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TRACKING INCOME PER HEAD IN CENTRAL-SOUTHERN EUROPE

Country responses to the global downturn (2008-2012)

***Abstract.** This work measures and provides interpretations on income per head and that of its core components in selected central-southern (CS) European countries between 2008 and 2012. The countries chosen for this analysis are the Czech Republic, Hungary, Poland and Romania whose income per capita levels vary, consistent with their respective economic structures. The period selected captures the global downturn, which serves as a useful platform on which the short-run effects on CS labour productivity and labour market reactions can be identified. Using Geary-Khamis dollars, in purchasing power parity terms, enables comparative analysis across the four selected, transition countries to be carried out in respect of these components. The work finds that income per head, driven by labour productivity, could be identified as increasing in the case of Poland only during this four-year period. Contrastingly, the Czech Republic, whose income per head is the highest within the group, was the only country to reveal positive labour productivity and labour market gaps relative to the average for all four countries. It occurs that higher GDP capita, a proxy for income per head, was a key factor in enabling these two latter countries to partially weather the global storm.*

Key words: *Income per head, labour productivity, labour utilisation*

JEL Classification : E20, E23, J24, J38, O47

I. Introduction

This work sets out to measure the change in income per head and that of its determinants across four selected Central-Southern European countries between 2008 and 2012. The countries chosen for this analysis are the Czech Republic, Hungary, Poland and Romania. The key objective is to derive a set of results, which will enable a greater understanding as to the reaction of each country's economy to the global downturn. The former Soviet states are all members of the

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European Union with varying economic structures and, likewise, different levels of income per capita. For this reason the time period along with the countries selected represents an interesting laboratory for comparative analysis. To facilitate this, each country's respective national currency is provided in Geary Khamis Dollars in purchasing power terms and is supplied by the Groningen database (2013). The results obtained are regarded as useful on the strategic front as to whether policy makers need to focus more on injecting greater investment into the economy during financial downturns or whether greater attention should be directed more towards addressing labour market issues. In some cases, a combination of the two is also necessary.

The theoretical framework and modelling techniques are introduced at the outset of this work. Of central interest in this analysis is income per head (gdp/capita), which continues to be regarded as the best measure of a country's level of welfare. This variable is calculated using two independent variables; one of which is labour productivity (the capital side), while the second accounts for the labour market side in respect of the number of hours worked per head. Capital and labour both vary depending on economic structure, but also react differently during periods downturns; as this work discovers.

The data gathered and applied in this research focuses on the years 2008 and 2012. This allows change to be measured over time as well as enabling the calculation of each country's respective economic performance relative to the average for all four countries. The results of this research show that only one country recorded positive, though marginal, levels of income per head during the recession. The analysis carried out reveals that there is a clear link between negative labour productivity when compared to the average across the sample set of countries and lower income per head, while countries with higher incomes per capita observe relatively more stable labour market conditions. This finding concurs with research carried out by Cameron & Neal (2003). Usually, countries with higher levels of GDP per capita are considered by international organisations to be more advanced, comparatively better developed and, as a result, also enjoy higher levels of welfare, income and better standards of living. This is an argument supported by trickle-down theorists (*see* Naghshpour and Sergi, 2008; Arljukova, 2008; Grybaite and Tvaronaviciene, 2008; Ginevicius and Podvezko, 2009; Ginevicius and Zubrecovas, 2009; Dzemydiene, 2008; Gryko and Kluzek, 2008; Diskiene, *et al.*, 2008; Savrina and Grundey, 2008; Tvaronavicius and Tvaronaviciene, 2008; Zagorsek, 2009; Burinskiene, 2009; Ciegis *et al.*, 2009; Rutkauskas, *et al.*, 2008; Kilijoniene *et al.*, 2010). In sum, the work finds that investment should be a continuous process and not adjusted according to downturns and periods of lower demand.

