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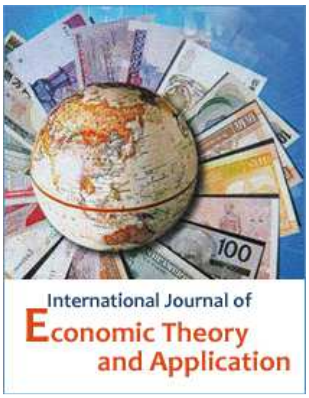

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Labour productivity trends analyses in Baltic countries to 2014

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Abstract
The objective of this article is to analyse the labour productivity, or and working efficiency of new European Union (EU) states, in Baltic countries (Estonia, Latvia, Lithuania), with emphasis on Estonia; and to compare them on the EU level. Labour market problems in Baltic countries have become more and more important. When the EU labour markets opened, some EU countries were forced to face the problem of partial workforce drain to richer countries with higher wages. In addition, on the one hand, Baltic countries have quite high unemployment rates, and on the other, many vacant jobs – there is a lack of qualified workforce. Low salaries, among other reasons, force many people to go to work in rich countries, where wages are several times higher. A number of proposals to increase labour productivity for both workers and entrepreneurs have been listed in the summary.

1. Introduction

For an introduction, let us look at the background of Baltic countries – Estonia, Latvia and Lithuania. The Baltic States are northern European countries east of the Baltic Sea. Baltic countries are located in Northern Europe and have a seaside; thanks to that they are able to interact with many European countries.

In 1940 the Soviet Union annexed the Baltic States. They were a half century of Soviet-bloc countries. This will help to understand better the economic backwardness of the Western European countries.

After the Baltic countries had restored independence (1991), integration with Western Europe was chosen as the main strategic goal. Today they are liberal democracies and their market economies in recent years have undergone rapid expansion in the early 2000s.

The Estonia's index of economic freedom is world ranked 11th in the 2014 and regional ranking 4th. Lithuania is 21th (11) and Latvia 42th (19). By comparison, the United States index of economic freedom is the 12th.

Before and after the economic depression, the Baltic States were successful. The Baltic countries had highest growth rates in GDP in Europe between 2000 and 2007, during periods of economic boom. Hence, these countries were called the Baltic Tigers. The term is modeled on four Asian Tigers.

The United Nations lists the Baltic States as countries with a "Very High" Human Development Index.

The Baltic States are members of the EU and the NATO since 2004. They were been the only former-Soviet countries to join either NATO or the EU at that time.

Total population of Baltic States are 6 406 155 (2011); area 175,116 km² or 67,523 sq mi; total GDP (PPP) (2013) $145.202 billion; GDP (PPP) per capita $22,666 (2013).

Free movement of workers within the EU is the basic document and it should be a favorable impact on the EU economy. But on the other hand mostly one-way intra-EU migration hinders development of these countries, where labour moves and created a fairly large social tensions. After the opening of the EU labour markets, some EU countries started facing the problem of partial work force drain to richer countries with higher wages. This problem is also in other new EU Member States. Baltic countries labour productivity, wages, and other economic indicators are lagging behind Western European operators. Why?

Working efficiency in the Baltic countries has been analysed. The situations before the crisis, during the crisis and after the crisis will be viewed.

The growth of the entire economy, measured using gross domestic product (GDP), will be viewed as background.

2. Methodology

The techniques and labour market survey definitions used by the authors have been specified in OECD [1] and Eurostat [2].

