



Economic Analysis Papers

PRODUCTIVITY IN CYPRUS

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PRODUCTIVITY IN CYPRUS¹

Theofanis Mamuneas, Elena Ketteni and Charalampos Karagiannakis

Executive Summary

The current crisis has highlighted the importance of increasing productivity in order for the economy to become more competitive and therefore increase its growth prospects. In this paper we analyse the productivity path of Cyprus utilizing various indices and compare those with the average performance in the Eurozone. We assess the performance of the Cypriot economy as a whole and also for each sector of economic activity separately. In particular, we distinguish between eight sectors, extracted utilizing the NACE2 classification scheme. The period under study is from 1995 to 2011 for the aggregate indices and from 2002 to 2010 for the sectoral disaggregation.

First, we calculate the total factor productivity also solely known as productivity or TFP, employing the growth accounting methodology. Then, we utilise these results to calculate the labour productivity growth and finally the real unit labour cost. All three indicators are interrelated since one depends on the other however, they consist separate tools therefore giving us the ability to infer results for different aspects of the economy and each sector. The TFP measure of productivity shows how effectively combined labour and capital inputs are used to generate GDP. TFP is usually referred to as ‘technology’ since it reflects phenomena such as advances in general knowledge, reductions in inefficiency and generally anything that would affect output production levels other than the inputs used, i.e. labour and capital. On the other hand, labour productivity shows the value of the additional goods and services produced per hour of work. Finally, the real unit labour cost measures the cost of labour required to produce a ‘unit’ of output. In this sense, this measure captures the competitiveness of a country or a sector with respect to labour.

Although labour productivity increased in Cyprus 1.7% on average during 2002-2007 and 0.9% during 2008-2010, our results suggest that the cost of labour per unit of output during the period 2002-2010 was higher compared to the Eurozone average, resulting in Cyprus becoming constantly less competitive. Furthermore, the ‘Manufacturing’, ‘Accommodation & Food’, ‘Electricity, Gas & Water’ and ‘Education’ were the sectors underperforming compared to their Eurozone counterparts, while on the other hand the best productivity performers were the ‘Constructions’, ‘Transport & Storage’, ‘Finance & Insurance’ and the ‘Health’ sector.

¹ The Economics Research Centre acknowledges financial support from the European Commission and the Ministry of Finance of the Republic of Cyprus.

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Η ΠΑΡΑΓΩΓΙΚΟΤΗΤΑ ΣΤΗΝ ΚΥΠΡΟ

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ΠΕΡΙΛΗΨΗ

Η τρέχουσα οικονομική κρίση έχει αναδείξει τη σημασία της αύξησης της παραγωγικότητας για να βελτιώσει η οικονομία την ανταγωνιστικότητά και τις προοπτικές ανάπτυξής της. Σε αυτή την μελέτη αναλύουμε την πορεία της παραγωγικότητας της Κυπριακής οικονομίας με την χρήση εναλλακτικών δεικτών και την συγκρίνουμε με την πορεία των χωρών της Ευρωζώνης. Πρώτα κοιτάμε τις επιδόσεις της Κυπριακής οικονομίας στο σύνολό της, ενώ στη συνέχεια στρεφόμαστε και μελετάμε ξεχωριστά του διάφορους τομείς οικονομικής δραστηριότητας. Συγκεκριμένα, χρησιμοποιώντας το σύστημα ταξινόμησης NACE2 διακρίνουμε μεταξύ οκτώ βασικών τομέων. Η περίοδος υπό μελέτη είναι από το 1995 έως το 2011 για τους συνολικούς δείκτες και από το 2002 έως το 2010 για την ανάλυση των επιμέρους τομέων.

Πρώτα υπολογίζουμε την συνολική παραγωγικότητα, γνωστή και ως «TFP» χρησιμοποιώντας την μεθοδολογία growth accounting. Στη συνέχεια, χρησιμοποιώντας αυτά τα αποτελέσματα, υπολογίζουμε την παραγωγικότητα της εργασίας καθώς επίσης και το μοναδιαίο κόστος εργασίας. Οι τρεις αυτοί δείκτες είναι συσχετιζόμενοι καθώς ο ένας υπολογίζεται με την βοήθεια του άλλου. Αποτελούν όμως διαφορετικά εργαλεία δίνοντάς μας έτσι την δυνατότητα να διεξαγάγουμε συμπεράσματα αναφορικά με εναλλακτικές πτυχές της οικονομίας. Η συνολική παραγωγικότητα αντανakλά οτιδήποτε επηρεάζει τα επίπεδα παραγωγής εκτός από τις ίδιες τις εισροές, δηλαδή την εργασία και το κεφάλαιο. Η παραγωγικότητα εργασίας αντανakλά την αξία των επιπρόσθετων αγαθών και υπηρεσιών που παράγονται ανά εργατοώρα. Τέλος, το πραγματικό μοναδιαίο κόστος εργασίας μετρά το κόστος εργασίας το οποίο απαιτείται για την παραγωγή μια μονάδας προϊόντος. Υπό την έννοια αυτή, ο δείκτης αυτός αποτυπώνει την ανταγωνιστικότητα μιας χώρας ή ενός τομέα ως προς την εργασία.

Παρά την αύξηση της παραγωγικότητας εργασίας στην Κύπρο 1.7% κατά μέσο όρο, την περίοδο 2002-2007 και 0.9% την περίοδο 2008-2010, τα αποτελέσματά μας συνιστούν ότι το κόστος εργασίας ανά μονάδα προϊόντος κατά την διάρκεια της περιόδου 2002-2010 ήταν υψηλότερο συγκριτικά με άλλες χώρες της Ευρωζώνης, με αποτέλεσμα η Κύπρος να γίνει λιγότερο ανταγωνιστική σε σχέση με τους εμπορικούς εταίρους της. Αναφορικά με τους επιμέρους τομείς της οικονομίας, η 'Μεταποίηση', τα 'Ξενοδοχεία & Εστιατόρια', ο 'Ηλεκτρισμός, Υγραέριο & Νερό' και η 'Εκπαίδευση' αποτελούν τους τομείς οι οποίοι συγκριτικά με την Ευρωζώνη βρίσκονται σε χαμηλότερο ανταγωνιστικά επίπεδο, ενώ στην αντίθετη όχθη οι τομείς 'Κατασκευές', 'Μεταφορές', 'Χρηματοοικονομικά & Ασφάλιση' και 'Υγεία' είναι τομείς όπου το κόστος εργασίας ανά μονάδα προϊόντος αυξήθηκε λιγότερο σε σύγκριση με άλλες χώρες της ευρωζώνης, το οποίο συνιστά πως οι εν λόγω τομείς γίνονται περισσότερο ανταγωνιστικοί σε σύγκριση με την ζώνη του Ευρώ.

1. INTRODUCTION

The aftermath of 2008 financial crisis and the current euro area crisis has highlighted the importance of productivity growth and competitiveness. 'Persistent losses in competitiveness and mounting external imbalances not only increase the economic and financial vulnerability of individual countries, but given the strong financial and trade interconnectedness of the euro area countries may also hinder the functioning of the euro area as a whole'. Therefore, a key driving force for the welfare and gains in income is how productive and competitive a country is.

National productivity estimates are of special importance since they are widely used in many aspects of public policy making (Diewert, 2002). For instance, the national monetary authorities consider national productivity growth estimates in making decisions about acceptable amounts of price inflation. Productivity also affects exchange rates, employment, investment and consumption. Bearing this in mind, productivity growth is an essential determinant for monetary policy.² There is evidence that increases in productivity are associated with low inflationary pressures and increases in competitiveness. High productivity reduces average costs and in the long-run reduces product prices therefore making the economy more competitive. Productivity measurement is also a key element towards assessing standards of living (OECD, 2011). A simple example is per capita income, probably the most common measure of living standards: income per person varies directly with one measure of labour productivity, value added per hour worked. In this sense, measuring labour productivity helps to better understand the development of living standards. Nothing contributes more to reduction of poverty, to increases in leisure, and to the country's ability to finance education, public health, environment and the arts (1993, Alan Blinder and William Baumol, p. 778). An OECD report (2001) also states that increases in productivity are associated with higher technical change (better ways to convert resources into outputs, Grilliches, 1987), higher efficiency (movements towards best practice in order to achieve maximum amount of output that is physically achievable with current technology and given inputs, Diewert and Lawrence, 1999) and real cost savings in production (Harberger, 1998).

The two most widely used measures of productivity are those of Total Factor Productivity (TFP) and Labour Productivity (LP). These two measures are not independent of each other. Total-factor productivity, also called multi-factor productivity, captures the part of real GDP growth that is not explained by the contributions from labour and capital. It shows how productively combined labour and capital inputs are used to generate GDP. TFP growth reflects phenomena such as advances in general knowledge, advantages of particular organizational structures or management techniques, reductions in inefficiency, and reallocations of resources to more

² For more details regarding productivity and monetary police see ECB 2008 Monthly Bulletin (Jan 2008).

productive uses. TFP cannot be measured directly. Instead it is a residual, often called the Solow residual, which accounts for effects in total output not caused by inputs.

