

# PRODUCTIVITY PERFORMANCE OF ESTONIA IN A GROWTH ACCOUNTING APPROACH

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**Abstract:** *This paper aims to contribute to a better understanding of the economic growth tendencies in Estonia and other former post-socialist countries and the interaction between productivity growth and their determinants after the transition decades. So this paper is structured as follows. Firstly we will introduce an alternative growth accounting method to determine the components of productivity growth based on this concept. In Section we will also provide our empirical results in Estonia, Latvia, Lithuania and Hungary compared to the EU-15 countries between 1990 and 2011 how TFP (Total Factor Productivity), Physical and Labour Capital Accumulation can contribute to (increase or decrease) economic performance of each country. Finally, we can conclude that the relationship between labour and output growth per capita has obviously and temporarily changed after the mid-1990s, which could be determined by the increasing role of such socio-economic factors as technological changes, capital accumulation and demographical fluctuations etc.*

*Keywords: productivity growth, growth accounting, regionalism*

*JEL Codes: C23, E32, E24.*

## **1. Introduction**

Estonia is a small country in Northern Europe on the Baltic Sea, at the crossroads of East and West, South and North. Samuel Huntington states that the Estonian border is a border of Western civilization, a border where civilizations clash. This has made Estonia interesting to historians but hard for people who live there.

A significant part of Estonia is a wooded and plain area. During the II. World War the Estonian economy was basically determined by agriculture but after the democratic transformation the agriculture productivity had dramatically reduced. The economic system like in other post-socialist countries was characterized by centrally planned economic system. Resources such as wood or water played an important role in the economic growth. As a result, wood and energy industry were considered to be a promising part of the economics, however, under the Soviet oppression, these industrial it was impossible to enforce such industrial activities.

This governmental system had several drawbacks. Personal, consumer and economic freedom were limited. Furthermore, the lack of the economic competitiveness caused low economic efficiency. The aforementioned factors led to low living standards and economic potential.

The end of communism had created a real chaos in the country. Shops were empty, in 1992 industrial production declined by more than 30 percent and real wages fell by 45 percent, while overall price inflation was running at more than 1000 percent and fuel price had risen by more than 10000 percent. To curb the crisis the government had to use dramatic measures to renovate the economic.

A temporary fuel loan from Finland helped to stabilize the situation, still the need to hasten the introduction of Estonia's own currency became apparent. Other economic reforms such as privatization and foreign trade were also being held up by the country's dependence on the Russian ruble.

In spite of earlier objections from the International Monetary Fund, Estonia introduced its new currency, the kroon On June 20, 1992. At 800 exchange points across the country, residents were allowed to exchange up to 1,500 rubles at a rate of ten rubles to one kroon. Excess cash was exchanged at a rate of fifty to one. Bank accounts were converted in full at ten to one. By the end of the three-day transition period, the move was declared a success, with only minor glitches reported.

The foreign capital investments were as important as in nowadays' economics. The economic modernization and the improvement of the infrastructure conditions were waited for by FDI. This paved the way to the birth of the law on foreign direct investment, which was very successful.

From the beginning of the 90's to the world economic crisis, the capital had been continuously increasing, which was an integral part of the recovery.

The mid-90s signalled the beginning of membership negotiations with the European Union as well as the start of a period when the EU became the most important trade partner for Estonia. However, trade with the union was rather one-sided, since mostly Finland, Sweden, Germany dominated foreign trade.

With the end of the communist regime new problems appeared which were caused by undeveloped welfare system and the lack of social system. The economic development of the country began in 1997 when Phare program started. This project included labour safety and health benefits reducing the inequality between men and women and improving the education. Furthermore, during this period Estonia made an effort to consolidate the Copenhagen criteria to join in the European Union.

On 1 May 2004, Estonia joined the European Union with nine other countries, which triggered a huge development of the country. Estonia, Latvia and Lithuania together got labelled as "Baltic Tigers" a nickname earned because of the huge economic growth. Construction and electronics industries were developed by leaps and bounds, which was due to the increase of the consumer need.

This considerable growth can be traced back to several factors. First of all, the government artificially induced internal consumption and open markets after the EU accession. Secondly, a significant amount of foreign direct investment played an important role in invigorating the economy.

