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PRODUCTIVITY ANALYSIS
ECONOMICS RESEARCH CENTRE

UNIVERSITY OF CYPRUS

SECTORIAL LABOUR PRODUCTIVITY TRENDS IN CYPRUS

SUMMARY AND POLICY CONCLUSIONS

Monitoring and explaining changes of productivity over time is important for the formation of growth-enhancing economic policies. Therefore, it is vital for an economy to monitor both its overall productivity, and the productivity in the sectors of economic activity that make up the economy. Although the focus is on labour productivity growth, this issue also updates and extents the Total Factor Productivity (TFP) growth estimations presented in previous issues. Further, we discuss the COVID-19 recession pandemic era and how this has impacted the economy's prospects. Sectoral analysis is particularly useful in this case since there is considerable heterogeneity across sectors: industries where it is more feasible to work remotely and could take advantage of new digital solutions, experienced a productivity surge, whereas industries that rely on face-to-face contact performed the worst. We consider a total of ten aggregated industries or sectors, defined according to the classification of economic activities - NACE Rev.2, for the period between 1996 and 2021.

Between 2015 and up to 2019, which is the period after the economic recession and before the COVID-19 crisis, Cyprus economy enjoyed on average a 1.1% labour productivity growth. The highest labour productivity growth was observed in the Information & communication sector with 6.4% growth. This was due to the TFP growth in the sector, which more than compensated the reduction in capital deepening. Over the same period, the Real estate and the Financial & insurance activities sectors' output per labor contracted by 7.1% and 5.2%, respectively. Most of the loss in the Financial & insurance sector's labor productivity was almost entirely attributed to its TFP reduction.

During the COVID-19 pandemic and recession in 2020 sharp declines in growth took place: real output and labour growth fell by 4.5% and 6.5% respectively. Nevertheless, labour productivity growth rose to 2%. Unlike previous recessions, after the COVID-19 recession, in 2021, growth rebounded rapidly with output and labor recovering by 6.4% and 4.7%, respectively. The analysis of sector level data showed that the impact of the shock has been asymmetric across sectors. Labour productivity growth increased soon after the first lockdowns in technology-intensive sectors such as the Financial & insurance activities and the Information & communication (ICT) sectors where working remotely was feasible and where firms could take advantage of new digital/online solutions. The gains in labour productivity growth, even though at a lesser extent, were retained during 2021. On the contrary, for sectors like the Wholesale, retail & accommodation, the Arts, entertainment & recreation, and the Construction sectors, that rely more on face-to-face interactions, the containment measures have had a negative impact on labour productivity growth. In 2021, after the economy started to re-open, most of the negatively influenced sectors recovered.

The acceleration in digital uptake could be a positive outcome from the crisis. To the path towards higher productivity growth, policies that target on increasing the degree and the speed of economy's digitalization are of utmost importance. Under the Recovery and Resilience Plan (RRP), Cyprus is currently working in implementing measures towards this direction. Equally important for long-term productivity are solid economic institutions, labour market flexibility as well as physical and digital infrastructure. All these, accompanied with widespread digital adoption across sectors, will determine the path of future productivity growth.

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1. Introduction

In this bulletin we update and evaluate the patterns of productivity growth across major sectors in the economy.[1] The focus is on labour productivity growth, although Total Factor Productivity (TFP) growth is also discussed. In addition, we examine the COVID-19 recession pandemic era and how this has impacted the economy's prospects. Sectoral analysis is particularly useful in this case since there is considerable heterogeneity across sectors: industries where it is easy to work from home and could take advantage of new digital solutions experienced a productivity surge. In contrast, industries that rely on face-to-face interactions contracted the most.