The productivity (TFP) is computed using the Growth Accounting Framework (Solow, 1957). Growth Accounting provides a useful framework for analysing observed output growth into components associated with changes in factor inputs and a residual, i.e. the total factor productivity. The Growth Accounting framework is empirically motivated and can be seen as a first attempt to understand the long-term growth process. The Growth Accounting framework does not rely on any ex ante implications of any theoretical framework and therefore does not aim to give explanations of the underlying forces of growth such as preferences, institutions and economic policies. It essentially implies breaking down observed real GDP growth into the contributions from pertinent factors growth such as labour, capital and technology.

Labour productivity is the ratio of the output of goods and services to the labour hours devoted to the production of that output. As already mentioned, at the aggregate level, labour productivity forms a direct link to a widely used measure of living standards, income per capita. "Labour productivity translates directly into living standards, by adjusting for changing working hours, unemployment, labour force participation rates and demographic changes", (OECD, 2001). From a policy perspective, labour productivity is important as a reference statistic in wage bargaining. It is important to point out that a common unresolved puzzle in the literature is the source of procyclicality of labour productivity (see Bernanke and Parkinson, 1991). Labour productivity is procyclical meaning that it increases during booms and decreases during recessions. Real business cycle theorists argue that technology shocks is what drives labour productivity while Keynesians attribute labour productivity to demand shocks.

Moreover, using labour productivity growth and the wage rate, one can evaluate the unit labour cost, which captures the competitiveness with respect to labour. Unit labour cost measures the cost of labour required to produce a 'unit' of output. It is simply the rate of compensation times the quantity of labour divided by total output. It is also equal to the rate of compensation divided by productivity. That being the case, as long as compensation increases at the same rate as productivity, unit labour costs, as well as the labour share of income will remain constant (Cashell, 2004)

In this paper we calculate both productivity indices and the unit labour cost for the Cypriot economy as a whole, as well as by sector and compare these results with the euro area. An attempt is made to evaluate which sectors are more efficient and more competitive when compared to the average in the euro area, therefore giving us valuable indication as to which sectors would potentially assist to future growth of the Cypriot economy. In the next section we present the methodology for the construction of the three main indicators and describe the data used in our procedure. Section 3 presents the main results while more detailed tables and

figures can be found in the appendix. In the third section we first discuss the results regarding the overall economy, while we continue with the analysis of the disaggregated sectors. On the sectoral analysis we emphasize on the unit labour cost and the competitiveness of the individual sectors. The final section concludes.

2. METHODOLOGY AND DATA

2.1 Methodology: Model Description

Productivity, also known as TFP or Total-Factor Productivity, is computed using the Growth Accounting framework (Solow, 1957). Growth Accounting provides a suitable framework for identifying individual factors of growth and summarising them in a convenient way. It provides a useful framework for analyzing observed output growth into components associated with changes in factor inputs and a residual. This residual is known as Total Factor Productivity. The Growth Accounting framework dates back to 1930's with Paul Douglas, Tinbergen (1942) and others, but the basics were presented by Solow (1957), Kendrick (1961), Denison (1962), and Jorgenson and Griliches (1967). For a historical review see Griliches (1996). More recently among many others, Erwin Diewert has formalized the theory by integrating index number theory, production theory and national accounts³.

The Growth Accounting framework is empirically motivated and can be seen as a first attempt to understand the long-term growth process. It essentially implies breaking down observed real GDP growth into the contributions from pertinent factors growth such as labor, capital and technology. Growth accounting provides a residual measure of TFP growth, which is in fact an index number and depends on the functional form of the production function used.

Labour productivity is the ratio of the output of goods and services to the labour hours devoted to the production of that output. Labour productivity is a key determinant of living standards measured as per capita income, and from this perspective is of significant policy relevance. Capital deepening is also referred as capital intensity. If the capital stock per labour hour is increasing this is an indication that the economy will expand, not indefinitely though due to diminishing returns. The ratio is increasing if capital grows faster than labour. If capital stock increases at the same rate as labour then the ratio is constant.

Finally, using the labour productivity measure one can calculate the unit labour cost. This unit labour cost provides an indication of how competitive an economy is with respect to labour. If wages grow faster than labour productivity, therefore causing a higher unit labour cost, then the

³ For expanded description of all methods used for construction of productivity see Diewert (2002)

economy is less competitive with respect to its labour. Cashell (2004) explains that ‘as long as the contribution of output produced by the last worker hired exceeds the cost of his labour, a profit maximizing firm will continue to add to its labour force. This will increase the demand for labour. An increase in the demand will tend to push up wage rates. Maybe this won’t be the case and the benefits will pass to consumers or just to the profits of the firm. Unit labour cost is a way to assess whether labour is reaping the benefits of increasing productivity. Unit labour cost is basically the rate of compensation divided by productivity. As long as compensation increases with the same rate as productivity, unit labour costs should remain constant’. For description of the model see Appendix.

2.2 Data Description

In order to utilize the growth accounting methodology data for the prices and quantities of both the output and the inputs are required. We obtained data from several publications of Eurostat and the European Commission. The data covers the period 1995 to 2011 for the aggregate economy, and the period 2000 to 2011 for the sectoral analysis. The variables used are the Gross Value Added in current prices and constant prices, the number of Employees (total and self-employees), the total Hours Worked (man hours, for total and self-employees), Investment in current and constant prices, and the Compensation of Employees. All price data are expressed in euros, in constant terms of 2000.

Data for Cyprus and the rest euro area 16 countries were collected. The respective variables for euro area as a whole were created by aggregating all 17 countries.⁴ The compiled dataset includes some of the sectors from Eurostat’s NACE2 classification which classifies economic activities into 21 branches. In particular, data were collected for the sectors of manufacturing, construction, wholesale & retail trade, transportation & storage, electricity, gas & water, accommodation & food services, financial & insurance activities, information & communication, real estate, education, health, and finally the services sector.⁵ In the sectoral analysis section of this paper we present the results for 8 of the aforementioned sectors, namely manufacturing, construction, transportation & storage, electricity, gas & water, accommodation & food services, financial & insurance activities, and education & health. We focus our analysis mainly in years 2002-2011, while we also separate them into two sub periods, the before crisis period from 2002 to 2008, and the crisis period from 2008 onwards.

For the construction of all output variables, we utilized the value added in current prices as the value of output, along with the value added in constant prices considered as the quantity of output. In order to obtain the price of each output we divided current with constant prices.

⁴ Malta and Ireland are excluded from the sectoral analysis due to data limitations.

⁵ The services sector includes professional, scientific & technical activities, administrative & support service activities, arts, entertainment & recreation, and other service activities.

Regarding labor, the compensation of employees was used as the value of labor, adjusted to include the self-employees, a procedure followed also by the European Central Bank. Having the value of labor and hours worked, the price of labor was calculated, and then expressed in 2000 prices. Utilizing the data for the price and value of labor one can then work out the quantity of labor.

The capital stock was constructed using investment data, in current and constant prices. The value of capital was obtained using the value added in current prices together with the value of labor. The perpetual inventory method was followed with a constant depreciation rate of 5%, to construct the quantity of capital. For the initial value, i.e. value in the initial period $t = 0$, of the quantity of capital, we used the initial investment of the respective period divided by the depreciation rate plus the growth rate of output.

Using the above inputs and output we construct indices of TFP and labor productivity. TFP, also known as Multi-factor productivity or MFP, is measured as output growth minus a weighted sum of the growth of all inputs, and is considered a better measure since it reflects more efficiently the efficiency of an economy. In this paper we refer to TFP as productivity. Together with TFP and labour productivity, two other measures of economic performance are calculated. Those measures are the unit labour cost and the capital deepening.

3. RESULTS

3.1 Overall Economy Analysis

3.1.1. Total Factor Productivity

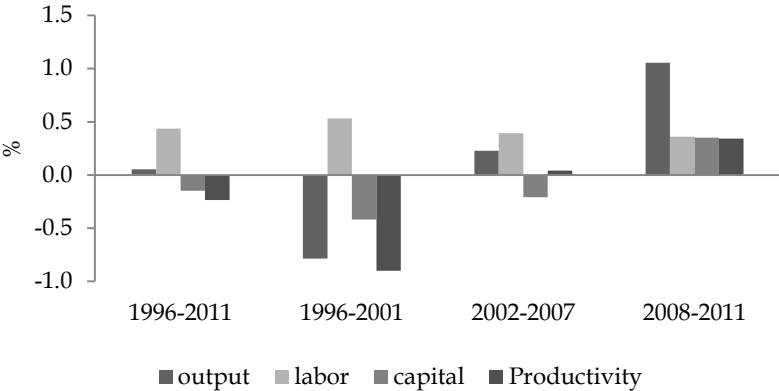
TFP shows the efficiency of an economy, or the competitiveness with respect to both labour and capital inputs. The overall productivity growth for Cyprus was 1.67% throughout the period. In the period 1996-2001 the average productivity growth rate was 2.7%, while in the period 2002-2007 it declined to 1.7%. After 2008, the productivity growth for Cyprus was nearly zero, with a value of 0.06%. In 2003 and 2009 we observe that productivity growth is negative, while the period 2004-2008 can be characterized by a stable productivity growth.