When the crisis hit Estonia in 2008-2009, GDP showed a downward trend. The recession caused inflation, high prices and huge unemployment rate. A Export reduction lead to another problem as well since a significant part of county's revenue stemmed from export.

Like in all countries of the world, there was a crisis management program, which managed to emerge from the recession quickly and was able to strengthen the economy. Compared to other countries in the region, Estonia was in the most stable position because they did not need to delay the introduction of euro and borrow IMF loans.

The government approved the austerity package which contained the following points (Márton, 2012):

1. A 10% reduction in public spending
2. Lesser extent, increased pensions, but also made a number of other steps towards the consolidation of pension law.
3. The Government approved a credit line of 360 million for small and medium enterprises to get loans, as well as tourism, re-search and development, job creation and social programs.
4. The Government made a EUR 700 million credit contract with the European Investment Bank, whose main aim is stimulating the economy and developing human resource.

Despite the crisis, Estonia has managed to correct the Maastricht criteria and on 1 January 2011 the country joined the euro zone. This step was beneficial for Estonia and for European Union, too. The single currency ended the exchange rate risks, and reduced the transaction costs while attracted foreign investors who were mainly interested in areas of metal industry, engineering, chemicals, business services and information technology (Ummlas 2011).

Although these measures affected the government's popularity, they were played an essential part in successfully handling the crisis and the return of economic growth.

This process went heavily and measures listed were a bad influence on the coalition government's popularity, but they can help you successfully handled the crisis, and the economy started to grow again, and could adopt the euro sooner. The road to this long-awaited economic freedom within Estonia was not easy and although on several occasions it seemed that the entire project had reached an impasse, it eventually turned out to be a success.

The primary aim of this paper is to contribute to a better understanding the economic growth tendencies in Estonia and the interaction between productivity growth and their determinants after the transition. So this paper is structured as follows. In section (1), we introduce an alternative growth accounting method to factorize the components of productivity growth based on this concept. In Section (2), we provide our empirical results in Estonia (EST), Latvia (LTV), Lithuania (LTH) and Hungary (HUN) compared to the EU-15 countries between 1990 and 2011. Finally, we concluded that the relation between labour and output growth per capita has obviously and

temporarily changed after the mid-1990s, which could be determined by the increasing role of such economic factors as technological changes, capital accumulation and demographical fluctuations etc.

## 2. Data and methods

In growth accounting approaches, as a result of physical capital accumulation or technological changes, output apparently increases in the long run. Although, determining the factors of GDP growth we should emphasize that economic growth cannot be only explained by changes in capital and labour stock but Solow (1956) predicted that other determinants also expected to play an important role. First, let us choose a simple neoclassical (Cobb-Douglas) production function:

$$Y_t = A_t K_t^\alpha L_t^{1-\alpha} \quad (1)$$

Where [Y] is the GDP, [K] and [L] are physical and labour capital in the period of [t]. [A] denotes total factor productivity (TFP), which measures how other features impact on productivity without K and L (i.e. technology changes, institutional effects etc.). Thus, we assume a constant return to scale ( $\alpha=1/3$ ) in proportion of capital and human factor.

Following Máté (2010) we define LF as the labour force ([LF] equals with the sum of employed and unemployed people). In our model we also use the so-called economic activity or participation rate that is estimated with  $[p_t] = LF_t/N_t$ , where [N] is the active (15-64 years old) population. We also apply for the active to total population ratio  $[a_t] = N_t/P_t$ , where [P] is the total population of each country. Let us denote the unemployment ratio as  $[u_t]$ , where  $[u_t] = U_t/LF_t$ . Meanwhile, the number of unemployed persons can be calculated with  $[U_t] = u_t * LF_t$ . Thus, the labour capital (number of persons engaged) should be equal with the division of labour force and unemployed persons, so  $[L_t] = LF_t - U_t$ . Hence,  $[L_t] = LF_t - u_t * LF_t = LF_t * (1 - u_t)$ . These equations allow us to express labour as follows:  $[L_t] = p_t * a_t * P_t * (1 - u_t)$  and Equation (1) can be substituted into:

$$Y_t = A_t K_t^\alpha (p_t a_t P_t (1 - u_t))^{1-\alpha} \quad (2)$$

Divide each side of Equation (2) with  $P_t$  and get  $y_t$  as labour productivity.

