



PRODUCTIVITY ANALYSIS

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PRODUCTIVITY DEVELOPMENTS IN CYPRUS

SUMMARY AND POLICY CONCLUSIONS

Strong productivity growth is a prerequisite for sustainable economic growth, which in turn translates to increases in the standard of living. It further ensures national competitiveness, contributing to favourable current account dynamics. Using multifactor analysis allows us to examine the underlying forces that contribute to labor productivity changes. Changes in labor productivity over time reflect movements in multifactor productivity –and therefore efficiency of resources’ utilization, and in the relative intensity of the use of the various factors of production. Increases in multifactor productivity translate to higher output with the same amount of inputs (capital and labor), hence increased efficiency in production processes.

Since 2015 that the Cypriot economy has enjoyed strong economic growth, productivity growth has rebounded, but the economy’s rate at which output per hour worked has increased, is yet to reach the pre-crisis levels. More efficient usage of the country’s resources, as captured by the soar in multifactor productivity over the latest years, has been the primary driver of this increase in labor productivity. The increase reflects past and recent efforts aiming at privatization of state owned companies, removing barriers and introducing greater flexibility in the labor market, and reforming the public sector to minimize wasteful bureaucracy, among others. Nevertheless, the tepid labor productivity growth of the Cypriot economy is an outcome of the decline in the growth of capital intensity, or the rate of change in capital stock per employed labor. Since labor productivity rises when capital grows faster than labor (if no changes in the efficiency of input factors occur), the observed slowdown in labor productivity is due to the fact that over the period since the end of 2014, capital has grown at a significantly slower pace than labor. With a significant amount of non-performing exposures still in Cypriot banks’ balance sheets, and tighter regulations in place for new credit lines, corporations find it harder to finance the acquisition of new fixed assets, which contributes to the negative substitution effect observed in the economy, and at the same time hinders the potential expansion of productive firms, compromising productivity.

Earlier releases of this commentary, that included cross country comparisons of multifactor productivity among European countries, highlighted the need for Cyprus to find ways to increase its productivity in order to improve its relative position in comparison to advanced European countries. To the path towards higher productivity growth, policies that target on increasing economic efficiency are of utmost importance. Following the international literature on the factors that drive productivity growth, to boost productivity, and thus, enhance sustainable growth and competitiveness in Cyprus, policies that encourage investment in Information and Communications Technology (ICT) and human capital, and promote Research and Development (R&D) should be at the centre of political agendas. These policies, in conjunction with continuous efforts to eliminate structural rigidities (such as delays in the judicial system, and wasteful administrative procedures within the public sector) and improve the soundness of economic institutions, including a healthier banking sector and/or the development of alternative sources of financing that can satisfy the needs of enterprises to fund their investments, will lead to productivity increases, assisting Cyprus to catching-up with the West –Central European countries.

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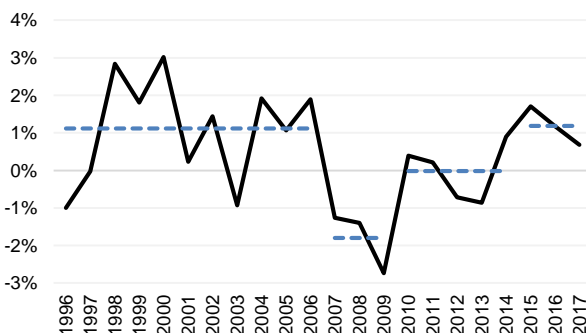
1. Introduction

In this bulletin we monitor the evolution of productivity in Cyprus, and discuss how the latest developments in the after-crisis era are impacting the economy’s short- and long-term prospects. Productivity is a key source of sustainable growth and competitiveness, thereby, promoting policies that boost productivity is crucial for the future well-being of the country’s residents. The analysis is based on data drawn from the Statistical Service of Cyprus and Eurostat, and covers the period from 1995 to 2017.