Changes in output growth can be explained from capital & labour contributions and from productivity changes. During the period 1996-2011 productivity growth has been the most important contributor to output growth, explaining more than half of the period's growth rate. Labour also made a significant contribution, while the remainder was accounted for the capital. Period 2002-2007, is characterized by a slowdown in productivity while both capital and labour growth increased their contribution to the overall output growth. Finally, in 2008-2011 a decline

in both labour and productivity contributions took place while capital growth was positive and capital appeared to have slight acceleration.

Comparing productivity growth between Cyprus and the euro area, Cyprus was slightly below the euro area average but both remained positive throughout the entire sample with the euro area average being 1.9%. This indicates that Cyprus is less competitive compared to the average country in the euro area. Higher productivity growth would be necessary in order for Cyprus to catch up with the rest of the euro area. Analytically, in period 1996-2001 productivity growth in Cyprus was 2.7% which is lower than the average of 3.6% of the euro area. The differences between Cyprus and Eurozone are depicted in figure 1 which shows deviations of Cyprus from the euro area.

FIGURE 1:
Output Growth and Components (deviations of Cyprus from euro area)



In figure 1 a positive number indicates that measures in Cyprus are higher than the euro area, while a negative number the opposite. In the period 1996-2001, Cyprus appears to be less competitive than the euro area. The period 1996-2001, is the worse in terms of productivity growth when compared with the euro area, with a difference in productivity of -0.9%. Output growth is also lower with Cyprus having a growth of 3.8%, while the rest of the euro area being on average at 4.5%. Capital contribution is very small in Cyprus, suggesting that this period is characterised by low capital intensity (0.1% Cyprus, 0.5% euro area). Investment also seems to lack when compared to the euro area, or it is directed to low productive capital like construction and public sector. On the other hand we have the labour contribution, which is higher in Cyprus than the EU (0.9% Cyprus, 0.4% Euro). Low capital and higher labour contribution in Cyprus indicates a substitution of capital with labour.

The period 2002-2007, is characterized by a slowdown in the growth of productivity in both Cyprus and the euro area (1.7% Cyprus and 1.7% Euro). In the euro area, we observe a reduction of 1.2% in the output growth, while the contributions of labour and capital increase. In

Cyprus we observe that output growth was slightly reduced at a rate of 0.3%, while the contributions of labour and capital increased. This increase is attributed to the increase of the number of employees, wages, and investment. In particular, labour growth was 1.75% in the period from 2002 to 2007, while in 1996-2001 was 2.63%, wage growth rate was 5% in comparison to 4.8% in 1996-2001 and finally, capital stock growth rate was 1.8% in comparison to 0.23% in the previous period.

Finally, after 2008 the euro area sees a slightly negative productivity growth rate (-0.3%), while Cyprus has a slightly positive growth rate about 0.1%. This is explained by the fact that the crisis reached the majority of the euro area before Cyprus, so we cannot yet conclude that Cyprus appears to be more competitive. Future work when more recent data become available will provide this information, but it is expected that due to the recent developments in Cyprus the productivity to reach even lower levels than the euro area. In the euro area we had a dramatic decline in the output growth, namely a deceleration of 3.49%, along with a deceleration of both capital and labour contributions. The contribution of labour was negative, pointing to the large unemployment in the euro area reaching 10.1% in 2011, while the contribution of capital was positive, though capital decelerated from 0.9% in the previous period to 0.5% in the period after 2008. Moreover, during the same period the average output growth in Cyprus was 0.8%, but decelerated by 2.7% from the earlier period.

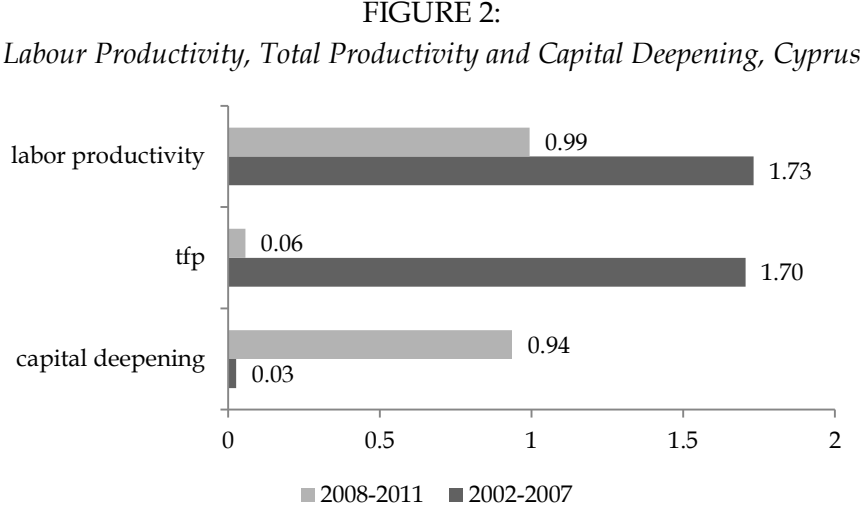
3.1.2. Labour Productivity and Wages

In Cyprus, labour productivity growth during the period 1996-2011 was on average 1.7%. In the period from 1996 to 2001, the average labour productivity growth was 2.1%, while between 2002 and 2007 it was reduced to 1.7%. This reduction was mainly driven from a large decrease that took place in 2003, in which labour productivity growth became negative. Various factors and incidents that occurred during 2003 may have caused this reduction in productivity. The 2003 annual report of the Central bank of Cyprus indicates that during that year there was a fall in both the arrivals and revenues of the tourism sector, a decline in the domestic demand, a slowdown in manufacturing, electricity, gas & water and a fall in local construction activities to a smaller extent. Moreover, imports and exports also shrunk during that period. At the same time, these overall reductions in economic activity were accompanied with an increase in employment and in real earnings. After 2003 the share of labour in total output started a downward trend which lasted until 2007. Specifically, in 2003 the share of labour was 0.63 and reached 0.57 in 2007.

After 2008 labour productivity rates in Cyprus dropped nearly close to zero (0.9%). This reduction can be attributed to the fact that both labour and output growth decelerated. There

was an overall contraction in major sectors of the economy during 2009 as is documented in the annual report of the Central Bank of Cyprus. In particular, the wholesale and retail trade sector, hotels & restaurants, the transport, storage and the communications sector were among the major sectors that contracted in 2009. During the same period, employment together with the share of labour saw a decrease. Specifically, employment recorded a reduction of 0.6%. The rate of unemployment increased drastically from 3.8% in 2008 reaching 7.9% in 2011, while the number of registered unemployed increased by 51.7% in 2009.

Figure 2 below shows the labour productivity and its main components for Cyprus. Recall from equation 4 above that labour productivity growth is equal to total factor productivity plus capital deepening. Capital deepening is defined as the capital services to hours worked ratio. If capital services increase faster than labour hours, the ratio is increasing indicating a substitution of capital for labour.



Regarding the period from 2002 to 2007, figure 2 shows that the main contributor to labour productivity is the total factor productivity, while capital deepening is almost zero. This period is characterized by low capital intensity indicating that investment are small or directed into low productive capital. Therefore, this translates to the fact that labour productivity is mainly explained by technological improvements for the span of this period. After 2008, both labour productivity and total factor productivity drop, with the latter getting close to 0%. Capital deepening though increases and therefore contributes to the fact that the labour productivity growth is higher than the total one. Those figures suggest that during 2008-2011 there has been some substitution between capital and labour. Data suggest that in this period capital growth is positive since capital appears to have a small acceleration, so investment has probably occurred in productive projects.

Taking the respective growth rates we constructed indices of labour productivity and total wages. The resulted indices are presented in the figure that follows.

FIGURE 3:
Labour Productivity and Wage Indices, Cyprus



In figure 3, we observe a gap between labour productivity and total wages with the total wage index being above the labour productivity throughout the covered period, and the divergence between the two be constantly increasing. As noted earlier, one can evaluate the unit labour cost by using labour productivity growth and the wage rate. The unit labour cost captures the competitiveness of a unit, i.e. industry, sector or country, with respect to labour. Based on figure 3, we can conclude that the unit labour cost increases throughout the period, indicating a loss in competitiveness of the Cypriot economy. The gap between the two indices appears to be larger during the period 2009-2011. Considering the whole sample, from 1996 to 2011 the wages are increasing by 4.4% annually, while the labour productivity by 1.6%, resulting a gap of approximately 3%. This increase is rather stable throughout the whole period under study. In particular, from 1996 to 2001, the growth rate of wages was 4.8%, while that of labour productivity was 2.1%, providing a unit labour cost of 2.7%. Similarly, the unit labour cost for period 2002-2007 was 3.3%, which is the highest value of unit labour cost among the periods under investigation, and 2.4% during the period 2008-2011 (see also figure 4).

