PRODUCTIVITY DYNAMICS IN LITHUANIAN MANUFACTURING INDUSTRY

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Abstract

This paper analyses the existing measures of productivity in Lithuanian manufacturing industry. Total factor productivity and its continuous growth are viewed as significant parameter that determine the competitive advantage in manufacturing and depend on changes of significant factors as R&D intensity, international trade and foreign direct investment. Productivity measures indicate the interaction between produced commodities or services and used capital and labour resources. The most common measure is labour productivity, measures the value added per employee and equates the turnover with the costs of commodity. The empirical study provides an analysis of the shifting the labour productivity differentials in manufacturing industries of Lithuania. The paper aims to evaluate the dynamics of productivity of manufacturing industries in the context of economic integration. Economic policies under export growth strategy have been widely argued that export increasing helps to enhance the productivity of exporters.

Keywords: total factor productivity, labour productivity, manufacturing industry.
JEL Classification: D20, D24, L60.

Introduction

The research problem. The manufacturing sector has an important impact on economic development in every country, contributing significantly to output, employment and exports. The development of manufacturing industry depends on national and international markets demand and abilities to meet market requirement, this requires constant investment and researches for improving factors of competitiveness. Therefore productivity can be used as one of the indicators, assessing the competitiveness of the manufacturing industry. The study assesses the changes of the productivity of Lithuanian manufacturing sector and reveals the main indices in 2007-2010 in order to present how the economic integration influenced this important indicator.

In recent years researches were focused their studies on the links between international trade and economic growth, so the attention to the problem of long run output and productivity dynamic enhanced. Ben-David (1993) have provided empirical evidence that trade and growth are positively related. The interaction between international trade and productivity was analysed by Bernard, Jensen (2004), Sharma, Mishra (2009), Falvey *et al.* (2004), Wagner (2007). Pessoa (2007) presented arguments and empirical findings on effects of FDI on host country firm's productivity. Rhee, Cho, Woo (2011) submitted issues of life cycle labour productivity function. The relationship between TDI and productivity also analysed Dunning (1999), Ferrett (2004), Vahter (2004). The issues related to productivity as factor of competitiveness of different economic activities of Lithuanian in the scientific literature were analysed by Snieska, Bruneckiene (2009), Saboniene (2010), Zilinske (2010), Laskiene, Pekarskiene (2011).

Object of the scientific research – productivity of manufacturing industry.

The main aim of the research is to analyse and compare the productivity dynamics in Lithuanian manufacturing industries.

Methods of the scientific research that have been employed in the paper are scientific analysis and summarizing of literature, comparative analysis of statistic indices.

Theoretical aspects of productivity

Productivity parameter often serves as the equivalent for competitiveness and may be applied both the national and industrial levels as well as for individual firms. Porter (1990) claims that "productivity is the only relevant measure of competitiveness". According to Wysokinska (2004), "higher productivity reflects the improved competitiveness". However, Buckley *et al*. (1988) thinks that competitiveness is more complex category and productivity is one of element, because competitiveness includes both efficiency and effectiveness.

Productivity measures describe the relationship between produced commodities or services and used resources. Tangen (2003) analysed partial and total productivity measures. Partial productivity measures

output levels in relation to one source of input, for example labour, capital, time or energy, total productivity measures take into account output levels in relation to the total sum of different input resources. The most common partial measure is labour productivity, it often measures as output per hour or per employee. This relative measure of productivity usually means the value added per employee and equates the turnover less the costs of product. Important partial productivity parameter is capital investment. Investments in capital may be omitted if labour productivity is used as the single parameter. The measurement of industrial productivity is problematic in the case of out of data of total factor productivity, usually databases present the rates and trends only of labour productivity. Wagner (2007) noted that "more appropriate measures of productivity like value added per employee or total factor productivity cannot be computed because of a lack of information on hours worked, value added and capital stock".