Labour productivity is measured as real output per hour of work. TFP is defined as the part of output growth that is not explained by share-weighted input growth (Törnqvist growth index). In the long run, TFP captures productivity benefits from many sources. These includes technological innovations, changes in the skills and efforts of labor, and utilization of capacity, among others. Labour productivity growth and TFP growth are interrelated since changes in labour productivity over time depend both on TFP changes as well as changes in the relative intensity of the use of capital and labour (the latter is referred to as capital deepening).[2] Labour productivity is also a significant policy tool as it is directly related to income per capita, a widely used measure of living standards.

To analyze the sectoral and the economy-wide patterns of productivity growth in Cyprus we use data from Eurostat for a total of ten aggregated industries or sectors, defined according to the classification of economic activities - NACE Rev.2, for the period between 1996 and 2021.[3]

2. Labour productivity growth

Figure 1, presents aggregate labour productivity growth, real output and labour growth, for each year in the sample. Two things are noticeable from Figure 1. First is the economic growth path over the years from 2007 to 2014. The period from 2007 to 2009, a period by the end of which the European economic crisis began, as well as up to 2014 is the worse in terms of economic growth. During this period real output and labour growth fell on average by 0.4% and 0.5% respectively resulting to 0.01% labour productivity growth. The banking crisis that peaked in 2013 also affected performance. During the years between 2015 and 2019, the Cyprus economy showed significant improvement: real output and labour growth rose by 5.2% and 4.1% respectively (1.1% labour productivity growth). This was mainly due to labour market and public sector reforms that have taken place since the beginning of the crisis.

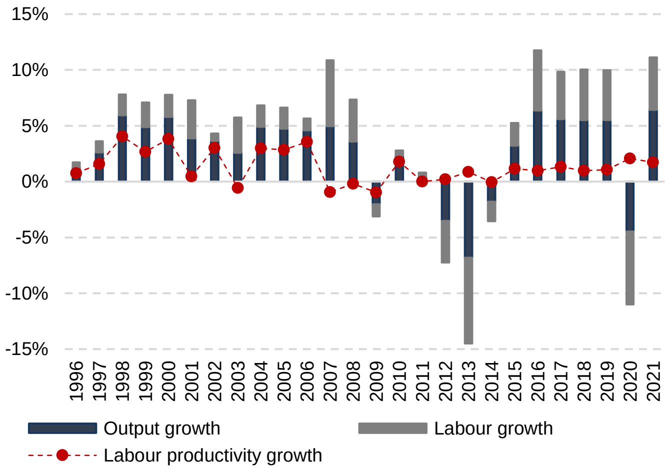
Second, is the COVID-19 pandemic and recession in 2020. There were sharp declines in growth: real output and labour growth fell by 4.5% and 6.5% respectively. As a result labour productivity growth rose to 2%. The COVID-19 recession was quite different from the previous recessions. As Figure 1 shows, unlike previous recessions, the recovery was quick. More precisely, in 2021, output and hours worked recovered by 6.4% and 4.7% respectively, resulting to a positive labour productivity growth that was even accelerated compared to the pre-pandemic level seen in 2019.

[1] You can find the previous bulletins on "Productivity Analysis" on the Economics Research Website: http://ucy.ac.cy/erc/en/publications/productivity-analysis.

[2] The variables used are the gross value added in current prices and constant prices, the number of employees (total and self-employed), the total hours worked (man hours, for total employees and the self-employed), investment in current and constant prices, and the compensation of employees. All price data are expressed in euros at constant 2015 prices. Output is constructed using the value added in current prices as the value of output, together with the value added in constant prices considered as the quantity of output. The price of output is obtained by dividing current prices with constant prices. Regarding labour, the compensation of employees is used as the value of labour, adjusted to include those who are self-employed, a procedure also followed by the European Central Bank. Having obtained the value of labour and hours worked, the price of labour is calculated and expressed in 2015 prices. Using the data for the price and value of labour, the quantity of labour is then obtained. The capital stock is calculated using the perpetual inventory method with a constant depreciation rate of 7%. Finally, TFP growth is constructed as output growth minus a weighted sum of the growth of all inputs, where the weights are based on two-period average factor shares.