FIGURE 4:
Labour Productivity, Real Unit Labour Cost and Real Wages (growth rates)

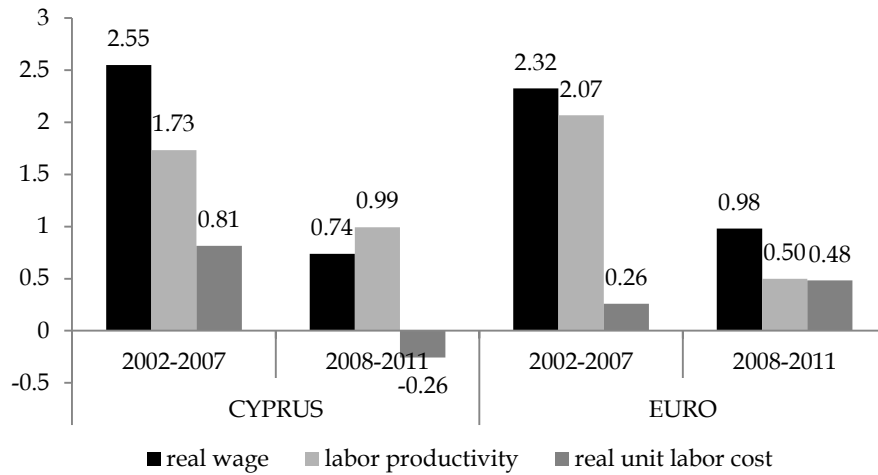


Figure 4 reveals that there is a gap between labour productivity and total wages in both Cyprus and the euro area. The total real wage growth rate is above the labour productivity in sub-period 2002-2007 in Cyprus, and therefore the unit labour cost appears to be positive. Similar, is the picture in the euro area. There is an obvious reduction in all growth rates between periods 2002-2007 and 2008-2011 for both Cyprus and the euro area as a whole. In period 2002-2007, the unit labour cost in Cyprus was higher compared to that of the euro area. Based on that observation we can conclude that there is a loss of competitiveness for the Cypriot economy during that period. Regarding the succeeding period, 2008-2011, the unit labour cost in Cyprus is lower and negative suggesting that labour productivity was higher than real wages. In the euro area the unit labour cost is growing, with a reduction in both labour productivity and real wages growth rates. A better picture is provided in the next figure.

Dean and Sherwood (1994) note that the costs of inputs used by a country's industries and sectors can be utilised as an important indicator of competitiveness. They further explain that if these costs are less in one country, then the country's trade situation is improving relative to another and that the unit labour costs can be used for comparisons among countries with respect to labour competitiveness.

FIGURE 5:
Real Unit Labour Cost

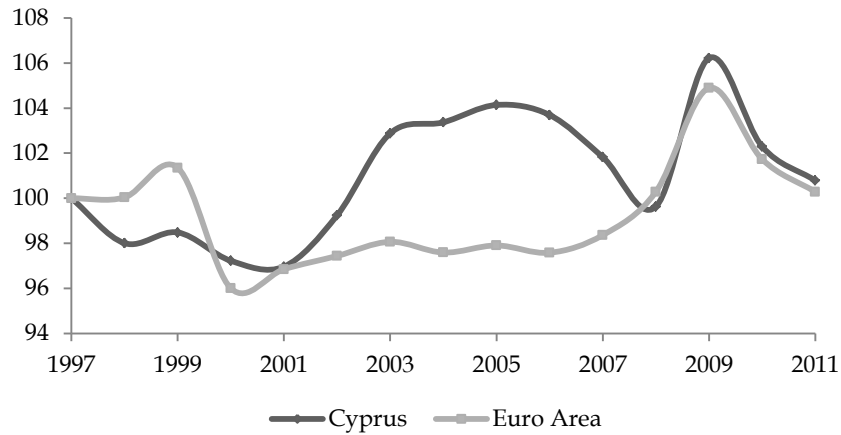


Figure 5 provides an illustration of the real unit labour cost index (1997=100) for Cyprus against that of the euro area. The unit labour cost has been converted to real terms using the consumer price index, in order to conduct country comparisons with more robustness, making sure that changes in unit labour cost do not reflect changes in inflation. The graph reveals a large gap between the unit cost of labour in Cyprus and the euro area starting in 2002 and lasting until 2007, with the Cypriot economy having higher unit labour cost compared to the euro area. During this period the compensation of employees together with wages were increasing, while output was decreasing, and employment was rather stable in Cyprus. These facts can explain why there is such a difference between Cyprus and the Euro average in terms of competitiveness during the aforementioned period, with Cyprus lacking in terms of labour competitiveness. In 2006, the gap started closing, reaching zero in 2008. After 2008 the two indices move together, with Cyprus staying closely above the euro area. After reaching a peak in 2009 the real unit costs for both countries have since been decreasing. The period after 2009 is a period described by large unemployment rates and decreasing outputs in both Cyprus and the euro area.

3.2 Sectoral Analysis⁶

3.2.1. Overview of the Sectors

The five largest sectors in Cyprus, ranked with respect to their share in GDP in 2011, are the wholesale & retail trade with a share of 12.1%, followed by the financial & insurance sector with

⁶ For brevity we refer to some composite sectors using the first sector in their naming. For instance we refer to the 'Accommodation & Food Services' sector, as 'Accommodation' sector. The detailed naming is according to Eurostat's NACE2 classification of sectors and can be seen in the sectoral graphs.

9.0%, then the construction sector with 7.9%, the accommodation with 6.5%, and finally the manufacturing sector with a share of 6.2%. The sectors with the smallest shares are the health sector with a share in GDP of 1.8%, the electricity, gas & water with 2.8%, the education with 4.2%, and finally the transportation sector with a share of 4.7%.

The ranking among the various sectors in Cyprus has not changed much over the years. In particular, for the whole period covered in this study, from 1996 to 2011 no change was experienced in the relative shares of the smallest four sectors in Cyprus. Slight reallocations were seen between the five largest sectors, especially after 2008 and as a result of the financial crises mostly impacting on the production of durable goods in the secondary sector of the economy. Namely, in the aftermath of the crisis during the period 2008 to 2011, the manufacturing, and the accommodation sectors shrunk by over 3%. On the other hand the financial services & insurance sector experienced an expansion of almost 2% to become the second largest sector in Cyprus as noted above, initially ranked as the fifth largest below manufacturing and construction sectors in late 90's. In this section, we focus on the following sectors: manufacturing, electricity, gas & water, construction, transportation & storage, accommodation & food service activities, financial & insurance activities, education and finally, the health sector. We emphasize on the performance of these sectors in terms of their unit labour cost movements to infer useful conclusions regarding their competitiveness.

The graphs (figure 6) in the Appendix, present the differences in real unit labour costs, the differences in labour productivities, and the differences in real wages between Cyprus and the euro area for the period 2002 to 2010. Prior calculating the country differences for each of the three measures, the real unit labour cost, the labour productivity and real wages, we converted these measures into indices having 2002 as a reference year. Therefore, for 2002 the difference between Cyprus and the euro area will be zero in each of the three measures, since they have all been set to take the same value for comparison purposes. Converting into indices allows us to compare in proportional changes rather than changes in the level of each measure between Cyprus and the euro area. A positive figure means that the growth rate of that measure in Cyprus rose faster than the respective in the EA. Of course there might be the case that Cyprus remained constant and the EA decelerated. A flat curve would translate to that the respective measure increased or decreased proportionally at the same rate in Cyprus and the euro area, throughout the period covered in the sample. Moreover, since the growth rate of the Real Unit Labour Cost (RULC) is defined as the difference between the growth rates of real wages and labour productivity, from each individual graph we can therefore inference on whether the difference in the RULC of the two countries originates from a gap in the growth rate of real wages or from a labour productivity growth rate gap between the two countries. Recall that when RULC decreases, this interprets to increasing competitiveness in a country. In our case, a negative RULC figure in the graphs below would represent an improvement in the

competitiveness in Cyprus since it would mean that the growth rate of the RULC in Cyprus was lower than that of the euro area. Note however, that this does not explicitly imply that the euro area competitiveness did not grow. It only implies that Cyprus grew faster than the euro area in terms of competitiveness.

If labour productivity increases then pressure is exerted through increased wage bargaining for wage increases. If on the other hand labour productivity decreases, then this is a signal that wages should be reduced. When the real unit labour cost in a specific sector increases above that of another country's then, this translates into loss in the competitiveness of that country's sector with respect to its labour, as compared to the other country's competitiveness. The real unit labour cost is reduced if either real wages are reduced or labour productivity increases.

Similarly in figure 7 of the appendix we observe the difference between productivity and capital-labor ratio of the Cypriot with the corresponding euro area sectors. A negative number here suggests that the Cypriot sector is worse with respect to productivity and has a lower capital – labor ratio (capital intensity), when compared to the euro area.