In the analysis that follows, we utilize a growth accounting framework to break down output growth and labor productivity growth into contributions attributed to the use of primary production factors (capital and labor), and to a residual component –the term referred to as multifactor productivity growth, that reflects technological innovations, changes in the skills and efforts of labor, and utilization of capacity, among others.¹

The tables presented in this bulletin, separate the sample into four sub-periods, 1996–06, 2007–09, 2010–14, and 2015–17, pertaining to phases of interesting developments for the various output and productivity growth subcomponents. Comparisons of the post-2015 (“late”) period to the pre-2006 (“early”) era, facilitate the discussion on current productivity developments, as they minimize the cyclical effects on the changes in productivity, and the other presented measures.

Figure 1: Multifactor productivity growth



Source: Statistical Service of Cyprus, Eurostat and authors’ calculations.
 Note: The dashed lines correspond to 1996-06, 2007-09, 2010-14, 2015-17 averages.

¹ Multifactor productivity is also referred to as total factor productivity, abbreviated as TFP in the graphs.

2. Productivity growth and contributions

Multifactor productivity growth is defined as the difference between output growth and the growth of an input factor index measuring the change in the contribution of the labor and capital inputs in the production process.² Figure 1 presents the evolution of multifactor productivity growth for Cyprus, together with the sub-periods’ averages considered in this bulletin.

Over the course of the decade to 2006, multifactor productivity grew at an annual rate of 1.1 percent on average. In the three years prior to the unfolding of the European sovereign debt crisis and the banking crisis in Cyprus, multifactor productivity growth fell to a negative 1.8 percent per annum. For the period from 2010 to 2014, total factor productivity in Cyprus effectively remained unchanged. Improvements in the allocation of the country’s resources together with labor market and public sector reforms that have taken place since the onset of the crisis, contributed to productivity increases evident in the post-2015 period. Specifically, from 2015 to 2017 multifactor productivity in Cyprus picked up at an annual rate of 1.2 percent per year.

Changes in labor productivity growth can be attributed to movements in multifactor productivity growth and in the relative intensity of the use of capital and labor, also known as capital deepening.³ Labor productivity growth for Cyprus, together with the aforementioned breakdown in the two components are presented for the sub-periods considered and for each year separately in table 1 and figure 2, respectively. The average annual percentage changes of the primary input factors, along with the growth rates of real investment, are shown in table 2.

The evidence in table 1 demonstrates that after 2006, labor productivity in Cyprus has fallen short to its earlier performance. In the pre-2006 period, labor productivity grew at an annual rate of 1.9 percent. This growth was

² This latter component is calculated as the weighted average of the growth rates of the individual inputs, where the weights are based on the two-period average factor shares. The employed methodology measures multifactor productivity using Törnqvist weights. Capital stock is calculated using the perpetual inventory method with a constant depreciation rate of 7%. The output and inputs are measured in 2010 constant prices.

³ Throughout this bulletin labor productivity is measured as output per hour worked.

mainly achieved by efficiency improvements, as 57 percent of the growth is attributable to the multifactor component (1.1 percent per year). The sluggish growth in labor productivity over the years from 2007 to 2014, was primarily driven by a weakening in multifactor productivity growth (averaging -0.6 percent per year) over the same period. Rigidities in the labor market, and bureaucracy, contributed to this efficiency deceleration in the economy, among other factors. Laborsaving adjustments and a shift towards more intensive use of capital, as evidenced by the lower growth of labor vis-à-vis that of fixed capital stock in table 2, resulted a controlled slowdown in labor productivity of 0.3 percent per annum for the period 2007–2014.

implies that companies have substituted capital for labor, sacrificing their labor productivity.⁴

As seen in table 2, capital stock has been added to the economy during the latest three years at an annual rate close to 5 times lower compared to the earliest period in the sample (0.8 percent versus 4.2 percent per year). The contained addition of new capital, has primarily been used as replacement capital to the depreciating existing capital, resulting in shallow capital growth (figure 3). Contrarily, labor since 2015 has been growing on average by 0.7 percentage points faster compared to its pre-2006 period growth.