[3] The ten industries/sectors are: Agriculture, forestry and fishing; Industry (except construction); Construction; Wholesale and retail trade transport, accommodation and food service activities; Information and communication; Financial and insurance activities; Real estate activities; Professional, scientific and technical activities, administrative and support service activities; Public administration, defense, education, human health and social work activities; Arts, entertainment and recreation, other service activities, activities of household and extra-territorial organizations and bodies.

Figure 1: Labour productivity growth (average annual percent changes)



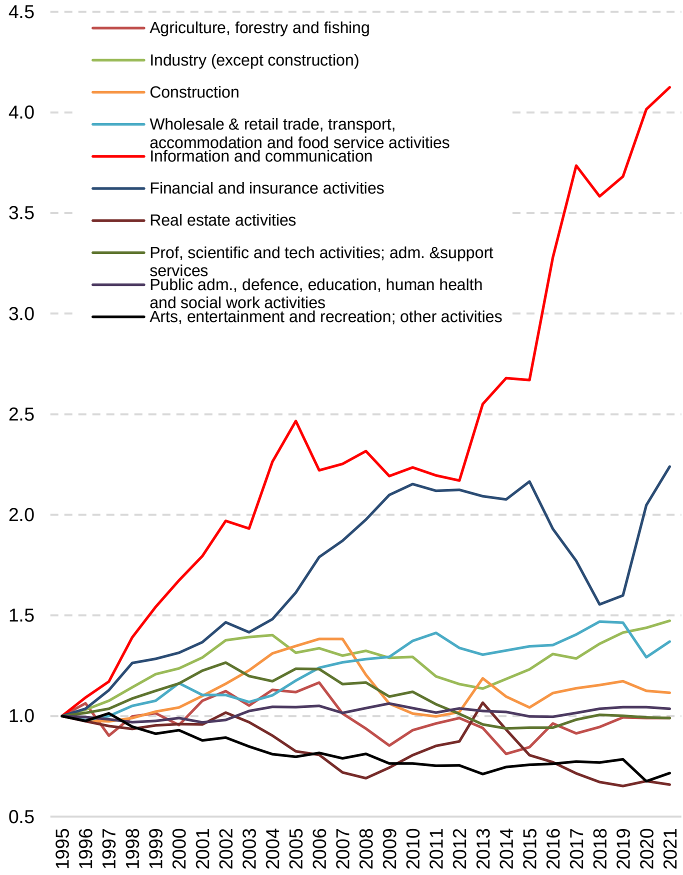
Source: Eurostat and authors calculations

To gain further insight and given the heterogeneity across sectors, Figure 2, shows the labour productivity index for each year in the sample, for the ten sectors of the economy. As can be seen in Figure 2, the trends in labour productivity growth index vary quite a bit by sector. The labor productivity growth followed an increasing path in most sectors, with the exceptions of the Real estate, the Professional, scientific and technical activities; administrative and support services, the Arts, entertainment & recreation and the Agriculture sectors.[4]

During the COVID-19 recession in 2020 there were significant spikes in the labour productivity growth index. Labour productivity growth increased soon after the first lockdowns in sectors such as the Financial & insurance activities and the Information & communication (ICT) sectors, where working remotely was feasible and where firms could take advantage of new digital/online solutions. More precisely, during 2020 the Financial & insurance sector showed a notable 24.8% increase in labour productivity growth (this was almost entirely due to the increase in output, namely 27.5% growth relatively to a 2.8% labour growth). This effect, even though at a lesser extent, was retained during 2021.

In contrast, for sectors where it is harder to work from home and/or rely on face-to-face contact, the containment measures have had negative impact on labour productivity growth. This is the case for the Wholesale, retail & accommodation, the Arts, entertainment & recreation, and the Construction sectors, which during the 2020 lockdowns experienced an output reduction of 31.5%, 22.2% and 7.2%, respectively. These sectors exhibited also negative labour growth of 19.1%, 7% and 3%, respectively. In 2021, after the economy started to re-open, most of the negatively influenced sectors recovered.