With respect to TFP, we observe that in the period 2002-2007, most sectors experienced positive productivity growth. The sectors with the highest contribution of productivity in output growth were the financial sector, followed by the transportation sector. Two sectors have experienced negative productivity rates, causing a reduction in their output and therefore loss of efficiency and competitiveness. Those were the manufacturing sector, which has a negative output growth since 1996, and the accommodation sector that saw a drop to its output growth due to the negative productivity. Finally, the education sector had a negative but an almost zero productivity growth. In the period 2008-2011, the effects of the crisis become apparent in the Cypriot economy. A drop occurred in the productivity of all sectors causing the aggregate measures of productivity and output growth to a further reduction, except in education, health and accommodation in which productivity increases and so did output growth. Negative productivity growth rates are observed in the construction, the electricity gas & water, and the transportation sectors. In the construction and transportation the negative productivity pushes the output growth downwards to negative rates. The financial sector also experienced a reduction in its productivity but the rates remained in positive levels, which was also the case for output growth. In the period 2008-2011, capital deepening is increasing in most sectors except accommodation, financial & insurance activities, and education, in which is basically 0%. These are therefore sectors with no investment or no new investment.

3.2.2. Sector Disaggregation

Prior entering the discussion regarding the individual sectors presented in this report, it is important through a retrospect to point out various economic developments and some key facts

that may have been the main driving forces beneath changes in the real unit labour cost and therefore the competitiveness of the overall economy, or even of specific sectors of the Cypriot economy.

In the 1st of May 2004 Cyprus entered the European Union, and in 2008 the euro adoption followed, replacing the national currency, the Cypriot pound. The integration of Cyprus within the E.U. was accompanied with the liberalization of various professions and with increasing labour mobility from and mostly towards Cyprus. A considerable amount of both skilled and unskilled labour started flowing into the local market. This flow had an immediate impact on the prices of services, since higher competition in the labour market due to increased labour supply would exert contractionary pressures forcing real wages on specific professions to go down. In terms of figures, in 2010 more than 74% of the employees coming from abroad were employed in the services sector, 21% in the production and constructions sectors and the remaining 5% in the primary sector.⁷

According to Soumeli (2008) in 2006 in Cyprus the proportion of employees that belonged to labour unions was 58%. Note that not all sectors in Cyprus are represented by a labour union. It is notable that the highest participations ratios are usually found in the public sector. Furthermore, the employees of sectors that have not formed labour unions are also protected through the existence of legislations related to employment that define minimum wages, levels of working hours and redundancy payments. Both the existence of labour unions and the employee protection legislations are intended to retain a smooth working environment between the two parties, employers and employees, in the labour market. However, sometimes these practises have been criticized that can work against the proper allocation of efficient human resources and therefore the productivity of labour since they may prompt workers to induce less effort due to the inability of employers to react to any such cases. Moreover, labour unions and employment protection measures can prove harmful for the overall economy not only to the aforementioned reason but also because during economic meltdowns public and private sector wages as well as employment cannot be adjusted accordingly.

The participation of employees in labour unions especially in the private sector has been declining over the years. One of the causes is the fact that immigrant workers are usually not interested in registering with unions probably in an effort to avoid any immediate financial burden. The percentage of foreign employees in the labour force reached 21.1% in 2010, from only 9.5 in 2002.⁸ As mentioned above, this increase can be partly attributed to the entry of

⁷ Source: Central Bank of Cyprus.

⁸ Source: Central Bank of Cyprus.

Cyprus in the E.U. that took place in 2004. In particular, in 2004 the percentage change in the overall labour force of Cyprus was around 4.2%, with over 3.1% of them being workers coming from abroad and the rest 1.1% being Cypriot citizens.

Below we blend into more detail and give possible explanations regarding the movements of the real labour unit cost and its components for each of the individual sectors examined in this study. As we saw in figure 4, where an illustration of the level of the overall unit cost in Cyprus against that of the euro area was given, the average real labour cost in Cyprus increased vastly after 2001 and retained its relatively high level until 2005 where it started a downward path, to converge to the EA average in 2008. In 2008 it reached a trough and started increasing again but this time following closely the levels seen in the Eurozone. The individual sectors though reveal a different picture with heterogeneous movements, attributed to the different structures of each of the specific sectors. Overall, four of the sectors can be said to be performing better compared to the EA for all or the majority of the period covered, from 2002 to 2010. Those sectors are the constructions, the transportations, the financial and the health sectors. To the other extent the manufacturing, the accommodation, the electricity, gas & water and the education sectors are underperforming compared to the EA average. An overperforming sector is a sector that is constantly becoming more competitive than the respective sector in the EA, while underperforming indicates the opposite. In a cross-sector comparison for Cyprus the health, the accommodation and the electricity, gas & water sectors are the sectors with the largest changes in their levels of competitiveness as opposed to the manufacturing, the financial and the education sectors that have been the most stable at least when compared to each other.

Manufacturing

Overall, the real unit labour cost in the manufacturing sector had been increasing until 2009. The sector in Cyprus can be characterised as underperforming when compared to the average real unit labour cost of the EA countries. Contrary to that of Cyprus, the labour cost in the euro area is decreasing until 2007. Both indices however, reach a peak in 2009 before starting declining. The increasing path of the real unit labour cost in Cyprus for the period 2002 until the peak in 2009 can be well attributed to the increasing real wages. Real wages in the manufacturing sector in Cyprus have been increasing from 2004, and peaked in 2008. Real wage increased a total of more than 12% during the four years prior to the peak in the real unit labour cost. Regarding the second component of the real unit labour cost, the labour productivity had been decreasing from the beginning of the sample until 2007. Labour productivity had been declining mainly due to decreases in the sectoral output for the period 2004 to 2006 and due to increases in labour in 2007. It is noteworthy that manufacturing is one of the sectors with high participation

rate of employees in labour unions. This could potentially explain why wages remained high even though labour productivity was decreasing during that period.

The manufacturing sector is basically worse with respect to productivity throughout the whole period. The TFP productivity of the sector has been decreasing since 2003, and it's rather stable after 2009. It experienced a small increase in 2008, that caused a shift in the difference but it was followed again by a reduction. The difference in the capital-labour ratio is relatively stable and around zero.

Electricity, Gas & Water Supply

The composite sector of electricity, gas & water, which is comprised of goods and services that are mainly produced under the administration of the government, is another of the four underperforming sectors in Cyprus. Also, it is important to point out that the highest participations ratios in labour unions are usually found in the public sector. The overall picture reveals an increasing tendency in the real unit labour cost in Cyprus with a peak in 2010. It is notable that this sector is the one with the greatest loss in competitiveness since the real unit labour cost increases to more than 75% in the period covered from our sample. The path of labour productivity has been rather stable having a moderate decreasing trend over the years, meaning that the explosive path in the real unit labour cost must have been driven from real wages. Real wages increased by almost 70% in 8 years, with the greatest increase happening between 2009 and 2010.⁹ It is also notable that there was almost no gap in the real unit labour cost between Cyprus and the euro area average until 2003.

The electricity, gas and water sector appears to be less competitive with respect to TFP productivity after 2007. While there was no significant difference until then, we see a drop in the figure suggesting that the sector became worse especially in the 2008-2010 periods. Both productivity and labour productivity of the sector are moving together, however after 2008 total productivity drops even further. The growth rate of capital stock of the sector is increasing from 2006 until 2010 and is higher when compared to the growth of labour and that's the reason for the increase in the capital-labour ratio, causing the difference between Cyprus and Euro to reach even positive levels after 2009.

⁹ Data for the compensations of employees reveal that all three sub-sectors (electricity, gas, and water) faced large increases after 2009. Specifically, in the water sector, compensations rose from €27.8 million to €49 million and in the electricity & gas sector from €42 to €74 million. Moreover, in 2010 gross wage and salaries in the electricity & gas sector increased from €23.1 million to €38, while in the water sector from €35 to €57.4 million, retaining high levels thereafter.

Construction

The competitiveness of the constructions sector in Cyprus has been increasing until 2008 where it reached its peak. Somewhat similar is the picture in the constructions sector in the euro area as well. On average labour productivity has been increasing and real wages have been decreasing from 2002 until 2008, where both reversed their direction. The decreasing path of real wages that is especially notable after 2005 can be attributed to the large amount of unskilled workers that migrated to the country, after it opened its borders in 2004. As explained in the beginning of the sectoral analysis section, entry of foreign workers has probably weakened labour unions and their activity, allowing wages to adjust to lower levels. After 2008 slight increases in real wages were recorded. This is probably due to the outflow of mostly foreign workers that was observed after the worsening of the economy and the negative expectations that were formed regarding the housing constructions market. Moreover, in the last 3 years of our sample, output in the sector has declined faster than labour, forcing labour productivity to decline over 22% during that period.