II. Theoretical Framework

Equation (1) shows income/output per head (O/P) and the two core components that determine it. Labour productivity (O/H), which when multiplied by the number of hours worked per head for a given year (H/P) reveals a country's

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level of welfare (GDP capita). The formula is applied to reveal the differences ($x-y$) in income between two countries (Ark van & McGuckin, 1999). Labour productivity is a key factor in output since it represents the quantity of goods and services produced per hour (Baldwin, R., et al, 2004). The actual volume of this variable depends on the contribution of investment in both physical and human capital in order for them to individually and/or jointly raise labour productivity (Clowes, D., 2010). Countries and regions with lower shares of capital in production achieve lower levels of labour productivity and tend to work longer hours (Gylfason, 1999). Equation (1) is given as follows:

$$O/P^{x-y} = (O/H)^{x-y} * (H/P)^{x-y} \quad (1)$$

The results obtained from the application of equation (1) generates useful information as to whether countries need to focus more on the investment front – the main source of labour productivity, or whether the number of hours worked per head suggests that governments need to place more emphasis on introducing policies directed towards tackling labour market weaknesses. Equation (2) focuses firstly on labour productivity. Increases in the total volume of labour productivity can be achieved via increased working hours and/or via increased investment in physical, human and innovation capital.

$$x_1 = \left(\frac{O/H^x}{O/H^y} \right) * 100 \quad (2)$$

Equation (2) measures the relative value in percentage terms of a given country's labour productivity (O/H^x) in relation to the CS European average (O/H^y), while equation 2a (below) calculates the actual labour productivity gap (LPG) between each of the individual countries and the CS average.

$$LPG^{x-y} = x_1 - 100 \quad (2a)$$

The application of equations (3) and (3a) is a two-stage approach directed towards providing the position of each country's labour market. The first stage involves the determination of relative income (RI) which involves the division of income per head for each of the four given countries by the group average (O/P^y). The value derived is assigned as x_2 .

$$RI^{x-y} = \left(\frac{O/P^x}{O/P^y} \right) * 100 = x_2 \quad (3)$$

Equation 3a represents the second stage in respect of the actual calculation of the labour utilisation gap (LUG). This is determined by subtracting the labour productivity gap (x_1) from the relative difference in income per head (x_2).

$$LUG^{x-y} = x_2 - x_1 \quad (3a)$$

The capacity to utilise labour determines the employment rate and influences that percentage of the labour force that is either actively employed or seeking work. The employment rate depends on macroeconomic management, conditions in the labour market and also the effectiveness of public, private and/or public-private employment agencies. The individuals desire to work is also of importance, since numerous factors determine incentives and the capacity to actively engage in the labour market, such as the real wage rate and health conditions, respectively (Cotis, 2004). A higher share of actively employed individuals, as a percentage of the total labour force, will raise output volume and increase the distribution of goods and services within a country's boundaries, leading to increased welfare distribution (Clowes & Choroś-Mrozowska, 2010).

III. Results on productivity

The results presented in table one are derived from the application of formula one and the determination of income per head. The data provided are for the years 2008 and 2012. The first observation concerns the Czech Republic, which ranks first for both years. This result is supported by its higher level of income per head, higher labour productivity and the country also works the most hours per head out of the group of four countries. Closer examination of the two periods however does reveal that the country did record falling values across all variables over the four-year period, proving that the country was not immune to the recession when measured in purchasing power terms. The dip in output at the same time is marginal and rather suggests more in the way of a period of stagnation.

Table 1. Labour Productivity, Hours Worked & Income/Head + Rankings (2008 & 2012)

Country Values in GK\$ & Hours	(2) Labour Productivity (O/H)	(3) Hours /Head (H/P)	(4) Income /Head O/P	(5) Rank Income /Head (O/P)
Czech Republic 2008	14.70	917	13.476	1
Hungary 2008	10.77	819	8.825	4
Poland 2008	12.01	848	10.186	2
Romania 2008	6.32	797	5.040	5
Czech Republic 2012	14.67	908	13.327	1
Hungary 2012	10.62	794	8.428	4
Poland 2012	13.45	829	11.151	2
Romania 2012	6.15	787	4.839	5
CS Average 2008	10.95	857	9.382	3
CS Average 2012	11.22	841	9.436	3

Source: Groningen Database: Own calculations based on statistical accounts (2013).