Figure 2: Labour productivity growth index



Source: Eurostat and authors calculations

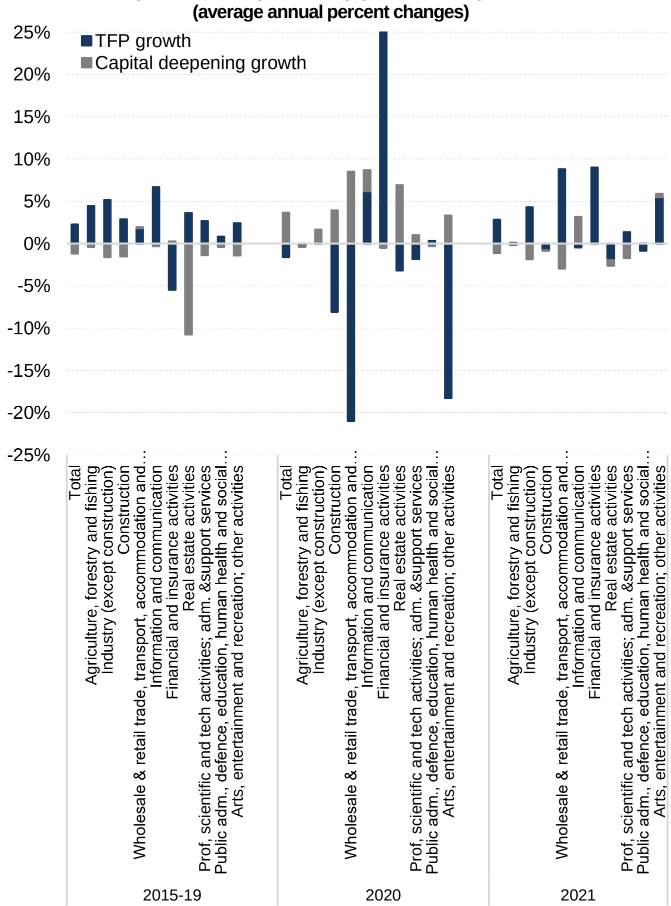
Figure 3 presents the labour productivity growth and its breakdown to TFP growth and capital deepening growth. We focus on periods relating to phases of interesting developments: the period after the economic recession, 2015-19, the COVID-19 recession year, 2020 and the year right after, 2021. On average, over the 2015-2019 period, the highest labour productivity growth among the sectors took place in the Information & communication sector with 6.4% growth. This was due to the TFP growth in the sector, which more than compensated the reduction in capital

[4] Due to output measurement issues, care has to be taken when comparing statistics related to the Real estate activities. More details on this can be found in: https://ec.europa.eu/eurostat/web/national-accounts/methodology/european-accounts/productivity-indicators

deepening. Over the same period, the Real estate and the Financial & insurance sectors' output per labor contracted by 7.1% and 5.2%, respectively. Most of the loss in the Financial & insurance sector's labor productivity was almost entirely attributed to its TFP reduction.

During 2020, the effect of TFP growth to the Financial & insurance sector's labour productivity growth was reversed: TFP growth contributed almost entirely to the notable 24.8% increase in labour productivity growth of the sector. TFP contribution maintained the sector's high labour productivity growth during 2021 as well. In the other end, during 2020, the Wholesale, retail & accommodation and the Arts, entertainment & recreation sectors losses in labour productivity were mostly due to their negative TFP growth. This was reversed in 2021 and most of the sectors' positive labour productivity growth is attributed to their positive TFP growth.[5]

Figure 3: Labour productivity growth decomposition
(average annual percent changes)



Source: Eurostat and authors calculations.

[5] There are a range of potential channels that may bias the measurement of TFP. Thus, the yearly estimates of TFP growth should be interpreted with caution.