The upward path of labour productivity in Cyprus before 2008 was mainly due to capital deepening, especially after 2007 since total factor productivity had been declining afterwards. Capital deepening during that period was positive suggesting a substitution of capital for labour, causing the improvement in labour productivity. New productive investment probably took place during this period in various projects. The growth rate of capital stock of the Cypriot sector is increasing between 2006 and 2008 around 10% but it drops in 2009 to almost zero percent. The reduction in labour productivity after 2008 is due to both a reduction in total productivity and capital intensity which could either mean no new investment or investment in low productive capital.

Transportation & Storage

The transportation & storage sector has seen a large improvement in terms of competitiveness and has even over-exceeded the performance of the same sector in the euro area which can be said to be relatively stable throughout the period. The share of air-transportation related services, which includes airport activities to a large extent, is on average 64% of the total sectoral output. Therefore, privatization of the administration of the national airports in 2006 can potentially explain the majority of improvements made in the sector that are reflected in the decrease of the RULC seen after 2005 and up until 2009. Labour productivity has seen a positive growth since the beginning of the sample; however, the peak in the real unit labour cost is mainly due to real wage decreases that started in 2005 and continued until 2010. Since 2009 the sectoral output has been declining faster than labour, resulting in a peak and a downward trend in labour productivity from 2009 onwards. Furthermore, between 2008 and 2009 the

RULC line in the graph crosses the horizontal line meaning that real wage growth in Cyprus has been lower compared to that of the EA since then.

The slight shift in the constantly improving labour productivity after 2009 is due to a drop in both total factor productivity and capital intensity. The transportation and storage sector seems competitive when compared to the euro area. The difference in the productivity is positive and increasing with a small drop in 2009. Similarly, after 2007 the capital-labour ratio of the sector is higher than the corresponding one from the euro area. Both productivity measures of this sector are increasing throughout the period, with small drops after 2009. The capital stock of the sector provides a different picture. The capital stock starts growing after 2005 until 2008 to reach 12%. After that we observe a drop in the growth rate of the capital stock which becomes zero in 2010 and negative in 2011. The capital-labour ratio is increasing.

Accommodation & Food Service

The accommodation & food service sector includes to a large extent, most of the tourism related activities and services. The sector had been experiencing huge increases in real wages until 2005. Since then, real wages have on average been decreasing to over 3% annually. Given that labour productivity has remained relatively constant, especially after 2005, contraction of real wages has forced real unit labour cost down, closing the gap that existed between Cyprus and the average level in the euro area. Similarly to the constructions sector, wage depletion can be attributed to the inflow of unskilled workers as a result of the Cyprus integration within the European Union that opened its borders to other EU citizens in 2004.

A slight improvement in the labour productivity after 2005 is attributed to total factor productivity increases. Capital intensity of the sector is close to zero suggesting no new investment or simply that the sector uses its capital only for maintenance. The capital-labour ratio of the sector is decreasing, and the growth rate of capital is in negative levels since 2007. The difference in the capital-labour ratio is around zero but sees a positive value in 2009 and 2010. Finally, emphasis should be given in improving the competitiveness of this sector since it belongs among the five largest sectors of the Cypriot economy and among the two largest during late 90s.

Financial & Insurance

In the financial services sector the gap between the RULC of Cyprus and that of the euro area has been increasing with Cyprus becoming constantly more competitive especially after 2004. Even though on average real wages on Cyprus have been growing slightly faster than in the EA, the gap in the real labour cost can be attributed to the faster growing of labour productivity in Cyprus. There is an upward trend in labour productivity in Cyprus since 2003, with labour

productivity becoming more stable after 2010. Labour has been increasing annually almost at a constant rate of 2% since 2004. Four years after the financial crisis of 2000, the sectoral output experienced an almost 10% annual increase, with future changes also remaining in high positive values.

The contribution of the capital deepening factor is almost zero and so is the growth rate of capital, translating to no new investment. As a result, the main contributor of labour productivity increases is the total factor productivity. The financial sector is the second sector that seems to be performing better than the euro area. The difference in the productivity is positive and increasing. The difference in the capital-labour ratio is decreasing and negative, suggesting that the corresponding euro area sector has a higher capital-labour ratio.

It is crucial here to point out that due to the nature of the output of the financial and also the rest services sectors, possible mis-measurement issues may lead to bias in terms of productivity and sectoral output assessment. The immateriality of the services output is an issue which has been left unresolved. Among other, Gallouj and Savona (2009) highlight this problem.

Education

The gap in the competitiveness of the education sector between Cyprus and the EA, has been increasing since 2005, with Cyprus real unit labour cost constantly increasing until 2009, while that of the EA remaining relatively constant. The labour productivity in the education sector in Cyprus is the most stable across all sectors. Therefore wages are almost entirely responsible for the increasing competitiveness loss of the education sector in Cyprus. Around 90% of the total expenditure in education sector is distributed to the primary and secondary education while only the remaining 10% belongs to higher education. As with the rest of the sectors it is important here to point out that most sectors are comprised of many different sub-sectors that in most cases for a deeper understanding it would be necessary to be studied separately. Further disaggregation of each sector needs to be made, and productivity analysis to be applied in order to be able to extract robust information and also to be able to utilize these results in the policy decision making process.

With respect to productivity, the education sector doesn't seem to have a difference with the euro area. Based on the graph the difference fluctuates around zero. The capital-labour ratio difference starts decreasing after 2003, becomes zero in 2007 and negative afterwards. The capital-labour ratio in the Euro sector has been increasing throughout the period, while the Cypriot ratio is rather stable, so the difference between the two is widening.

Human Health & Social Work

Competitiveness in the health sector of Cyprus has been improving from the beginning of our sample. Given the stable real unit labour cost in the EA, the gap between Cyprus and the rest of the euro area has been increasing. The gap of real wages is negative and decreasing in the entire sample suggesting that real wages in Cyprus have been decreasing faster when compared to the average in the EA. Increased competition in the health services, as a result of the liberalization of most professions in 2004 can potentially explain what has been driving real wages down. On the other hand, labour productivity in Cyprus has seen huge increases since 2005 while the downward trend in the euro area has contributed to the widening of the gap between Cyprus and the EA. The increases in labour productivity of the health sector in Cyprus after 2005 are both due to increasing sectoral outputs but also due to negative growth rates in the sectoral labour.

Moreover, both capital intensity and total factor productivity are contributing to the observed increase in labor productivity. The growth rate of capital stock and total factor productivity are increasing, so the increase in the labor productivity is attributed to both technological improvements and high investment.

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APPENDIX

1. Description of the model:

Solow's (1957) seminal paper provides a convenient context for introducing the basics of growth accounting, which has influenced numerous subsequent growth accounting studies. Following his notion, we define a production function as:

$$Y = F(K, L, t)$$

, where Y is the quantity of output, K is the capital input; L is the labor input and t the level of technology (TFP). Differentiating with respect to time and dividing by Y (rearranging in terms of growth rates)

$$\hat{y} = \frac{\partial F}{\partial K} \frac{K}{Y} \hat{k} + \frac{\partial F}{\partial L} \frac{L}{Y} \hat{l} + \frac{\partial F}{\partial t} \frac{1}{Y} \quad (1)$$

, where $\hat{\cdot}$ stands for the growth rate e.g. $\hat{x} = \frac{\partial x}{\partial t} / X$. Then the rate of TFP change \hat{T} is calculated as a residual:

$$\hat{T} = \frac{\partial F}{\partial t} \frac{1}{Y} = \hat{y} - \frac{\partial F}{\partial K} \frac{K}{Y} \hat{k} - \frac{\partial F}{\partial L} \frac{L}{Y} \hat{l} \quad (2)$$

Equation (2) is however impractical since the marginal product of capital, $\frac{\partial F}{\partial K}$ and labour, $\frac{\partial F}{\partial L}$, inputs are unobservable. But, assuming that firms maximize profits then the social marginal products must be equal to the observed factor prices. Therefore, equation (2) becomes:

$$\hat{T} = \hat{y} - s_K \hat{k} - s_L \hat{l} \quad (3)$$

, where $\hat{\cdot}$ denotes again growth rate and s indicates the output shares of capital and labor. This framework grew phenomenally from 1957 on (Diewert, 2002). The methodology was extended and applied in various empirical studies.

When production exhibits constant returns to scale we can link the labor productivity with total-factor productivity growth. Labor productivity growth depends on TFP growth plus the capital deepening, where capital deepening is referred to the growth rate of per capita capital,

measuring the substitution between capital and labor. Labor productivity can therefore be written as:

$$\hat{\ell} = \hat{T} + s_K(\hat{k} - \hat{l}) \quad (4)$$

Finally, using the labour productivity measure one can calculate the unit labour cost as the difference between the wage growth rate and the labour productivity growth rate.