Labour productivity is defined as GDP per hour worked. The measures of labour productivity are presented as indices and as rates of change. [1]

Labour productivity per hour worked is calculated as real output (deflated GDP measured in chain-linked volumes, reference year 2005) per unit of labour input (measured by the total number of hours worked). Measuring labour productivity per hour worked provides a better picture of productivity developments in the economy than labour productivity per person employed, as it eliminates differences in the full time/part time composition of the workforce across countries and years. [3]

Formulas of productivity measures [4]

	Productivity measures by net sales	**Productivity measures by value added**
Productivity of labour (thousand euros)	$\frac{\textit{net sales + subsidies}}{\textit{number of persons employed}}$	$\frac{\textit{value added}}{\textit{number of persons employed}}$
Productivity per hour (euros)	$\frac{\textit{net sales + subsidies}}{\textit{number of hours worked by employees}}$	$\frac{\textit{value added}}{\textit{number of hours worked by employees}}$

Labour productivity per person employed (on the basis of value added) – indicates how much value added is generated on average per person employed (is calculated as value added divided by the number of persons employed). [4]

GDP is an indicator for a nation´s economic situation and a measure of the economic activity. It reflects the total value of all goods and services produced. Expressing GDP in PPS (purchasing power standards) eliminates differences in price levels between countries, and calculations on a per head basis allows for the comparison of economies significantly different in absolute size. [5]

Economic growth is defined as a production increase of an output of a production process. In order to calculate GDP growth rate in constant prices, GDP in current prices is converted to the prices of the previous year and changes in volume are determined based on the level of the reference year. The calculation of the annual *growth rate* of GDP volume is intended to allow comparisons of the dynamics of economic development both over time and between economies of different sizes. For measuring the growth rate of GDP in terms of volumes, the GDP at current prices are valued in the prices of the previous year and the thus computed volume changes are imposed on the level of a reference year. Price changes therefore do not affect the growth rate of GDP. Accordingly, price movements will not inflate the growth rate. [6]

GDP per capita in constant prices constant prices GDP is found and the ratio of the average population. Often used in constant prices GDP as an indicator of the wealth of nations, as it reflects the average real income in this country. However, the tool does not provide a complete overview of economic well-being. For example, GDP does not reflect much of the unpaid work in households, nor does it take into account negative effects of economic activities, such as damage to the environment. GDP per capita in constant prices is based on rounded figures. [7]

GDP per person employed is intended to give an overall impression of the productivity of national economies expressed in relation to the EU-27 average. The volume index of GDP per capita in PPS is expressed in relation to the EU-27 average set to equal 100. If the index of a country is higher than 100, this country's level of GDP per head is higher than the EU average and vice versa. Basic figures are expressed in PPS, i.e. a common currency that eliminates the differences in price levels between countries allowing meaningful volume comparisons of GDP between countries. The index, calculated from PPS figures and expressed with respect to EU27 = 100, is intended for cross-country comparisons rather than for temporal comparisons. [8]

The theoretical bases of labour productivity have been brought in more detail in the authors' earlier works [9 - 24] and in the works of other authors [25 - 27].

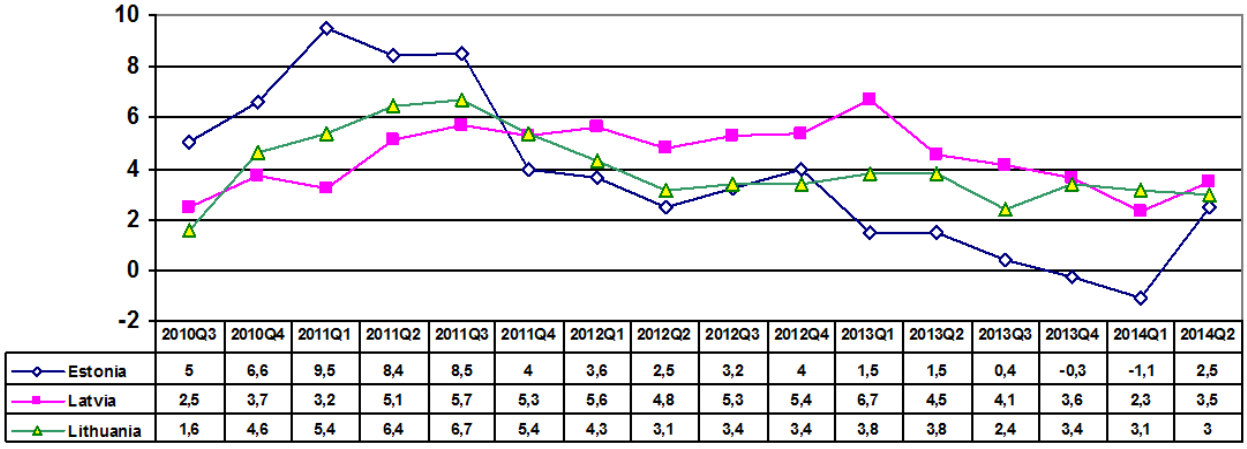
All *figures* are the authors' illustration.