Given the importance of TFP in most sectors, Table 1 displays the sectorial TFP growth index. Up to 2014, with the exception of the Financial & insurance, the Information & communication and the Wholesale and retail trade, transport, accommodation & food service sectors, most sectors exhibited negative or close to zero TFP growth. Over the last 7 years of the sample from 2015 to 2021, and despite the COVID-19 recession in 2020 most sectors, except the Wholesale, retail & accommodation and the Arts, entertainment & recreation sectors showed significant improvement relatively to their previous bad performances.

Table 1: TFP growth
(average annual percent changes)

Sector	Period	
	1996-2014	2015-2021
Total	0.87	1.80
Agriculture, forestry and fishing	-1.10	3.14
Industry	-0.84	4.34
Construction	-1.51	0.78
Wholesale&retail trade, transport, accom., food serv.	1.37	-0.44
Information and communication	3.38	5.59
Financial and insurance	3.54	0.98
Real estate activities	0.44	1.85
Prof, scientific and tech activities; adm. &support services	-0.70	1.85
Public adm., defence, educ, human health & social work	0.08	0.51
Arts, entertainment and recreation; other activities	-0.84	-0.10

Source: Eurostat and authors calculations.

3. Conclusion and Policy Implications

The Cyprus economy, like most economies, has been hard -hit during the COVID-19 recession. The lockdowns in 2020 were accompanied with sharp declines in output and labour growth of around 4.5% and 6.5% respectively. However, labour productivity growth increased by 2%. In 2021, output and hours worked recovered, with a 6.4% and a 4.7% increase, respectively. The result was a positive labour productivity growth that was even accelerated compared to the pre-pandemic level seen in 2019.

The analysis of sector level data suggests that the impact of the shock has been asymmetric across sectors. Labour productivity growth increased soon after the first lockdowns in technology-intensive sectors such as the Financial & insurance activities and the Information & communication

(ICT) sectors where working remotely was feasible and where firms could take advantage of new digital/online solutions. TFP growth accounts for much of the labor productivity surge, especially in the Financial & insurance sector. The gains in labour productivity growth, even though at a lesser extent, were retained during 2021.

In contrast, for sectors like the Wholesale, retail & accommodation, the Arts, entertainment & recreation, and the Construction sectors, that rely more on face-to-face interactions, the containment measures have had a negative impact on labour productivity growth. The Wholesale, retail & accommodation and the Arts, entertainment & recreation sectors losses in labour productivity were mostly due to their negative TFP growth.[6] Most of the negatively influenced sectors recovered after the re-opening of the economies in 2021.

Looking ahead, the acceleration in digital uptake could be a positive outcome from the crisis. Under the Recovery and Resilience Plan (RRP), Cyprus is currently working towards implementing measures that will increase the degree and the speed of economy's digitalization.[7] However, equally important for long-term productivity are the soundness of economic institutions, labour market flexibility as well as physical and digital infrastructure. All these, together with a widespread digital adoption across sectors, will determine the path of future productivity growth.

[6] The results in Bloom et al. (2020) at the firm level are in line with our findings. They find considerable heterogeneity in productivity across firms. For firms where its easier to work from home and where face-to-face interaction with customers is not so necessary, the short- and medium-term effect on firm-level TFP was more likely to be positive. On the contrary, for firms where it is harder to work from home and where they depend on face-to-face interaction with customers, the short- and medium-term effect on firm-level TFP was more likely to be negative. (Bloom, N., P. Bunn, P. Mizen, P. Smietanka, and G. Thwaites (2020). The impact of covid-19 on productivity. Technical report, National Bureau of Economic Research).

[7] The Economics research center of Cyprus contacted the economic impact assessment of the Cypriot RRP and provided estimates of the Plan's impact on future output growth. For a more in-depth discussion see Andreou et al., (2021). Report on the Assessment of the Recovery and Resilience Plan of Cyprus. Economic Policy Papers, and references therein. https://www.ucy.ac.cy/erc/en/publications/economic-policy-analysis-papers

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