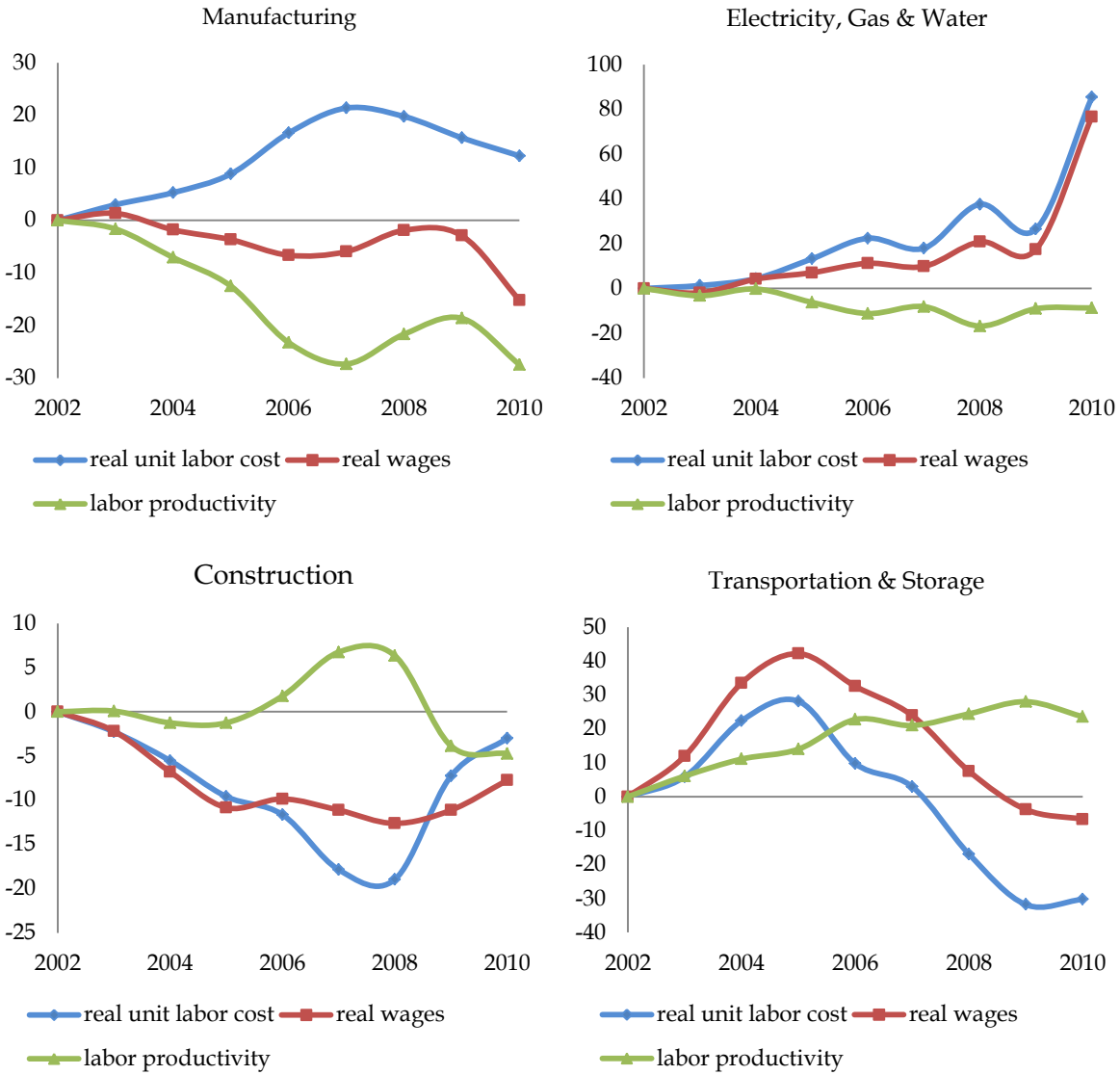
$$\hat{u} = \hat{w} - \hat{\ell} \quad (5)$$

, where \hat{w} is the growth rate of wages, and \hat{u} is the unit labour cost or the real unit labour cost when \hat{w} measures in real instead of nominal terms.

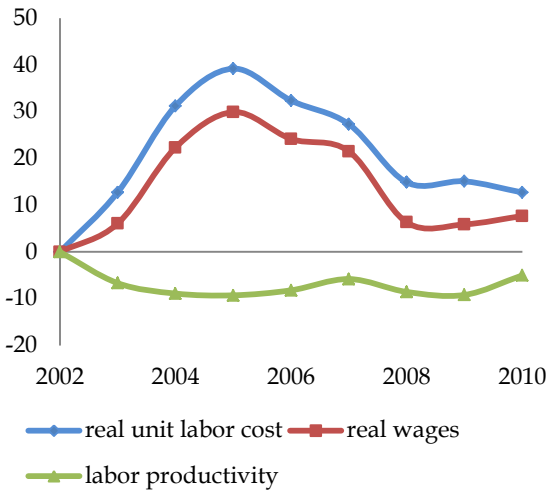
2. Results

FIGURE 6:

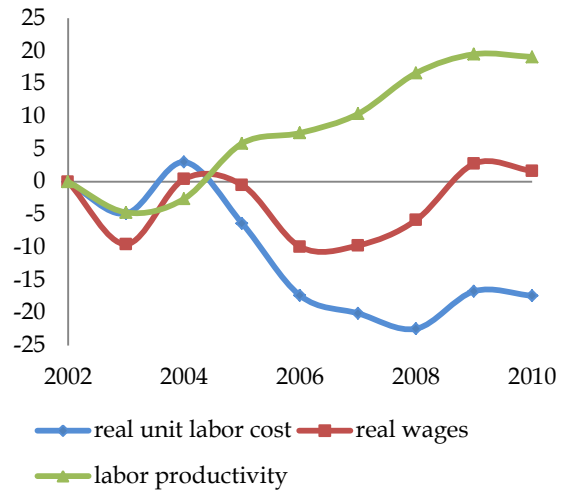
Real Unit Labour Cost, Real Wages, Labour Productivity (differences of Cyprus from euro area)