3. Analyses of Gross Domestic Product

The growth of the entire economy, measured using gross domestic product (GDP), will be viewed as background.

The Baltic countries GDP fell strongly in 2009, but in subsequent years was the growth rate as before the economic crisis.

The trend line shows the cyclical development of the Estonian economy (GDP). In addition to the economic decline during the years 2008 – 2009, there was also a decline in 1999. If an annual real GDP increment of more than 10% can be considered excellent, then the result in 2009 (14.1%) was one of the largest in the world. The development of the Estonian economy before and after the crisis was one of the fastest in the EC. Yet, the crisis led to a very deep recession, which was one of the greatest in the world, as well as in the EC, and lasted for nine quarters. Thus, the country covered two extremes. On the other hand, it also shows that the reforms carried out in the past were successful and established a base that enabled exiting the crisis successfully. In particular, this meant creating favourable conditions for business. Again, GDP growth in 2011 and 2012 are highest in the EC. However, in 2013 only 0.8%.[6]



	2010Q3	2010Q4	2011Q1	2011Q2	2011Q3	2011Q4	2012Q1	2012Q2	2012Q3	2012Q4	2013Q1	2013Q2	2013Q3	2013Q4	2014Q1	2014Q2
Estonia	5	6,6	9,5	8,4	8,5	4	3,6	2,5	3,2	4	1,5	1,5	0,4	-0,3	-1,1	2,5
Latvia	2,5	3,7	3,2	5,1	5,7	5,3	5,6	4,8	5,3	5,4	6,7	4,5	4,1	3,6	2,3	3,5
Lithuania	1,6	4,6	5,4	6,4	6,7	5,4	4,3	3,1	3,4	3,4	3,8	3,8	2,4	3,4	3,1	3

Figure 1. *GDP percentage change compared with the same quarter of the previous year [6]*

Latvia and Lithuania's economy developed rapidly, but Estonia in 2013Q4 and 2014Q1 was step backwards (minus).

Table 1. *Gross domestic product at market prices. PPS per inhabitant [28]*

	2002	2007	2008	2009	2011	2013
Est	10200	17500	17200	14900	17400	18600
Lat	8400	14300	14600	12700	15000	17300
Lit	9100	15500	16100	13600	16900	19100

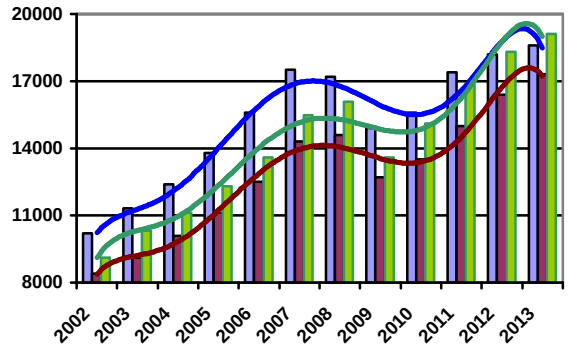


Figure 2. *GDP at market current prices. PPS per inhabitant [28]*

The 2007 level exceeded Lithuania and Latvia only in 2011 and Estonia in 2012.