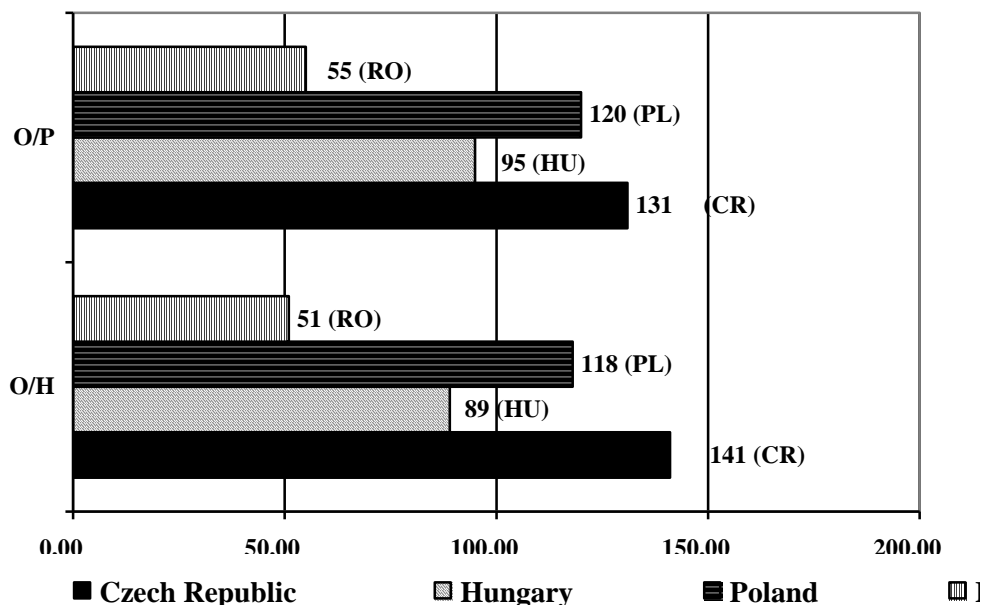
The actual income per capita rankings of each country in column five reveal no change between 2008 and 2012 and this is due to the parallel falls in productivity, hours worked and income per head across three of the countries. The exception to this trend was Poland, whose labour productivity and income per head both increased. Although the increase in these two variables was marginal given the time period measured, it does indicate that investment was a source of minimal growth and stability during the recession.

The relative position and efficiency

Setting the CS average equal to one hundred, graph one depicts the relative position of each country in terms labour productivity (lower section) and income per head (upper section). The results show that the Czech Republic & Poland achieved above average values for income per head and labour productivity when compared alongside the CS average. The values for Hungary, however, are marginally below in terms of income per head. This can be attributed to the country's labour productivity (LP) values in dollars, which were below the CS average in both 2008 and 2012. A comparison of the LP (\$) values in Hungary for both years in comparison to the respective CS average values, does in fact show that labour productivity has deteriorated in relative terms over time. This suggests

that the country benefitted less from investment over the four-year period and was therefore likewise less immune to the recession in contrast to, for example, Poland.

Graph 1. Relative Income per Head (O/P) & Labour Productivity (O/H) in CS Europe compared with the CS Average (%) 2012.



Note: CS European Average = 100%

Source: Groningen Database: Own calculations based on statistical accounts (2012).

Romania, which joined the EU three years after the former three in the year 2007, observed a 51% and 55% of the CS average for labour productivity and income per head, respectively. The results show that, while the country has a comparatively lower income per head, Romania is efficient. This is measured by comparing labour productivity with income per head – hence; labour productivity in Romania (51% of the CS average) generates a more than proportionate (+4) level of income/welfare per head (at 55%), while the opposite applies in the case of the technologically more advanced Czech Republic (Tiusanen 2006), (GDP/Capita < Labour productivity) -10)). Closer observation reveals that countries endowed with greater shares of capital in national output (the Czech Republic and Poland), tended to be less efficient during the recession, while countries whose total output contains higher shares of agriculture (Hungary and Romania) tended to be more efficient. The latter countries would, in such circumstances, be comparatively less dependent on external markets in terms of export supply – especially, capital goods. Needless to say, the level of demand across Europe for agricultural products

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would be less affected by the recession than as would be the demand for capital goods.