$$y_t = A_t K_t^\alpha (p_t a_t (1 - u_t))^{1-\alpha} \quad (3)$$

Since the unemployment ratios are generally not very high in the examined OECD countries, we can assume that  $[\ln(1 - u_t)] \approx -u_t$ . and taking Equation (3) in logarithm leads to the following log-linear form:

$$\ln y_t = \ln A_t + \alpha \ln K_t + (1 - \alpha) \ln p_t + (1 - \alpha) \ln a_t - (1 - \alpha) u_t \quad (4)$$

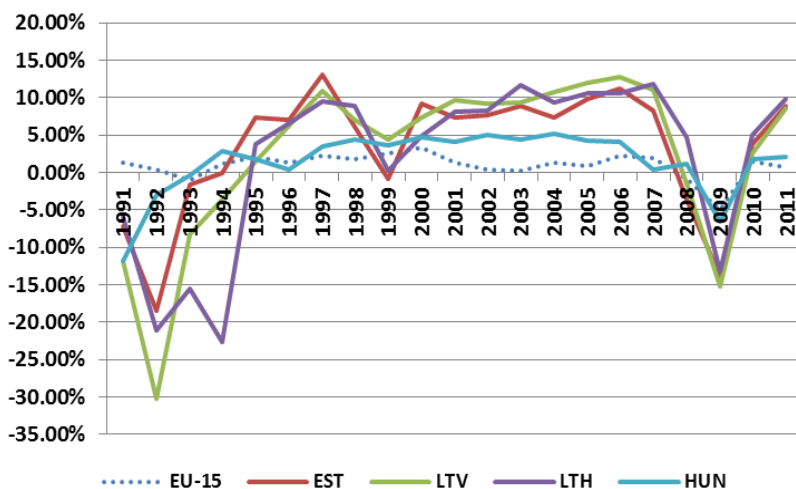
Differentiations of Equations (4), with respect to time, were expressed to the changes in logarithm of GDP per capita [ $g_y$ ], as a function of the productivity growth and their components ( $g_A$ ,  $g_k$ ,  $g_p$ ,  $g_a$  and  $g_u$ ).

$$g_y = g_A + \alpha g_k + (1 - \alpha) g_p + (1 - \alpha) g_a - (1 - \alpha) g_u \quad (5)$$

Using the available time series of Estonia from the European Commission's Annual Macroeconomic Database (AMECO, 2016) and the Groningen University's Penn world Table 8.1 (PWT, 2016) the results are reported in the next session. Labour productivity per person employed indicates how much value added is generated on average per person employed, which is calculated as real GDP at constant 2005 national prices (in million 2005 US\$) divided by the number of persons employed. Physical capital is proxied by gross capital stock at constant 2005 national prices (in million 2005 US\$). Demographic variables, such as total number of workers (thousand), total population and between 15 and 64 year olds and number of unemployed persons are also needed in our estimations.

### 3. Results of a growth accounting approach in Estonia

Our results are in accordance with the expectations. Productivity growth tendencies showed that after the transition periods the performance is decreased in Estonia, Latvia, Lithuania and Hungary and in 1999; 2008-2009 there were also negative output per capita changes thanks to the global economic recessions (Figure 1.). After 2010 a new expansion is started.



**Figure 1:** The productivity growth changes (%) in some post-communist OECD countries

Source: own calculations based on AMECO (2016) and PWT (2016)

Table 1: Results from growth accounting components, 1990-2011 in some post-communist OECD countries

