LABOR PRODUCTIVITY RESEARCH FOR LATVIAN PRODUCTION BRANCH EXPORT COMPANIES

Vladimir Shatrevich[1], Janis Zvanitajs[2]

[1]*Riga Technical University, Latvia, vladimirs.satrevics@rtu.lv*
[2]*Riga Technical University, Latvia, janis.zvanitajs@rtu.lv*

Abstract

This paper analyses exporting companies` labor productivity. We analyze empirical studies about difference from export and non-export companies in term of productivity. This paper uses the generalized propensity score methodology and empirical methods. In this paper, we apply the newly developed generalized propensity score methodology that allows for continuous treatment, that is, different levels of the companies' export activities. The main aim of this paper is using the generalized propensity score method and panel data for Latvian manufacturing companies, we estimate the correlation between exports based companies and labor productivity level. The aim of paper is to examine the relationship between export market participation and total factor productivity growth at the company's level, using a representative sample of Latvian manufacturing companies for the period 2000-2010. We expect that companies export activities are decent for labor productivity growth.
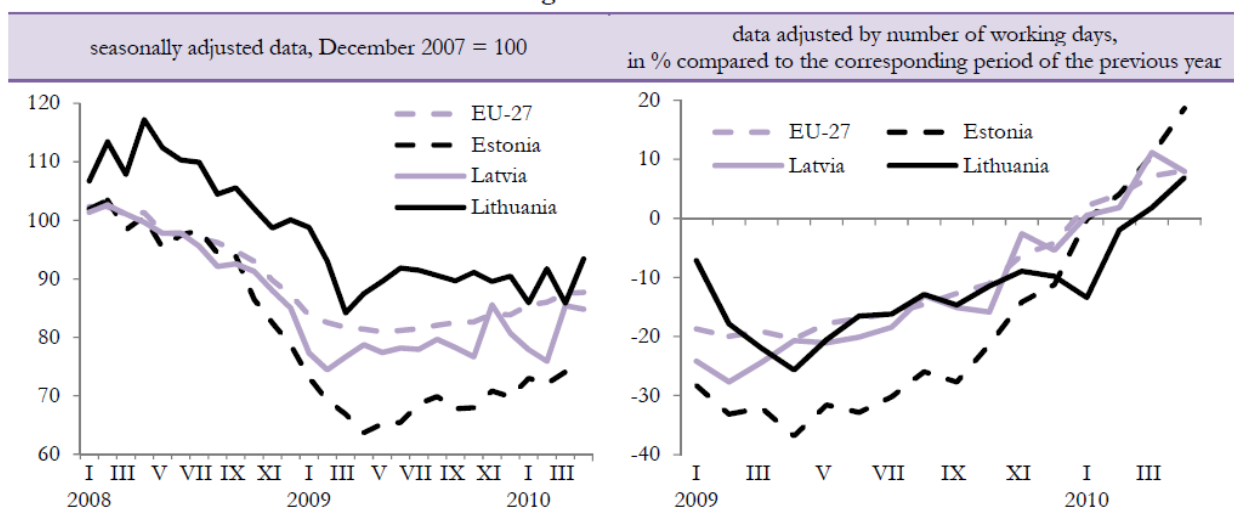
Keywords: export, production branch, productivity management, GDP, labor productivity
JEL Classification: E23, E01, L60.

Introduction

Growth of manufacturing industry in Latvia fell considerably behind the average growth rate of the world economy during the period of rapid growth and in the result the share of manufacturing in the economy from 2004 until 2008 decreased by almost 3 percentage points, which is considered as a substantial decrease. In 2009, manufacturing comprised only 10% of the total value added. Manufacturing in Latvia suffered dramatically from the global financial crisis. The main paper hypothesis point is concerned about more productive companies involved into export markets. In the present research, using company-level data from Latvian manufacturing industry, we attempt to provide new information into the modern research on export-productivity correlation in the Latvian manufacturing industry. In the post-recession period Latvian government policy have shown solid interest in the export-led growth through various export promotions policies (Recent document "Latvian goods and services exporting companies promotion". MK Nr.181 from 31.05.2010).

Figure 1. Manufacturing production volume index

And knowing this relationship is vital and relevant for understanding company level responses to aggregate shocks and for pursuing suitable policy. Export-promotion is one of the key policy stands of Latvian trade policy.