Productivity gaps

Equation (2) measures labour productivity for each country relative to the CS average and is done so with a view to determining each country's respective labour productivity gap (2a). Countries with positive LPG values (see table 2, column five) are those which have generally benefited from greater injections of investment and/or which tend to work relative more hours. In contrast, negative LPG values would suggest the need for greater investment in physical / human capital and/or the need for the implementation of active labour market policies.

$$x_1 = \left(\frac{O/H^x}{O/H^y} \right) * 100 \quad (2)$$

$$LPG^{x-y} = x_1 - 100 \quad (2a)$$

Table two provides the values in dollars for labour productivity (column 2) for the years 2008 and 2012, while column three shows the CS average values for both years. Column four lists the relative change in productivity, consistent with graph two, and the far-right column (5) displays the values calculated for each country's labour productivity gap (LPG).

Table 2. Labour Productivity Compared & the Labour Productivity Gap (2008 & 2012)

Country Values in GK\$	(2) Labour Productivity (O/H ^x) Individual Countries	(3) Labour Productivity (O/H ^y) CS European Average	(4) Labour Productivity (X ₁ = %)	(5) Labour Productivity Gap (X ₁ - 100)
Year 2008				
Czech Republic	14.70	10.95	134	34
Hungary	10.77	10.95	98	2-
Poland	12.01	10.95	110	10
Romania	6.32	10.95	58	-42
Year 2012				

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Czech Republic	14.67	11.22	131	31
Hungary	10.62	11.22	95	-5
Poland	13.45	11.22	120	20
Romania	6.15	11.22	55	-45

Source: Groningen Database: Own calculations based on statistical accounts, 2008 & 2012.

Note: CS European Average = 100%

The LPG values calculated (column 5) reveal that two countries (Romania & Hungary) observed negative gaps relative to the CS average. These gaps did in fact widen over time as can be observed via a comparison of the values for both years. The values for Hungary are marginally below the CS average, while the case of Romania displays not only a widening LP gap over time (-42 to -45), but one which is more severe and reflective of its low capital/labour (K/L) ratio. This suggests a need for greater investment in order to raise productivity and commence a process of convergence towards the CS average.

In contrast, the Czech Republic in 2012 (+31) followed by Poland (+20) achieved LPG values consistent with higher levels of investment and comparatively higher shares of capital in production. In terms of the former, the LP gap fell marginally from 34 to 31 percent, while the case of Poland shows a wider positive distance between itself and the CS average, increasing from +10 to +20 percent during the four-year period. The results for the four countries represent a useful laboratory, since the time span captures the effects of the recession on output. The results show that, with the exception of Poland, all remaining countries observed a three percentage fall between 2008 and 2012. Column three shows the CS average for labour productivity (LP), which increased from \$10.95 to \$11.22 in 2012. Country-level LP values in column two together with the LP gaps in column five therefore suggest that the observed increase in CS average labour productivity was in fact driven purely by Poland.

III. Comparative results on labour utilisation

The following two equations (3 & 3a) jointly measure the conditions in the labour market with a view to determining the labour utilisation gap between each individual country and the CS average. The value is obtained by subtracting the value for labour productivity from each country's relative income per head. The calculation involves a two-stage process. The first stage involves the application of equation three (below), which divides each country's income per head by the CS average and is multiplied by one hundred to derive a value for X_2 , which is the value for relative income (RI). The second stage (equation 3a) calculates the labour

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utilisation gap (LUG). This is carried out by subtracting relative labour productivity (X_1) from relative income (X_2).

$$RI^{x-y} = \left(\frac{O/P^x}{O/P^y} \right) * 100 = x_2 \quad (3)$$

$$LUG^{x-y} = x_2 - x_1 \quad (3a)$$

Table three shows the results obtained following the application of both equations (3 & 3a). Columns two and three list the values for income per head the four CS countries and the CS average for the same years. Column four provides the change (X_2) in labour utilisation for both years, while column five displays the values calculated for relative income per head. Relative labour productivity is given in column five and the labour utilisation gap (6) is determined by subtracting column five from column four.