<b>EU-15</b>	$g_y$	$g_A$	$g_k$	$g_p$	$g_a$	$g_u$
<b>1990-1995</b>	0.43%	-0.87%	1.05%	0.63%	-0.04%	-0.34%
<b>1995-2000</b>	1.99%	0.33%	0.85%	0.63%	-0.03%	0.21%
<b>2000-2005</b>	0.84%	-0.40%	0.81%	0.52%	-0.05%	-0.04%
<b>2005-2010</b>	-0.17%	-1.06%	0.76%	0.31%	-0.08%	-0.09%
<b>2010-</b>	1.05%	0.66%	0.46%	0.25%	-0.17%	-0.15%
<b>EST</b>	$g_y$	$g_A$	$g_k$	$g_p$	$g_a$	$g_u$
<b>1990-1995</b>	-6.85%	-6.67%	0.66%	-0.25%	-0.10%	-0.49%
<b>1995-2000</b>	6.56%	6.08%	0.97%	-0.26%	0.21%	-0.43%
<b>2000-2005</b>	8.23%	5.18%	2.18%	0.03%	0.14%	0.70%
<b>2005-2010</b>	2.36%	0.94%	2.38%	-0.16%	-0.09%	-0.71%
<b>2010-</b>	6.27%	4.62%	0.76%	0.12%	-0.27%	1.04%
<b>LTV</b>	$g_y$	$g_A$	$g_k$	$g_p$	$g_a$	$g_u$
<b>1990-1995</b>	-13.54%	-11.93%	-0.48%	1.05%	-0.32%	-1.86%
<b>1995-2000</b>	6.01%	5.63%	0.20%	0.05%	0.25%	-0.11%
<b>2000-2005</b>	10.19%	7.37%	1.38%	0.74%	0.21%	0.49%
<b>2005-2010</b>	3.81%	1.68%	1.78%	1.01%	-0.08%	-0.59%
<b>2010-</b>	5.57%	5.33%	0.34%	-0.11%	-0.30%	0.32%
<b>LTH</b>	$g_y$	$g_A$	$g_k$	$g_p$	$g_a$	$g_u$
<b>1990-1995</b>	-16.33%	-15.54%	0.84%	-0.78%	-0.20%	-0.64%
<b>1995-2000</b>	5.77%	7.53%	0.79%	-1.37%	0.01%	-1.18%
<b>2000-2005</b>	9.61%	7.80%	1.38%	-0.60%	0.18%	0.85%
<b>2005-2010</b>	4.93%	3.94%	1.85%	-0.69%	0.13%	-0.31%
<b>2010-</b>	7.41%	4.54%	0.83%	2.69%	-0.24%	-0.40%
<b>HUN</b>	$g_y$	$g_A$	$g_k$	$g_p$	$g_a$	$g_u$
<b>1990-1995</b>	-3.12%	0.50%	-4.14%	0.20%	0.34%	-0.02%
<b>1995-2000</b>	2.76%	0.84%	1.21%	0.28%	0.10%	0.33%
<b>2000-2005</b>	4.58%	1.07%	3.31%	0.20%	0.11%	-0.11%
<b>2005-2010</b>	0.70%	0.87%	0.40%	-0.11%	0.00%	-0.45%
<b>2010-</b>	1.91%	0.35%	1.80%	0.09%	-0.07%	-0.27%

Source: own calculations based on AMECO (2016) and PWT (2016)

According to Table (1), TFP played a key role in productivity growth alongside the technological shocks in all examined post-communist countries and the average 5-year-periods. Moreover the growth effects of physical capital

accumulation have still been steady and enormous at 0.6 and 2.4 per annum in Estonia. Meanwhile changes in the activity rates ( $g_a$ ) or equivalently that of the participation rates ( $g_p$ ) contributed to economic growth with a magnitude similar to unemployment ( $g_u$ ) ratios. Although, labour components are less appropriate than technological and capital stock changes in our estimations, we can claim that ageing with migration and the reducing activity contributed less productivity growth tendencies in Estonia, Latvia and EU-15 countries.

#### 4. Conclusions

According to the growth accounting results, the capital accumulation and activity rates played key role in economic growth beside the TFP in Estonia alongside the technological shocks. Nevertheless, some other determinants, such as unemployment is less influenced productivity growth.

Hence, further and more relevant researches should aim to reveal the main features and productivity growth tendencies. An additional research direction has also emerged in this study. We argue that the institutional economic perspective is relevant since it extends the achievements and existing frontiers of macroeconomic theories.

Although, these approaches stated that financial institutions originated assumptions of growth, but recently serious debates have taken place in an attempt for policy makers to explain and understand the role of institutions and their interactions as they might influence their productivity. However, no clear theoretical consensus has yet emerged and several unanswered problems remained our empirical findings could demonstrate the importance of productivity growth. Hence, further research in this approach could be more fruitful

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