There is common theoretical opinion that exports improve the productivity growth of involved individual companies and enhance overall economic growth of state. The relationship between productivity and exports has important implications for current areas of research and policy in nowadays. Bernard, Jensen (2004) focused their analysis by asking "whether there are productivity effects at a more aggregate level as a result of the reallocation of resources across plants and industries". They concluded that "the positive correlation between exporting and productivity levels appears to come from fact, that high productivity companies are more likely to enter international markets, so the employment and output growth rates are much higher at exporters". Grossman, Helpman (1991) claimed that "export plays a vital role by improving productivity though innovation". The results of recent studies of Wagner (2007) showed that exporters are more productive than non-exporters. According to Parente, Prescott (1994), technology transfer is important factor for productivity dynamics. Productivity growth can occur as a result of many factors such as capital accumulation, the adaption of new technologies, research and development (R&D), changes in the organization of companies and through export participation (Sharma, Mishra, 2009). Falvey *et al.* (2004) studied the linkages between exports, restructuring and industry productivity changes in Sweden and showed that exporting has sizeable impact on industry productivity growth which is independent of the interactions between exporting and companies productivity.

The empirical literature provides the occurrence of positive and negative effects of inward FDI to host country economic growth and to productivity also. Pessoa (2007) identified three main channels through which inward FDI is thought to improve the productivity of a host-country: a) direct improvement in efficiency through the redirection of local resources towards more productive uses, including within purchased companies; b) increase in domestic market competition; and c) indirect impact via spillovers and other externalities associated with interactions between the foreign affiliate and the host country economy. All the three channels can contribute to reduce the substantial gaps existing between countries. Ferrett (2004) noted that "the notion that the FDI decision can be analysed as exogenous to spillover possibilities, has been questioned by models showing that a technological leader's incentive to produce abroad weakens as spillovers become more likely".

Vahter (2004) studied the effects of foreign direct investment on labour productivity in manufacturing industries of transition countries (Estonia and Slovenia) and researches showed that in Estonia the export oriented foreign investment companies had on average much lower labour productivity level than on the domestic market oriented foreign affiliates. In Slovenia, on the contrary, the export orientation of a foreign affiliate did not correlate with lower labour productivity. The different types of foreign direct investment can have different effects on the host country and that the existence of positive spillovers may depend on the level of economic development of the host country.

The dynamics of labour productivity in Lithuanian manufacturing industry

Labour productivity is partial measure of productivity and is measured as total sales in constant prices per employee. Eurostat presents data of labour productivity on the basis of GDP per person employed, these data are presented in Table 1 in order to give an overall impression of the productivity of national economies expressed in relation to the European Union (EU-27) average. The gap between Baltic state's labour productivity and EU-27 average is notable, but it is important to advert that during 2000-2010 this gap decreased by 20.1 percentage points in Lithuania, by 14.9 percentage points in Latvia and by 22.1 percentage points in Estonia. Labour productivity per person employed in Lithuania (63.3 in 2010) is higher than in Latvia (55 in 2010), but less than in Estonia (69.3 in 2010). The labour productivity indices in Baltic States are higher only in comparison with Turkey, Romania and Bulgaria, so the gap between transition countries and other EU countries is evident.