Initial observation of column six shows that the Czech Republic is the single country to have achieved a positive labour utilisation gap (LUG) for both 2008 and 2012. Comparing this result with the country's labour productivity (LPG) in table two shows that the Czech Republic was the only country to record positive gaps on both fronts relative to CS averages. The values for Poland border just below (-2) the CS average in respect of its utilisation of labour, while the LU gaps for Hungary and Romania are marginally below at minus six and minus four, respectively. The Hungarian case reveals an almost even set of results for both LP (labour productivity, table two) and LU (labour utilisation) gaps. Both of these fall marginally below the CS average (2012) at minus five and minus six, respectively.

Table 3. The calculation of the labour utilisation gap (2008 & 2012)

(1) Country Values in GK\$ (Year 2008)	(2) Income / Head (country) (O/P ^x)	(3) Income / Head (Av.) (O/P ^y)	(4) (O/P ^x) —— x 100 (O/P ^y) X ₂	(5) (O/H ^x) —— x 100 (O/H ^y) X ₁	(6) Labour Utilisation Gap (X ₂ - X ₁)
Czech Republic	13.476	9.382	144	134	10
Hungary	8.825	9.382	94	98	-4
Poland	10.186	9.382	109	110	-1

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Romania	5.040	9.382	54	58	-4
Year 2012					
Czech Republic	13.327	9.436	141	131	10
Hungary	8.428	9.436	89	95	-6
Poland	11.151	9.436	118	120	-2
Romania	4.839	9.436	51	55	-4

Source: Groningen Database: Own calculations based on statistical accounts, 2008 & 2012.

Note: CS European Average = 100%

The results for Romania in this regard display a much wider discrepancy between both of the measured gaps. For example, while the country's utilisation fell just below the CS average in 2012 (-4), the Romanian production of goods and services per hour (productivity) stood at almost half of the CS average (-45) in the same year. Investment is therefore a key priority in Romania in order for it to raise productivity and reduce its gap in respect of the CS average.

Country level implications

Graph two depicts each country's labour productivity and labour utilisation gaps for the year 2012. The results presented in this form provide greater orientation as to the types of policies that could be considered at a country level in order to achieve more stable and efficient outcomes on both the capital and/or labour market sides of each country's economic operations. According to Julio Roman & Bratu (Simionescu), the uncertainty affects the evolution and the forecasts of macroeconomic indicators, being necessary to assess the forecasts uncertainty.

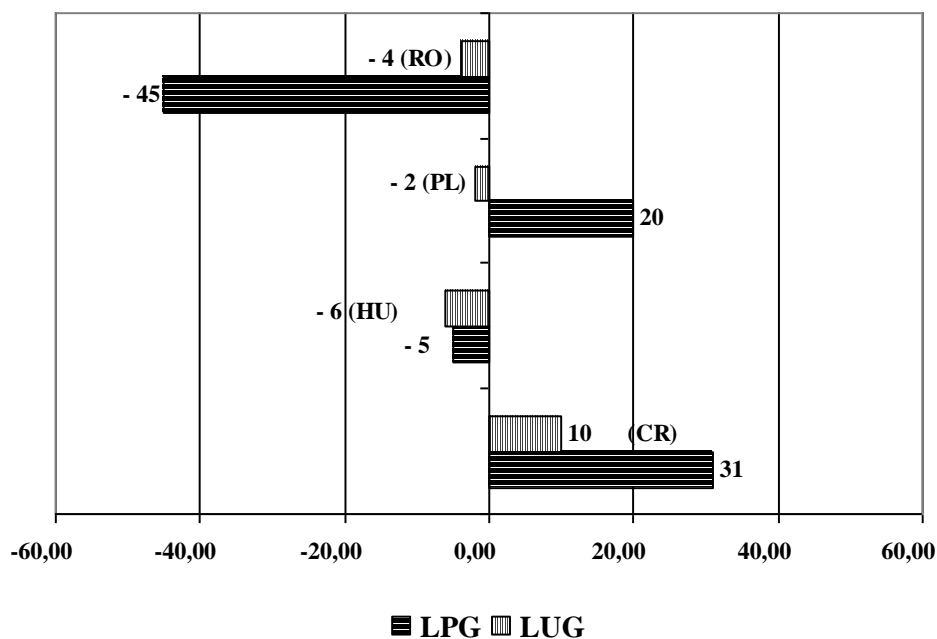
The Czech Republic turns out to be the most productive country and also with the more favourable labour market conditions in so far that it is the only country whose LP and LU gaps are both positively positioned above the CS average. Poland achieves an LP gap, which is twenty percent above the average, though its labour utilisation results (-2) suggests that the implementation of active labour market policies is a priority. Work carried out by Clowes (2011) suggests the advantages of public-private employment agencies in this regard.