The trend lines GDP at market prices (PPS) per inhabitant:

$$\text{Estonia } y = -0{,}7278x^6 + 26{,}445x^5 - 360{,}48x^4 + 2286{,}3x^3 - 6903{,}2x^2 + 10389x + 4785{,}6;$$

$$R^2 = 0{,}9682 \quad (1)$$

$$\text{Latvia } y = -0{,}6393x^6 + 23{,}604x^5 - 328{,}37x^4 + 2140x^3 - 6670x^2 + 10091x + 3129{,}5;$$

$$R^2 = 0{,}9799 \quad (2)$$

$$\text{Lithuania } y = -0{,}7258x^6 + 26{,}847x^5 - 376{,}26x^4 + 2495{,}7x^3 - 8058{,}5x^2 + 12781x + 2237{,}9;$$

$$R^2 = 0{,}9704 \quad (3)$$

GDP per capita (PPP) is an important indicator of a state's standard of living, which takes into account price level differences. The figure shows that the economy was the highest during the years 2007 - 2008. A larger or smaller recession took place in 2009, which is called the crisis year. In the following years economy grew. In 2011, the U.S., as well as the EU 27 as a whole, including Germany, Sweden, Latvia and Lithuania, reached a record level per capita. Finland and Estonia were short of the 2007 - 2008 level. [28]

$$\text{Est } y = 0{,}1016x^5 - 4{,}7524x^4 + 76{,}919x^3 - 512{,}06x^2 + 1694{,}7x + 2636{,}5;\ R^2 = 0{,}9603 \quad (3)$$

$$\text{Lat } y = 0{,}1224x^5 - 5{,}6236x^4 + 90{,}097x^3 - 590{,}44x^2 + 1715{,}6x + 1345;\ R^2 = 0{,}9549 \quad (4)$$

$$\text{Lit } y = 0{,}0034x^6 - 0{,}1272x^5 + 0{,}8085x^4 + 16{,}069x^3 - 201{,}26x^2 + 869{,}14x + 2456{,}9;\ R^2 = 0{,}9736 \quad (5)$$

Between 1995 and 2007, GDP per capita in constant prices in Estonia increased by 2.48 times, by 2.31 times in Lithuania and 2.67 in Latvia. The economic crisis significantly brought down the levels and in 2011, Lithuania

was the only country that managed to exceed pre-crisis levels, in fact, Estonia and Latvia were also short of the level of the year 2006.

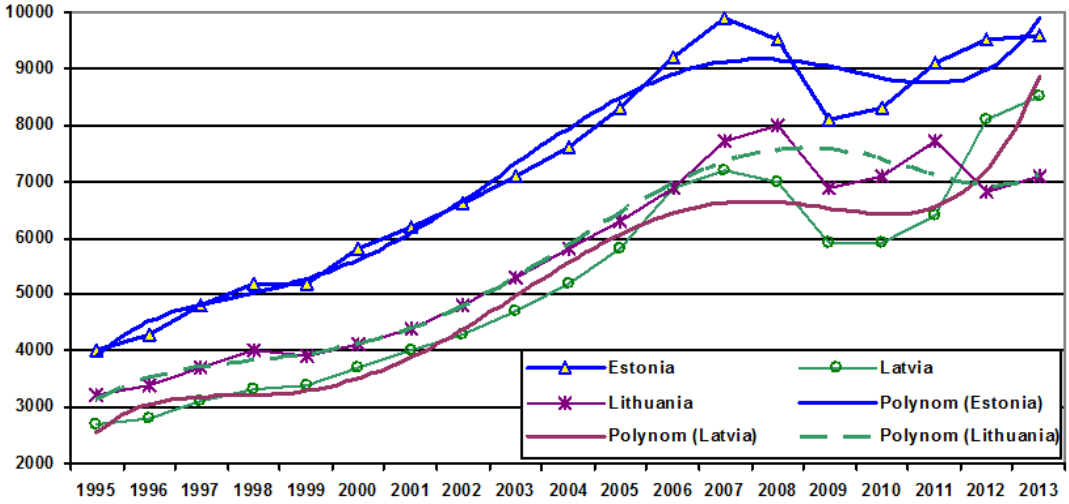


Figure 3. *Real GDP per capita, euro per inhabitant, 1995 – 2013 [7]*

4. Analyses of Labour Productivity

Table 2. *Labour productivity per person employed, index EU27 = 100 [29]*

	2002	2008	2009	2010	2011	2013
Est	51.2	65.6	65.9	68.8	69.7	69.3
Lat	42.8	55.0	57.2	60.7	63.7	66.9
Lit	48.5	61.9	57.9	68.1	72.2	74.6