This paper aims to examine the relation between export and productivity in Latvian manufacturing industry in the post-recession period. The reason for this is that selling goods in foreign countries involves additional costs and more competiveness skills. Additional extra costs that includes marketing, transportation costs, distribution, the cost of personnel involves high skills to manage foreign markets, or production costs. These companies need additional attention modifying domestic products for foreign consumption. These costs provide an entry barrier that less successful and competiveness lack companies cannot overcome. Compared to 2008 manufacturing has decreased in 2009, although it has been growing since the 2nd quarter of 2009 due to global demand starting to recover. (see figure 2) In the majority of sectors, most of the output is being exported; therefore the growth of individual sectors largely depends on the expansion of export opportunities. The leading growth industries in this sector are wood, metal, food and beverages industries (see figure 3).

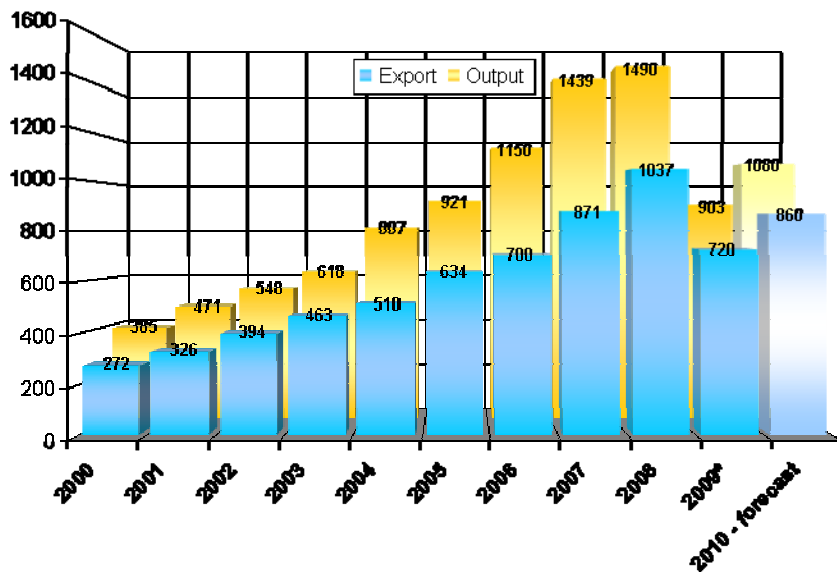Manufacturing industry output in Latvia mill. LVL

Figure 2. Manufacturing production realization mill. LVL
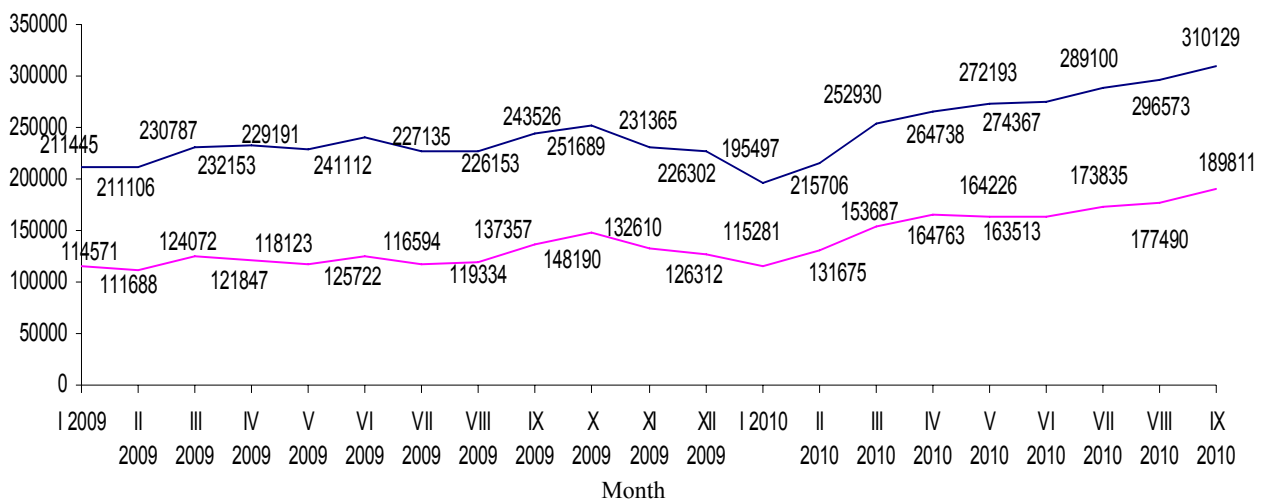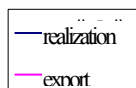
Local realization and export 2009 – 2010, thous. LVL