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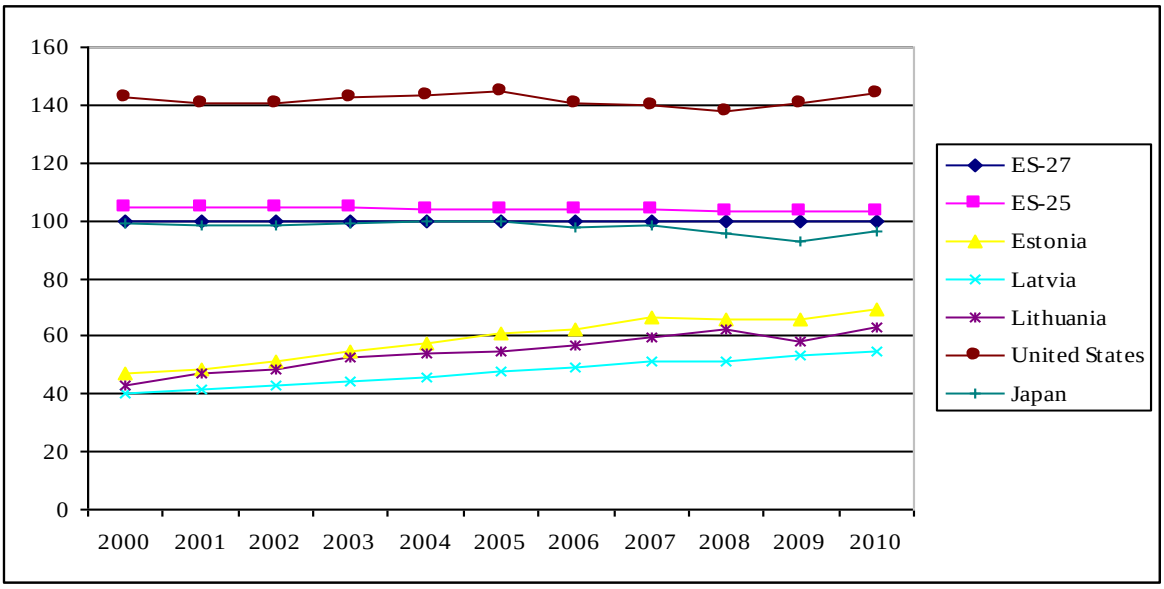

Figure 1. Labour productivity per person employed of national economies (EU 27 – 100)
Source: http://epp.eurostat.ec.europa.eu/

In order to explain the gap of labour productivity between EU countries it is important to analyse not only the amount of workers, but differences in current prices of commodities and services. Relative price level in Lithuania compared to the price level with the EU (EU 27 – 100) in 2010 amounted to 63.5. Nevertheless, these differences are typical for countries with economies in transition.