Luxembourg has highest productivity within the EU and also globally and Norway has the highest productivity outside the EU. In 2013 was 10 EU member higher productivity > EU=100: Luxembourg = 163.9; Ireland = 135.5; Belgium = 127.3… EFTA countries Norway = 156.7 and U. S. (2010) = 146.2. [29]

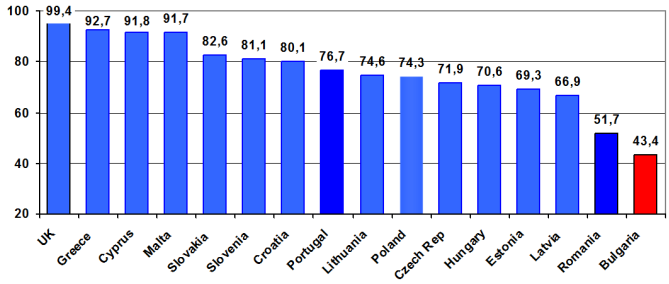


Figure 3. *States with lower productivity < EU=100, 2013 [29]*

Post-socialist countries have lower productivity; however the levels of Malta and Cyprus are somewhat higher. The EU-15 state Portugal has somewhat higher productivity than Estonia. EU post-socialist states Slovenia, Slovakia, Hungary and the Czech Republic have even higher productivity. Of the EU candidate states, Estonia is exceeded by Croatia, while Turkey remains at the same level.

In Estonia yield per worker, i.e. productivity grew 2.0 times during the period under examination; however, it came to a pause during the economic crisis.

In contrast, in 2013 in Latvia, yield per one worker was 66.9% and 74.6% in Lithuania, similar to the EU average. The indicator was highest among EU member states in Luxembourg (163.9), Ireland (135.5) and Belgium (127.3) and lowest in Bulgaria (43.4) and Romania (51.7). Productivity was 1.5 times higher than the EU average in Norway (156.7) and the USA (146.2).

However, the prevailing trend is that regardless of growth in productivity elsewhere, the indicator rises noticeably quicker in Estonia and also other new EU accessions, than in veteran and wealthy EU-15 countries.

When analysing productivity in EU-27 (added value produced by one worker) by sectors of the economy and the size of companies, one cannot draw an equipollent (equal in force or effect) conclusion regarding productivity and the number of workers engaged in the company. It is conditioned by the particular sector of the economy. For instance, productivity among energy and water management companies is highest in small firms with up to 9 persons on payroll. On the other hand, for companies active in the lease of movable property, accommodation (housing) companies, and among all the sectors of the economy taken together as an entity, productivity is highest in big firms that employ 250 or more workers. Highest productivity among textile and habiliment (articles of clothing) firms can be noted in companies with 10 - 49 workers; the same can be said for timber companies with 50 – 249 workers [30].

A more detailed analysis of the productivity indicators of Estonian companies and the labour expenses in current prices, i.e. the predominant share constituted by salaries, is brought below. In Estonia, productivity differs little for companies in the size of up to 249 workers. In 2003 and 2007 firms with 50 –99 workers boasted the largest productivity; in 2005 it was companies with up to 9 workers and for the rest of the surveyed period, companies with 100 – 249 workers dominated. Invariably, large companies with smaller productivity had 250 and more workers. This can be accounted for by the fact that smaller companies have larger

flexibility in management, a smaller number of ancillary personnel and also because the workers of small companies are more likely to be "jacks of all trades" than in big companies. In big firms productivity is sapped, as a general rule, by large overheads. Estonian labour productivity growth in 2010 was 4.6% and -1.7% in 2011. [31]