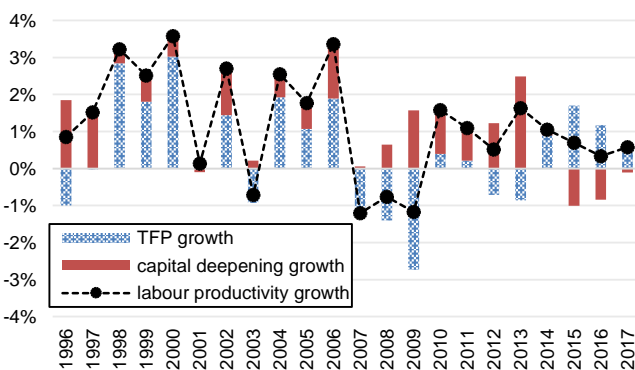
Table 1: Labor productivity growth decomposition (average annual percent changes)

Period	Labor productivity	Contributions	
		Multifactor productivity	Capital deepening
1996–06	1.95	1.12	0.83
2007–09	-1.04	-1.80	0.76
2010–14	1.17	-0.01	1.18
2015–17	0.54	1.19	-0.65
2007–14	0.34	-0.68	1.02
1996–17	1.17	0.47	0.7

Table 2: Input quantities and investment growth (average annual percent changes)

Period	Labor hours	Capital stock	Investment
1996–06	1.79	4.21	3.51
2007–09	3.28	5.47	0.46
2010–14	-2.97	0.36	-14.33
2015–17	2.51	0.87	22.43
2007–14	-0.63	2.28	-8.78
1996–17	1.01	3.05	1.62

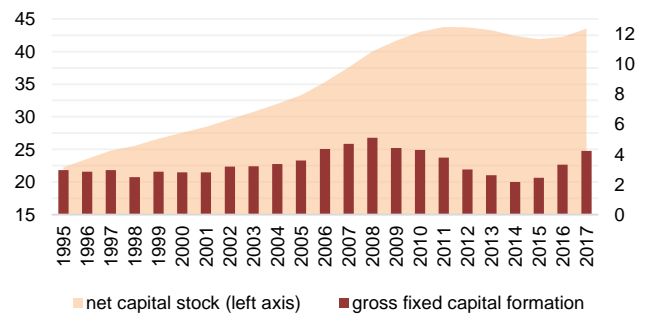
Figure 2: Labor productivity growth



Source: Statistical Service of Cyprus, Eurostat and authors' calculations.
Note: Labor productivity measured as output per hour worked.

As both labor and capital since 2014 have become constantly more efficient, and total-factor productivity has started recovering, labor productivity has failed to follow suit due to a dampening in capital intensity growth (table 1, figure 2). Over the latest period 2015–2017, output per labor grew by 0.5 percent, recording a decrease of about 70 percent compared to the period before 2006. On the contrarily, multifactor productivity accelerated at an annual 1.2 percent rate, surpassing the economy's pre-2006 levels. Regardless of the surge in investments over the same period, the -0.6 percent decline in capital intensity

Figure 3: Capital stock and investments



Source: Statistical Service of Cyprus, Eurostat and authors' calculations.
Note: bn €, 2010 constant prices.

With domestic credit institutions still suffering the aftermaths of the 2012–13 banking crisis in Cyprus, and stricter leverage regulations in place, companies have intensified the use of labor as they fail to find funds to

⁴ The depletion of investments in Cyprus over the period 2009–2014, implies that in subsequent periods the percent change in investment is measured from a lower, and therefore, high investment growth rates should be interpreted with cautiousness. In other words, despite the seemingly huge acceleration (22.4%) in investment over the 2015–17 period, the level of investment in 2017 amounted to only €4.2bn, compared to its €5.1bn peak in 2008, where investment growth for the reference period 2007–09 was on average only 0.4% per year (table 2, figure 3).

finance the acquisition of new capital. This, together with the majority of the growing sectors being among the labor-intensive ones, further limiting the potential for capital-labor substitution, have contributed to the observed slowdown in capital deepening over the post-2015 period.