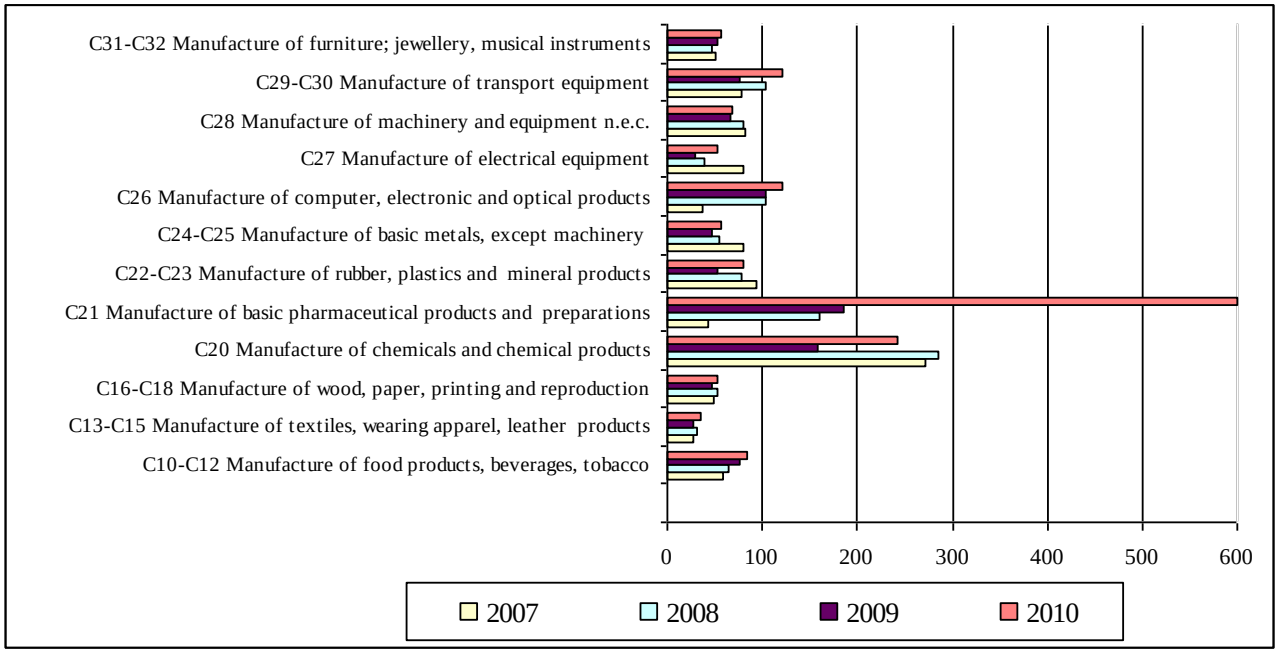

Figure 2. Labour productivity per person employed in Lithuanian manufacturing industries, LTL thousand

The analysis of labour productivity indices (Figure 2) and detail study their dynamics in different manufacturing industries revealed that this measure depends on the level of technology. The labour productivity indices in high-technology and medium-high-technology manufacturing industries are relatively higher in comparison with industries defined as medium-low-technology and low-technology.

Nevertheless, the study of changes of Lithuanian manufacturing industry structure in accordance with the level of technological developments showed that largest part of manufacturing consist of industries with low-technology susceptibility, gradually grew medium-low-technology industries, but the parts of high-

technology and medium-high-technology industries declined in general industrial structure during 2000 – 2010 (Table 1).

Table 1. Lithuanian manufacturing industry structure in accordance with the level of technology, percent

	2000	2010
High-technology products	4.4	1.7
Medium-high-technology products	7.9	6.4
Medium-low-technology products	15.6	20.0
Low-technology products	72.1	71.9

Source: calculated by the author according to the OECD science-intensive industries classification

The traditional industrial branches with low-technological susceptibility prevail in Lithuania, where almost 72 percent of all manufacture production is made in 2010; in the sectors medium-low-technologies – 20 percent, medium-high – 6.4 percent and industries of high-technologies constitute only 1.7 percent of total manufacture production in 2010.

The labour productivity indices are largest in *Manufacture of chemicals and chemical products* and during 2005-2010 average of labour productivity consists of 242 LTL thousand per employee per year. It is important to notice, that the level of productivity decreased in 2010 until 241.1 LTL thousand per employee while it was 284.8 in 2008. The part of this industry in total manufacturing production increased twice from 5 percent in 2003 to 10.9 percent in 2010.

Strong growth of labour productivity is achieved in *Manufacture of computer, electronic and optical products* (from 48.8 LTL thousand per employee in 2005 to 121.6 in 2010). This manufacturing is very important in terms of significance of high-tech, so it part accounts only 1.7 percent in 2010. Also labour productivity is rising in *Manufacture of basic pharmaceutical products and preparations* (from 61.8 LTL thousand per employee in 2005 to 599.3 in 2010, it part in total manufacturing production isn't significant – only 0.5 percent) and in *Manufacture of transport equipment* (from 67.2 LTL thousand per employee in 2005 to 121.7 in 2010, it part in structure of manufacturing is 1.7 percent).

Manufacture of textiles, wearing apparel, leather products is the industry with lowest labour productivity. The part of this traditional industry decreased from 15.8 percent in 2001 to 4.8 in 2010. Although the indices of productivity consistently increased each year (from 24.9 LTL thousand per employee in 2005 to 34.7 in 2010), the level of productivity remained low.