Table 3. *Labour productivity. Euro per hour worked. [3]*

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Estonia	7.0	7.4	7.7	8.2	8.7	9.2	9.7	10.3	10.0	10.3	10.8	10.8	11.2	11.2
Latvia	4.2	4.5	4.7	5.0	5.5	5.9	6.3	7.9	7.3	7.2	7.6	7.9	8.2	8.4
Lithuania	5.6	6.2	6.5	7.1	7.5	7.7	8.2	8.7	8.8	8.3	9.4	10.1	10.3	10.6

In Norway, the indicator for euro per hour worked has grown from 49.3 thousand to 69.6 thousand during the years 1990 – 2011, in Sweden from 29.8 to 45.5, in Finland from 25.7 to 39.7, in Denmark from 37.4 to 53.4, in France from 33.4 to 45.6, in Germany from 31.2 to 42.8; and during the period from 2000 – 2013 in the EU (27 countries) from 27.8 to 32.1 thousand. Norway (69.6 thousand) and Luxembourg (58.2 thousand) have highest productivity per hour worked in Europe and also globally. [3]

Table 4. *Labour productivity per hour worked, index EU27 = 100 [32]*

	2002	2008	2009	2010	2013
Estonia	43.4	55.6	59.2	60.4	60.8
Latvia	33.4	45.8	48.2	51.7	56.9
Lithuania	45.3	54.1	51.1	59.6	66.4

Table 5. *Labour productivity per hour worked, euro, index 2005=100, % change over previous year [3]*

	2006	2009	2010	2013
EU (28)	102.1	101.6	104	106.3
Germany	103.6	102.7	104.5	107.2
France	102.9	101.3	102.5	104.5
UK	102.2	101.2	102.3	100.8
Italy	100.4	97.9	100.2	99.6
Bulgaria	103.4	106.9	111.7	121.6
Czech Rep	106.7	110.1	111.9	112.7
Estonia	105.0	111.6	117.2	121.6
Latvia	106.8	122	130.2	143.1
Lithuania	106.7	107.5	122.6	137.5
Hungary	103.6	102.1	102.7	107
Poland	102.9	109.2	116.8	126.6
Romania	106.2	115.2	114.6	120.5
Slovenia	106.1	110.2	113.3	117.4
Slovakia	105.8	113.4	118.5	126.7

Compared to 2005, labour productivity per hour in all 10 of the new post-socialist EU countries has increased at a more rapid pace than the EU 27 average. Ireland had the greatest increase of the old EU member states (117.3) and Latvia among the new members (133.6). Hungary had the smallest growth (104.6) among new members, which was even lower than the EU 27 average. The level of Estonia among the new member states was average.

Table 6. *Labour productivity per hour worked. % change over previous year [3]*

	2001	2008	2009	2010	2011	2012	2013
Est	5.9	-2.8	2.5	5	0.1	3.5	0.1
Lat	6.5	-8	-1.5	6.7	2.9	4.7	2.1
Lit	11.8	1.9	-6.5	14	7	1.9	2.9

Labour productivity grew for all countries until 2008. In 2008 some countries, including Estonia (-2.8), experienced a decline. In 2009, all countries, except Estonia and Poland were experiencing a decline. In 2011 hourly labour productivity only decreased in Estonia compared to the previous year.

Table 7. *Labour productivity per person employed on the basis of value added of Estonia (QII), thousand euros [33]*

	Total	Man	Con	Transp	Trade
2002	2.5	2.4	2.1	3.3	2.4
2003	2.6	2.6	2.4	3.4	2.4
2004	2.8	2.7	2.8	3.5	2.8
2005	3.3	3.2	3.8	3.3	3.4
2006	3.9	3.5	4.9	3.3	4.2
2007	4.7	4.4	6.1	4.3	5.0
2008	4.6	4.6	5.1	4.4	4.8
2009	3.7	3.4	3.5	3.9	3.5
2010	4.1	4.6	2.9	3.7	3.9
2011	5.0	6.0	3.9	5.7	4.8
2012	5.4	5.9	5.1	6.0	5.3

Man - Manufacturing
Con - Construction
Transp - Transportation and storage
Trade - Wholesale and retail trade

From the second half of 2006, productivity per employed person in reference to sales revenues was over 20 thousand euros. A dramatic decline occurred in QI of 2009, which was followed by a slow growth, whereas QIII and QIV of 2010 were record-breakers. Admittedly, Estonia has made its exit from the economic crisis mainly along the intensive road, i.e. on account of productivity growth.