Both Romania and Hungary parallel Poland's results with minus four and minus six percent below the average for labour utilisation, respectively. Both of these countries also record below average values for labour productivity. In this regard the LP gap for Hungary is minus five percent below the CS average, while the Romanian gap is comparatively nine-times less. These findings suggest that, with the exception of the Czech Republic, the remaining three countries could benefit from new employment, while Hungary and, more so, Romania also need to

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adopt a more pro-active approach aimed towards drawing in higher levels of investment in addition to domestic spending objectives.

Graph 2. Relative Gaps in Labour Utilisation (LUG) & Productivity (LPG) between CS Countries and the CS Average (%) 2012.



Note: CS European Average = 0 percent.

Source: Groningen Database: Own calculations based on statistical accounts, 2012.

Conclusion

This work has identified that the implementation of simplified modelling techniques can in fact reveal substantial information concerning a country's economic management. The work focused purely on four Central-Southern European countries and measured their respective economic performances relative to the average for the entire group on both the capital and labour market fronts. The work found that the two most productive countries, when measured in terms of labour productivity and income per head, were the Czech Republic and Poland. The former of the two was the most productive, which is reflective of higher rates of investment and likewise consistent with greater shares of capital in production. In respect of both countries, the work finds that higher productivity and that of income per head does lead to higher levels of efficiency and also comparatively

more stable conditions in the labour market. Investment is therefore of paramount importance, since injections of such into key areas of production raises the demand for supply side specialisations and subsequently expands networks. This in turn generates greater employment opportunities via the increased demand for labour.

The information provided above does raise the question as to whether these findings are useful or applicable to Romania or Hungary, whose economies fell below the CS average. It should be highlighted that investment did play a central role in the case of the Czech Republic and Poland, but for different reasons. Firstly, the Czech Republic, the country endowed with greater shares of capital in production, was not immune to the recession. The country is however strongly integrated into EU supply and production networks, especially in key capital goods sectors. Poland, meanwhile, was a beneficiary of substantial investment funding during the recession, which was supplied by the EU for the purpose of infrastructure development. It could be argued that in the absence of such funding, labour market conditions could have been substantially worse – needless to say, quite a possibly different scenario in terms of productivity and income per head. The case of Poland is an isolated one given that it was the only country not to have observed falling productivity and income per head. While the country did not achieve substantial growth during the period measured, investment did help the country to weather the recessionary storm.

The economic situation in Hungary has declined over time over time in terms of output and also with regards to its overall conditions in the labour market. Policy implementation in Hungary undoubtedly needs to address both the capital (investment) and labour market sides of the equation in order to raise output and generate greater consumer confidence. Romania faces similar labour market conditions in this regard, though its much deeper investment vacuum needs to be filled in order for the country to expand and build production networks. One of the observed barriers to progress in this area was the actual timing of the country's accession to the EU, which occurred at the outset of the recession. This in turn did not allow the country to benefit from the scale of EU investment such as that, for example, witnessed in Poland. One can conclude from this analysis that the time period and the onset of the global recession does represent an interesting laboratory for comparative analysis. It further suggests a strong role for the state in the event of private sector decline.

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