Manufacture of wood, paper, printing and reproduction and *Manufacture of furniture* also are industries with low technology susceptibility, but these industries remained considerable parts in structure of Lithuanian manufacturing industry (accordingly 7 and 4.5 percent in 2010).The labour productivity indicators are also among the lower ones (accordingly 52.6 and 57.2 LTL thousand per employee in 2010).

Manufacture of food products, beverages, tobacco has a sufficiently high level of labour productivity, it accounts 85 LTL thousand per employee in 2010, the part of this manufacturing in industry structure is actually high – 20.9 percent.

Insufficient labour productivity level was formed in *Manufacture of electrical equipment* – only 53.5 LTL thousand per employee in 2010. This manufacturing according level of technology is medium-high, but it's part in Lithuanian manufacturing industry consists 1.1 percent. *Manufacture of basic metals and fabricated metal products, except machinery and equipment* has greater part of industry structure – 2.8 percent, it labour productivity decreased from 79.3 in 2007 to 57 LTL thousand per employee in 2010. *Manufacture of rubber, plastics and mineral products* has relatively high labour productivity indices: 80.3 LTL thousand per employee in 2010, but it is notable, that in 2007 it consist 94.4 LTL thousand per employee.

The moving into high-value added export industries, in which knowledge as well as technology intensive industries play a central role, is high issue and depends on its emphasis on research and development, technology capabilities and the pace of technology transfer. The above sources of competitiveness at the micro and macro levels will also play an important role in attracting foreign direct investment in to manufacturing to support industrial restructuring.

According to Blomstrom, Kokko (1998) productivity spillovers can occur as a consequence of movements of highly skilled staff from multinational corporations to domestic firms, can stimulate learn superior production technologies from the former, and as 'competition effect' if competition from

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multinational corporations force domestic rivals to update production techniques and other technologies in order to become more productive. However, Romer (1993), Vahter (2004) noted, that FDI has positive effects on countries with low productivity indices. Laskiene, Pekarskiene (2011) analysed impact of FDI on a labour productivity in different activities of Lithuanian economy on basis of correlation analysis and revealed that interaction between FDI and labour productivity in manufacturing is sufficiently strong.

Figure 3 presents the 2008-2010 average values of labour productivity per employee and foreign direct investment to Lithuanian manufacturing industries. It is interesting to remark that during 2008-2010 average 45.5 percent total FDI was directed into *Manufacture of chemicals and chemical products.* Traditional industries also attracted higher parts of total investments in comparing with others manufacturing: *Manufacture of food products, beverages, tobacco* attracted average 17.5 percent, *Manufacture of furniture* – average 9.4 percent and *Manufacture of wood, paper, printing and reproduction* – average 7.2 percent, *Manufacture of textiles, wearing apparel, leather products*- average 4.6 percent.

Other manufacturing industries received much less FDI, nevertheless, their parts in industry structure are relative small: *Manufacture of basic metals and fabricated metal products, except machinery and equipment* – 1.7, *Manufacture of computer, electronic and optical products* – 0.9, *Manufacture of transport equipment*- 3.5, *Manufacture of basic pharmaceutical products and preparation* – 4.7, *Manufacture of rubber, plastics and mineral products*- 3.6 percent of total FDI during 2008-2010.

