shock		-0.057		-0.073	
Credit constraint shock		-0.359 *	-0.343 *	-0.310 **	-0.301 **
Supply shock		-0.109		-0.107	
Observations	177	177	177	177	177
Likelihood ratio test	$\chi2(13)=35.77$	$\chi2(17)=41.52$	$\chi2(8)=36.57$	$\chi2(17)=38.81$	$\chi2(8)=33.73$
Prob>$\chi2$	0.001	0.001	0.000	0.002	0.000
Pseudo R2	0.1578	0.1832	0.161	0.1163	0.1011

Note: ***, ** & * denote statistical significance at 1%, 5% and 10%, respectively.
In Probit models (1), (2) and (3), the dependent variable is a dummy that takes the value of 1 if the firm reported a 'moderate' or 'strong' increase in productivity compared to labour costs. In ordered probit (4), the dependent variable is a categorical variable that takes the value of 1 if productivity decreased, 2 if unchanged and 3 if productivity increased relative to labour costs. Column 5 reports the AME of outcome 3 (i.e. increase in productivity) to be comparable with Models (1) and (2). Model (5) re-estimates Model (4) using only statistically significant variables.

[13] It is common practice in the empirical literature using probit models to retain covariates in the model that are recommended by theory or used in similar studies despite not being statistically different from zero. The bottom rows of Table 1 show the Likelihood ratio test. In all models, the hypothesis that all coefficients are equal to zero can be rejected at the 1% level of significance. Models (3) and (5) in Table 1 show that the results are very robust to the exclusion of non-statistically significant variables.

Estimates in Model (1) point to some degree of sectoral heterogeneity, with construction firms less likely to benefit from higher productivity compared with the manufacturing sector (the reference category). On the contrary, there is no statistically significant difference between productivity in manufacturing and services. Differences between these two sectors are however captured by the labour share, which is twice as high in services compared with manufacturing. The results show that labour productivity is more likely to be lower in firms with a higher share of labour in total costs.

Differences due to size classes are not statistically significant. This finding runs contrary to what is usually found in the micro literature and could be due to the exclusion of micro companies from the survey. The latter constitute more than 95% of firms in Malta, accounting for around one third of employment and one quarter of value added. The exclusion of these companies, which are usually less productive than larger firms, could thus explain this counterintuitive result.

The characteristics of the workforce matter for productivity. Workforce stability and a higher share of skilled workers increase the likelihood that a firm reports to have registered an increase labour productivity. Skilled manual workers are found to have a greater and more statistically significant effect compared to skilled non-manual workers. On the contrary, the share of part-timers and temporary employees is negatively related with productivity, although this effect is not statistically significant at conventional levels.

Restructuring efforts are found to increase the likelihood of higher productivity. Firms that have implemented changes to their production structure, for instance, by outsourcing part of their operations, are more likely to experience an improvement in productivity. Companies that adjusted their labour force or exposed to foreign markets are also likely to report an improvement in productivity although, in both cases, the effects are not statistically significant.

Model (2) augments the covariates in the previous model with the nature of the shocks hitting the firm. Out of the four adverse shocks considered – a drop in demand, higher uncertainty, a reduction in the access to finance and in the availability of supplies – firms faced with credit constraints were found to be less likely to experience an improvement in productivity. This finding suggests that credit impairments, not only via the quantity but perhaps also its price, could provide another important channel through which the financial sector affects labour productivity.

Model (3) includes only those covariates that were statistically significant in the previous two models. The marginal effects of the statistically significant variables are very similar to those reported in Models (1) and (2).

To assess the robustness of the results, Model (4) presents the estimates of an ordered probit approach. This time, the dependent variable, instead of a binary 0-1 variable, is a categorical one that increases with productivity, taking values from 1 to 3, where 1=the firm reported a '*moderate decrease*' or '*strong decrease*' in productivity; 2=the firm reported

'*unchanged*' productivity; 3=the firm reported a '*moderate increase*' or '*strong increase*' in productivity. Table 1 reports the average marginal effects of category 3 – an increase in productivity – to make it comparable to the first two columns. Model (5) is estimated using only the statistically significant covariates of Model (4).

The main conclusions remain unchanged with three differences. First, the share of high skilled manual workers no longer remains statistically significant. Second, sectoral heterogeneity becomes more pronounced, with both construction and trade less likely to benefit from higher labour productivity compared with the manufacturing sector. Finally, demand shocks also turn out to be important, with firms facing adverse demand shocks less likely to register an improvement in productivity. This could be due, for instance, to labour hoarding as firms may prefer to retain workers rather than incur hiring and retraining costs when demand conditions return to normal. As in Model (3), the ordered probit model confirms the negative relationship between credit constrained firms and productivity, as well as the role played by the declining share of labour, workforce stability and outsourcing.

Discussion and policy recommendations

The analysis in this Box, which is based on a survey conducted in 2014, points to a number of structural characteristics that affect labour productivity. Despite covering only the three-year period from 2010 to 2013, the analysis in this Box still remains policy relevant, given its focus on the 'structural' characteristics underpinning labour productivity in Malta.

The changing structure of the Maltese economy, with a very pronounced shift towards the services industry, complicates the use and reliance on aggregate unit labour costs as a measure of competitiveness. Sectoral estimates of hourly labour costs suggest that Malta remains quite competitive compared with other euro area countries in terms of costs, and has even maintained its cost competitiveness despite the reduction in labour costs in a number of stressed economies since the financial crisis.[14]

Another interesting finding is the relationship between productivity and outsourcing. The latter has been on the rise in recent years, spanning both IT and non-IT activities, such as security and cleaning activities. Productivity benefits from outsourcing as the firm reorganises its production activities. However, it also calls for caution in the interpretation of the decline in the share of certain sectors, such as manufacturing, since a considerable proportion could be the result of outsourcing of certain tasks.

The results confirm the importance of skills and workforce stability to foster productivity growth. The positive relationship between employment stability and productivity is very robust across model specifications. Employment stability or tenure increases the gains of learning-by-doing and provides incentives for employers to invest in training since they will be reaping the rewards of their investment. More generally, these findings support policies that raise the workforce's skill base, not only through investment in education but also to strengthen active labour market policies, such as lifelong learning and the provision of

[14] Micallef, B. (2015), "Sectoral and cross-country estimates of hourly labour costs", *Quarterly Review,* 2015(2), pp. 56-60, Central Bank of Malta.

adequate incentives, for both employers and employees, that promotes the development of job-specific skills.

The negative relationship between productivity and credit constrained firms calls for policies that improve access to credit, especially for SMEs. In this regard, judicial reforms that reduce the time required to recover collateral and the introduction of a credit registry should improve both the access and the cost of credit by reducing informational asymmetries and the risk premium charged by banks. Equality in the tax treatment of equity injection and borrowing should also help to lower the cost of borrowing and improve access to finance. The establishment of the Malta Development Bank should also facilitate SME financing and lower the cost of credit.

Firms facing adverse demand conditions are less likely to register improvements in productivity although this finding is not robust across all model specifications. To an extent, this could be due to labour hoarding, especially if disturbances are deemed to be transitory. However, it strengthens the need for prudent fiscal policy in good times, thereby allowing room for manoeuvre during periods of subdued demand to stimulate economic activity and productivity.