Productivity per employed person in reference to added net value has changed due to other regularities. As late as in QIV of 2010, Estonia reached the level of the three successful pre-crisis quarters of 2007. Whereas in QIV of 2010, the level was already 1.5 times higher than productivity in the deepest slump of the crisis in QI of 2009.

After the crisis, productivity recovered quicker in reference to sales revenue than in reference to added value, which is an indicator of the runaway selling prices after the crisis.

While the above analysis by quarters supports the assumption that during the period of the economic crisis changes take place extremely rapidly, as a consequence, an analysis with one year precision will not provide a correct picture of upcoming changes.

Table 8. *Productivity per employed person for Estonian companies, thousand euros, 2005 – 2012 [33]*

	2005	2008	2009	2010	2012
Turnover	72.1	93.6	81.2	95.4	117.1
Value added	14.7	18.7	17.4	19.6	23.5

Sales revenue per employed person was 44.3 thousand euros in the first quarter of 2010, which is more than in the previous year but still falls short of the average of 2007 and 2008.

The productivity of the business sector in reference to added net value increased by 18% in 2010, while the companies' average labour expenses per employed persons remained at the level of 2009.

Based on sales revenue, labour productivity per employed person grew steadily for all companies until 2008, as did hourly productivity based on sales revenue, then a great decline of 13.2% and 10.0% respectively followed, which, on the other hand, is much smaller than the decline of total business output or real GDP. However, already in 2010, both indicators reached record levels.

A similar comment also holds for labour productivity and hourly productivity based on added value of Estonia. Still, in 2010 labour productivity per employed person based on sales revenue in smaller firms remained below the labour productivity of the pre-crisis years. However, growth was strong in large companies with 250 or more employees, where it grew to 103,500 euros (in comparison, the same indicator was only 64,600 euros in 2005). This also led to the sum of all companies achieving the greatest labour productivity in 2010.

Hourly productivity based on sales revenue in 2010 still remained low for companies with up to 20 employees, while larger companies already reached record levels. Again, large companies with 250 and more workers experienced a particularly large increase, where it grew to 61,150 euros (in comparison, the same indicator was 37,350 euros for such companies in 2005), amounting to an annual growth of 18.1%.

As a whole, labour productivity and hourly productivity based on added value reached record levels for all companies in 2010. SME still remained below the 2007 level and for companies with 10 to 19 employees, below the 2008 level. On the other hand, companies with more than 20 employees already reached record levels in 2010.

Table 9. *Hour productivity on the basis of value added of Estonia (QII), euros, 2002 - 2014 [33]*

	Total	*Man*	*Con*	*Transp*	Trade
2002	5,69	5,56	4,79	7,35	5,43
2003	6,14	6,01	5,50	7,67	5,62
2004	6,52	6,20	6,46	7,16	6,46
2005	7,61	7,16	8,56	7,35	7,73
2006	9,08	7,99	11,12	7,35	9,71
2007	10,99	10,03	13,80	9,65	11,63
2008	10,93	10,35	11,95	9,91	10,99
2009	9,03	8,04	8,29	9,12	8,35
2010	9,81	10,44	6,86	8,54	9,25
2011	11,97	13,52	9,05	12,88	11,33
2012	12,76	13,14	11,51	13,62	12,45
2013	13,13	12,67	12,46	14,36	13,47
2014	13,28	13,62	11,47	16,14	12,73

Man - Manufacturing
Con - Construction
Transp - Transportation and storage
Trade - Wholesale and retail trade