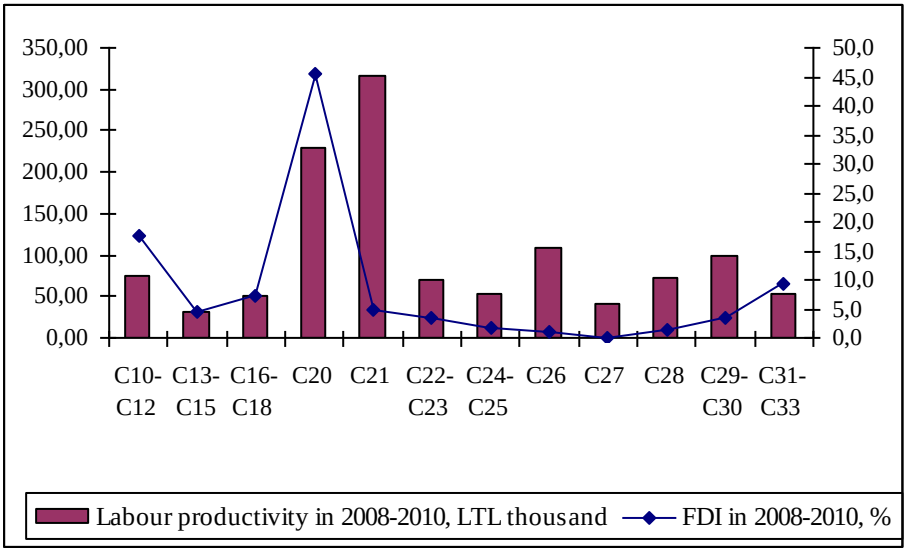

Figure 3. Labour productivity per person employed and FDI in Lithuanian manufacturing in 2008-2010

Industrial transformation, structural changes and results of manufacturing as higher production amounts, productivity, exports growth, wage level, also rely on the ability of the manufacturing companies to exploit their competitive advantages by adjusting to global market conditions. Here, it is important to emphasize that international competitiveness at the micro level depends upon companies' ability to exploit their competitive advantages under a given set of macro environments. Industrial restructuring would require allocate resources to the segments of manufacturing with greater export potential, an industrial reorientation implies a shift towards knowledge and technology intensive activities. However, would require vigorous efforts to develop and upgrade workforce capabilities through education, retraining, and skill acquisition programs.

Conclusions

Achievements of activities in industry influence an overall level and the growth of economics and welfare of a country. The Lithuanian economy has experienced remarkable period of economic transformation since 1991, so Lithuanian manufacturing industry structure was formed as a result of economic transformation in conditions of global market competition and economic integration to the European Union. Nevertheless, the results of manufacturing are not at the level of EU, this rating may be applied to measures of productivity also.

The gap between Lithuania labour productivity and EU-27 average is notable, this difference was 26.7 percent (EU 27 – 100, Lithuania – 63.3) in 2010, but it is important to advert that during 2000-2010 this gap decreased by 20.1 percentage points. In order to explain the gap of labour productivity between EU countries it is important to analyse not only the amount of workers, but differences in current prices of commodities and services. Relative price level in Lithuania compared to the price level with the EU (EU 27 – 100) in 2010 amounted to 63.5. These differences are typical for countries with economies in transition.

The analysis of labour productivity indices revealed that this measure depends on the level of technology. The labour productivity indices are relatively higher in high-technology and medium-high-technology manufacturing industries in comparison with industries defined as medium-low-technology and low-technology. The average indices of labour productivity during 2008-2010 are largest in *Manufacture of computer, electronic and optical products, Manufacture of chemicals and chemical products, Manufacture of basic pharmaceutical products and preparations* and *Manufacture of transport equipment.* The lowest rate of labour productivity reached *Manufacture of textiles, wearing apparel, leather products* and *Manufacture of wood, paper, printing and reproduction.*

The different types of foreign direct investment can have different effects on the host country and that the existence of positive spillovers may depend on the level of economic development of the host country. According to Romer (1993), Vahter (2004) studies, FDI has positive effects on countries with low productivity indices. During 2008-2010 largest amount of FDI was directed into *Manufacture of chemicals and chemical products.* Traditional industries – *Manufacture of food products, beverages, tobacco, Manufacture of furniture, Manufacture of wood, paper, printing and reproduction, Manufacture of textiles, wearing apparel, leather products* – also attracted higher parts of total investments in comparing with others manufacturing.

The observed manufacturing productivity indices and their changes represent the sufficiently problematic development of Lithuanian manufacturing industry as transition country and therefore would require increase labour productivity, investment in order to sustain and to enhance exports and competitiveness of manufacturing sector.

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