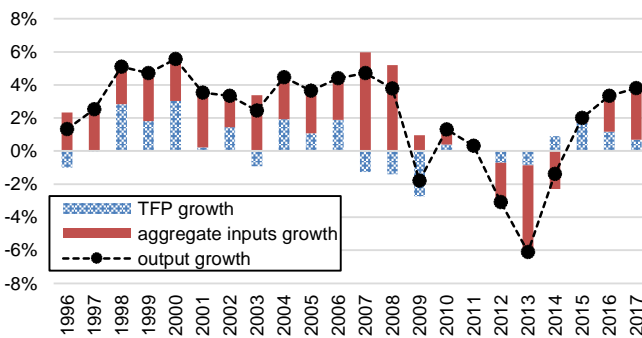
3. Output growth contributions

Table 3, presents the decomposition of real output growth into multifactor productivity growth, and growth in the individual production input contributions for the sub-periods considered, whereas figure 4, depicts the respective components for each year in the sample, separately.

Table 3: Output growth decomposition (average annual percent changes)

Period	Output	Contributions		
		Multifactor productivity	Labor	Capital
1996-06	3.74	1.12	1.16	1.46
2007-09	2.24	-1.80	2.18	1.86
2010-14	-1.79	-0.01	-1.88	0.10
2015-17	3.05	1.19	1.52	0.34
2007-14	-0.28	-0.68	-0.36	0.76
1996-17	2.18	0.47	0.66	1.05

Figure 4: Output growth



Source: Statistical Service of Cyprus, Eurostat and authors' calculations.

In the 1996-06 decade, multifactor productivity growth contributed on average about 30% to the annual 3.7 percent output growth. This contribution of multifactor productivity has risen by 9 percentage points, to 39%, in the post-2015 period, with the remaining 61% attributable to the combined inputs' growth. Considering the composition of the two inputs, in the pre-2006 era, of the aggregate 2.62 percent contribution to output growth, 55% was attributed to the capital factor growth (1.46 percent), and the remaining 45% to the labor factor growth (1.16 percent). Over the latest three-year period the contribution

of capital (0.35 percent) accounted for only 18% of the inputs' total contribution of 1.86 percent.

4. Conclusion and Policy Implications

In the recent years, as the domestic economy has been emerging from the earlier crisis, and output has been growing strongly, labor productivity has failed to follow suite, jeopardizing the short- and long-term prospects of the economy. Over the period 2015-17 output per hour worked slowed to an average of 0.5 percent, from 1.9 over the course of the decade to 2006. As collective efforts to increase the economy's efficiency have paid out, and total-factor productivity has been back growing following its marked decline throughout the 2007-2014 period, the slowdown in labor productivity is exclusively attributed to a shift towards labor intensity. Over the post-2015 period a significant reduction in the use of capital services has occurred, and the slowdown can be traced back into the reduction of the capital deepening rate.

The slowdown in labor productivity and the absence of capital deepening in the post-crisis period of recovery, is part of a wider trend observed in the Euro area and the United States.⁵ Institutional differences among countries and varying degrees of financial systems' resilience, imply that the underlying causes of this widespread slowdown among developed countries differ. According to the European Central Bank the slowdown in labor productivity growth observed in the post-crisis period can be traced back to both a deceleration in multifactor productivity and an absence of capital deepening. To the contrary, in Cyprus the effect of capital deepening in the slowdown of labor productivity growth has been more pronounced, while multifactor productivity has rebounded contributing to a mitigation of the overall slowdown.

The large number of non-performing exposures that built up since the financial and sovereign debt crises, have forced banks to tighten their standards and keep turning down requests for new credit lines to companies.⁶ As

⁵ See article 'The slowdown in euro area productivity in a global context', ECB Economic Bulletin, Issue 3/2017. Note that due to business cycle timing differences, ECB refers to the post-2013 era as the post-crisis period.