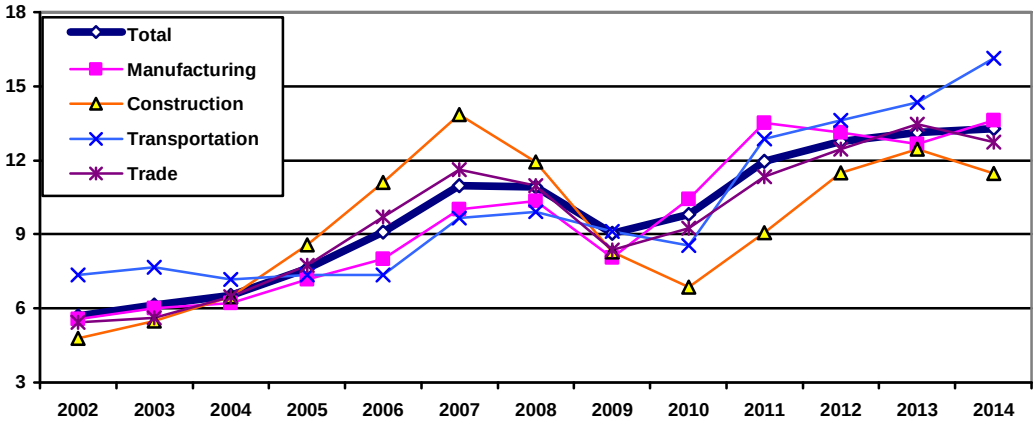


Figure 4. *Hourly productivity based on added value of Estonia (QII), 2002-2014, euros [33]*

During the years 2002 – 2004, hourly productivity based on net added value in transportation was better than the Estonian average. The construction boom began and in 2008 raised hourly productivity in construction to a higher level than the state's average; the difference was especially great in 2007. The following crisis, on the other hand brought the productivity of builders sharply below the average. Although the builders' productivity grew significantly in 2011 and 2012, it remained lower than in other economic sectors.

While productivity in the processing industry remained

lower than the average both before and during the crisis, it was the highest in 2010 and 2011. In 2012 however, productivity in transport slightly exceeded industry. Both one and the other were better by specific quarters in recent years, thus they were equal.

Productivity in the retail and wholesale trade during the years 2005 – 2008 was higher than the average and lower after the crisis.

As a rule, there were no significant differences in the productivity of different sectors of the economy before or after the crisis, excl. construction.

Taking into account this publication and the previous work of the authors [9 - 24] have made the following conclusions and suggestions.

4. Conclusions and Suggestions

4.1. Conclusions

1. Companies came out of the economic crisis by a surge of hiring professionals, engineers and customer service staff.

2. Companies were brought out of the economic crisis by the growth of labour productivity.

3. The importance of large companies, especially those with 250 and more employees, was decisive.

4.2. To increase Labour Productivity the Following Should be Taken into Account

1. By the employee.

1.1 Objective factors (different innate abilities, talents, working and living conditions),

1.2 Subjective factors (self-realization, motivation, commitment, a desire to work better, ambition, education, qualification, a variety of mental and physical abilities, laziness, negligence, drunks, the courage to set high goals and the desire to strive for them).

2. By the employer (the company).

2.1 Objective factors [better organization of work, using more efficient machinery and equipment, innovation, improving working conditions (lighting, noise, humidity, temperature, air composition, etc.), natural conditions, material possibilities],

2.2 Subjective factors [moral (cheering, encouragement, etc.) and material incentives (salary, bonuses, bonus payments, etc.), creating conditions for up-skilling and re-training, the work environment (working collective, i.e. co-workers, etc.), not overly demanding, behaviour with the staff (guaranteeing human integrity, name-calling, etc.), taking internal tensions to the minimum, a desire to develop the company and increase its fame, the educational level and experiences (information capital) of the management leadership, the ambition of the company's management].

3. Several of the factors for raising mental and physical work productivity are different. Typically, an increase in the company's productivity depends more on the employees that do mental work (engineers, economists, etc.). It is important to establish an optimal relationship between the groups. The excellent drawings for a machine designed by an engineer will still usually be finished in metal by workers.

4. Each company, sector of the economy and region has its peculiarities, and taking these into account would increase labour efficiency.

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