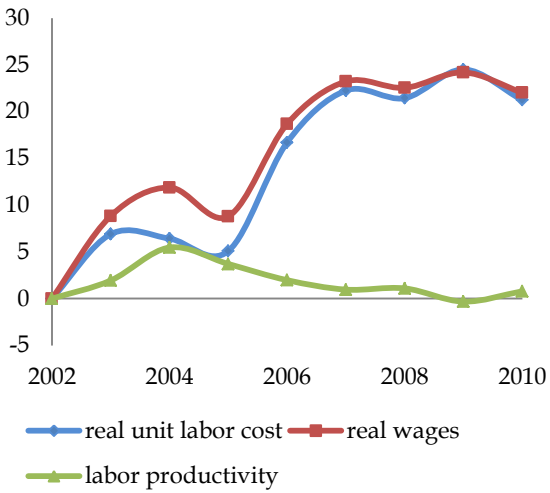
Accommodation & Food Service Activities



Financial & Insurance Activities



Education



Health

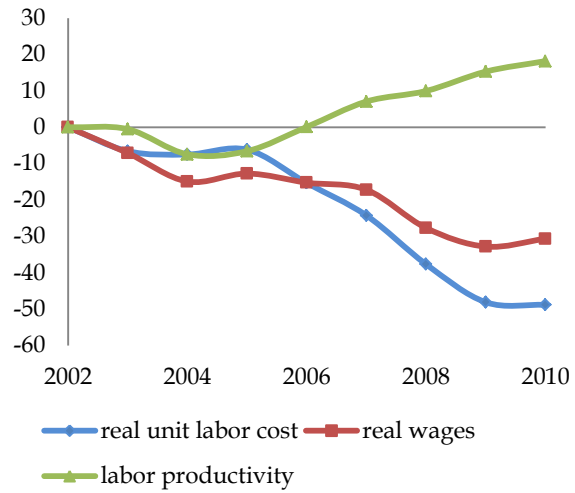


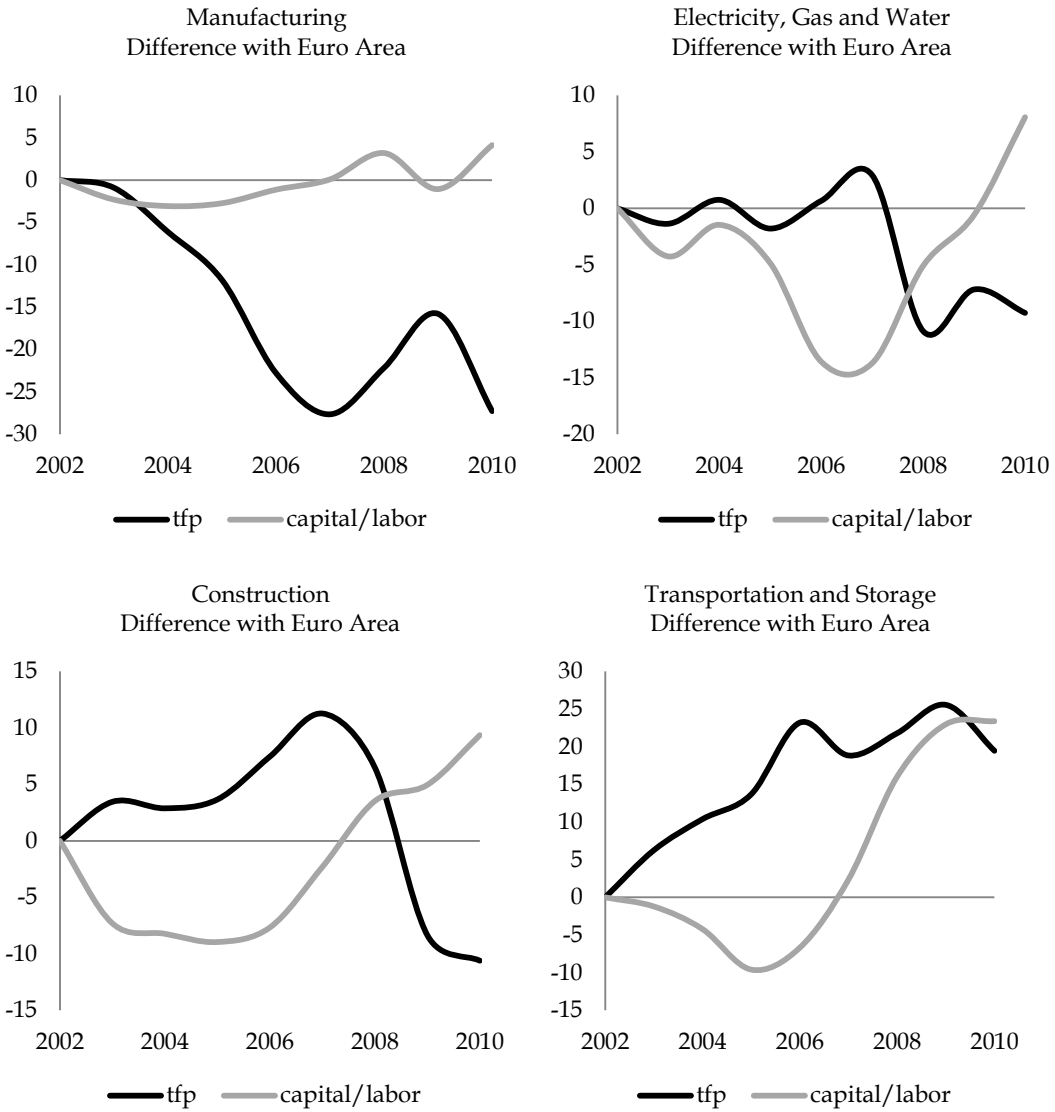
TABLE 1:
Output Growth and Components

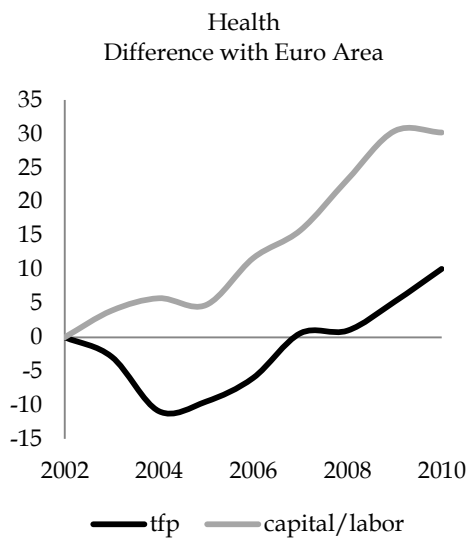
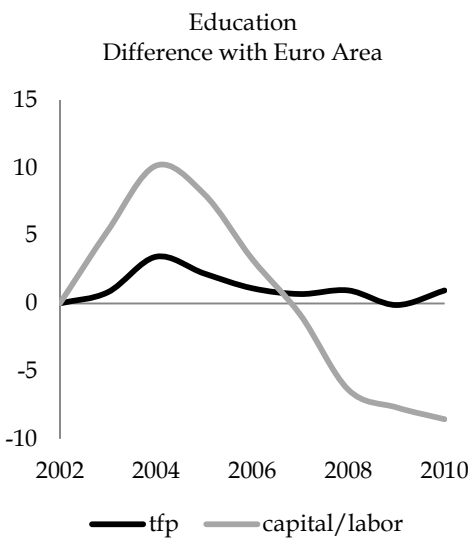
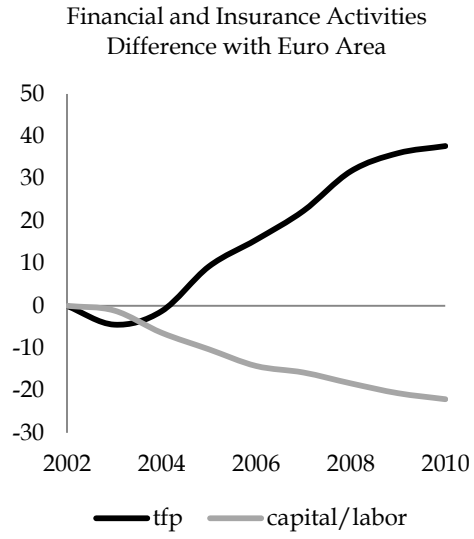
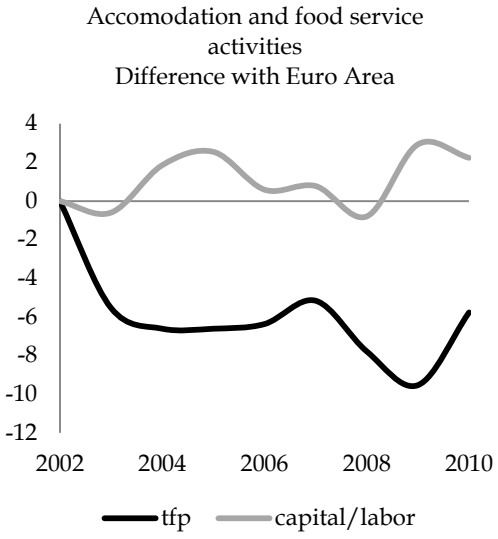
	Output	Productivity	Inputs
<u>Manufacturing</u>			
2002-2011	-0.84	-0.81	-0.03
2002-2007	-0.15	-0.85	0.70
2008-2011	-1.89	-0.75	-1.13
<u>Electricity, Gas and Water</u>			
2002-2011	3.88	-1.21	5.09
2002-2007	5.83	2.24	3.59
2008-2011	0.96	-6.38	7.34
<u>Construction</u>			
2002-2011	0.37	-1.94	2.31
2002-2007	7.00	2.65	4.35
2008-2011	-9.56	-8.83	-0.74
<u>Transportation and Storage</u>			
2002-2011	2.30	1.01	1.29
2002-2007	5.07	3.45	1.62
2008-2011	-1.87	-2.65	0.78
<u>Accommodation and Food Service Activities</u>			
2002-2011	-0.92	-1.06	0.14
2002-2007	-1.50	-2.37	0.87
2008-2011	-0.05	0.92	-0.97
<u>Financial and Insurance Activities</u>			
2002-2011	4.90	4.39	0.51
2002-2007	5.44	5.41	0.02
2008-2011	4.08	2.85	1.23
<u>Education</u>			
2002-2011	2.75	0.06	2.69
2002-2007	2.47	-0.10	2.57
2008-2011	3.17	0.30	2.87
<u>Health</u>			
2002-2011	3.94	2.11	1.84
2002-2007	2.53	0.89	1.64
2008-2011	6.06	3.93	2.14

TABLE 2:
Labor Productivity, TFP and Capital Intensity

	Labor Productivity	Productivity	Capital Deepening
<u>Manufacturing</u>			
2002-2011	-0.02	-0.81	0.80
2002-2007	-0.41	-0.85	0.44
2008-2011	0.58	-0.75	1.33
<u>Electricity, Gas and Water</u>			
2002-2011	0.33	-1.21	1.54
2002-2007	1.00	2.24	-1.24
2008-2011	-0.68	-6.38	5.70
<u>Construction</u>			
2002-2011	-1.22	-1.94	0.72
2002-2007	1.59	2.65	-1.06
2008-2011	-5.44	-8.83	3.39
<u>Transportation and Storage</u>			
2002-2011	2.98	1.01	1.97
2002-2007	4.64	3.45	1.19
2008-2011	0.49	-2.65	3.14
<u>Accommodation and Food Service Activities</u>			
2002-2011	-1.21	-1.06	-0.15
2002-2007	-2.51	-2.37	-0.14
2008-2011	0.74	0.92	-0.18
<u>Financial and Insurance Activities</u>			
2002-2011	4.22	4.39	-0.17
2002-2007	5.33	5.41	-0.08
2008-2011	2.54	2.85	-0.31
<u>Education</u>			
2002-2011	0.10	0.06	0.04
2002-2007	0.04	-0.10	0.15
2008-2011	0.17	0.30	-0.12
<u>Health</u>			
2002-2011	3.77	2.11	1.67
2002-2007	2.35	0.89	1.46
2008-2011	5.90	3.93	1.98

FIGURE 7:
Productivity and Capital/Labour Ratio (differences of Cyprus from euro area)





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