⁶ According to the European Banking Authority, the ratio of non-performing exposures in Cyprus is 34.1%, while the average among the European Union



Cypriot businesses are primarily funded by bank debt, tighter regulations for new loans imply that companies find it harder to finance the acquisition of new fixed assets, translating to weaker investments. Since labor productivity growth can be achieved by intensifying the use of the non-labor input, weaker investments depress capital deepening rates, pronouncing the negative effects on labor productivity. Impediments to obtaining credit, not only contribute to lower capital deepening, but also to lower total-factor productivity as it hinders the potential expansion of productive firms.

Cross country comparisons of multifactor productivity among European countries, has highlighted the need for Cyprus to find ways to increase its productivity in order to improve its relative position in comparison to advanced European countries.⁷ To the path towards higher productivity growth, policies that target on increasing economic efficiency are of utmost importance. The international literature on the factors that drive productivity growth suggests that higher tertiary education enrollments, and higher expenditures in Research and Development (R&D), and in Information and Telecommunications Technology (ICT), are associated with improved economic efficiency, as this captured by the relationship of these factors with the growth in multifactor productivity.⁸ Moreover, elimination of bureaucratic obstructions, increased competition, removal of rigidities to labor and product markets, together with the soundness of economic institutions such as, regulatory quality, government effectiveness and business friendly environment (in terms of starting business & obtaining credit), can all facilitate towards the improvement of productivity.⁹

Studying the underlying constituents of country rankings measuring national competitiveness can assist in identifying the factors that hinder productivity. Considering

countries stands at 3.6%. Cyprus has the second largest NPE ratio among its counterparts. Source: EBA Risk Dashboard (Q2 2018).

⁷ Our multilateral analysis ranked Cyprus among the countries with the highest multifactor productivity growth (4th among 15 European countries) but also among the least productive ones (11th). For further details, refer to 'Productivity Analysis' bulletin issues of March 2015 and March 2016.

⁸ For a more in-depth discussion, see Ketteni E., Mamuneas, T. and P. Pashardes (2017). Factors affecting the productivity of European economies. Cyprus Economic Policy Review, Vol. 11, No. 2, pp. 3-18.

⁹ See article 'The slowdown in euro area productivity in a global context', ECB Economic Bulletin, Issue 3/2017, and references therein.

the 2018 IMD World Competitive Center's Rankings, Cyprus lacks efficiency in the judicial system, as it ranks fifty-eighth in terms of contract enforcement out of the 63 countries considered in the rankings. Likewise, multiple sub-factors rank Cyprus well below the 30th percentile in terms of the government's practices towards embracing digital transformation and integration of new technologies, suggesting excessively complicated administrative procedures that compromise efficiency.¹⁰ Moreover, Cyprus also ranks at the lower-end compared to other countries, in terms of R&D expenditures (fifty-second).

Concluding, the factors that hinder productivity growth in Cyprus and the directions for the way forward are summarized below.

- (1) The banking sector is stronger but challenges remain. Efforts to clean up the balance sheets of credit institutions should be intensified, and alternative methods of financing should be encouraged.
- (2) Further reforms in the public sector to eliminate wasteful administrative procedures and to integrate digital technologies into government practices are needed.
- (3) The efficiency of judicial system should be enhanced and delays in settling disputes should be eliminated.
- (4) Policies that target in eliminating other institutional rigidities and enhance competition must be promoted.
- (5) Policies that encourage investment in ICT and human capital, and promote R&D should also be encouraged.

For stable growth to be achieved and labor productivity to restore, policies in the abovementioned directions should be considered. These policies will lead to productivity increases, assisting Cyprus to catching-up with the West - Central European countries.

¹⁰ In 'E-Participation' and 'E-Government' Cyprus ranked 56th and 49th, respectively.



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