Figure 3. Local realization and export **2009 – 2010, thous. LVL**

Data and Methodology

In this part of the paper the authors introduce to the methodology. First, general view of the econometric methods is introduced. After that, calculation methods` pros and cons, used in this study, are presented. In this paper, we reviewed the generalised propensity score methodology recently developed by Imbens (2000) and Hirano and Imbens (2004). The method allows different levels of the companies' export intensity. Imbens (2000). Based on the this method, Hirano and Imbens (2004) further estimated a response function that characterize the conditional expectation of outcome given export-sales ratio. This methodology was introduced to the literature examining the export-performance relationship by Fryges (2006a), who estimates the relationship between the companies' export-sales ratios and their subsequent sales growth rates using a data set of young technology-oriented companies in Germany and the United Kingdom. Reviewing this methodology, this paper analyses the causal relationship between the growth of labour productivity and the export intensity using a data set from The Association of Mechanical Engineering and Metalworking Industries of Latvia in Riga.

The two hypotheses (self-selection of the more productive companies and the learning-by-exporting hypothesis) have been tested empirically since the mid-1990s. Wagner's (2007) survey reviews the findings of studies that use micro data at the level of companies (i.e. plants, establishments, local production units) to investigate the causal relationship between export activities and productivity empirically. Wagner concludes that "details aside the big picture that emerges after ten years of microeconometric research in the relationship between exporting and productivity is that exporters are more productive than non-exporters, and that the more productive companies self-select into export markets, while exporting does not necessarily improve productivity" (Wagner 2007).

This finding, however, does not answer the question in which way a company actually benefits from its export activities. Arguing that more productive companies become exporters is only a necessary condition for exporting. But this argumentation does not constitute a sufficient condition. All of the theoretical models of individual companies' foreign market participation - for example, the dynamic model formulated by Roberts and Tybout (1997) - state that a company will export if the (expected) benefits of such an engagement are positive. There might be various reasons why the existing literature has not found an impact of a company's export activities on its labour productivity. Firstly, Roberts and Tybout's model assumes a profit-maximising company. A company will export if the profits the company makes by selling its products abroad are non-negative. Thus, a company may benefit from its export activities by increasing profits rather than by achieving higher labour productivity. Unfortunately, in most cases micro data at the level of companies do not contain information on companies' profits. This is particularly true for those data sets that originate from voluntary surveys.

Secondly, the behaviour of companies might be forward-looking in the sense that the desire to export tomorrow leads a company to improve performance today to be competitive on the foreign market, too. Cross-sectional differences between exporters and non-exporters, therefore, may in part be explained by differences between companies. In this case, we observe that the more productive companies become exporters. Thirdly, most of the papers reviewed by Wagner only examine direct effects of companies' export activities on labour productivity. Under circumstances involving regional effects, non-exporting companies might also profit from other companies' exporting activities such that international business activities have a productivity-increasing effect on both exporting and non-exporting companies.

Finally, most studies that empirically investigate the learning-by-exporting hypothesis only distinguish between exporting and non-exporting companies. The companies' export status is used as a binary treatment variable and the labour productivity of exporting and non-exporting companies is compared applying different econometric methods. Whether or not exporting has a positive effect on company performance might, however, not simply depend on a company's export status, but might be a continuation function the company's export activities. On the one hand, there are companies that only occasionally receive some rare orders from abroad; from the other hand companies actively exploit the potential of the foreign market, generating a high percentage of their total sales in the foreign market. In this paper, we will work on the basis of the latter argument and analyse the effect of exporting on companies' labour productivity growth at each export-sales ratio in the interval from zero to one. If we can show that exporting improves labour productivity only within a sub-interval of the range of companies' export-sales ratios whereas it has no or even a negative effect within another sub-interval, this can at least partly explain why

those studies that confine themselves to companies' export status do not find any impact of companies' export activities on productivity growth.

A common approach to simply investigate differences in productivity between exporters and non-exporters is to follow the methodology introduced by Bernard and Jensen (1995, 1999). Studies of this type use long-term data for plants analysed differences in levels and growth rates of productivity between exporters and non-exporters in a first step. Here one starts by looking at differences in average labour productivity (usually total value of shipments per worker, or value added per worker) or average total factor productivity between exporters and non-exporters. The result is an unconditional productivity differential. The next step is the computation of so-called exporter benefits, defined as the remaining percentage difference of labour productivity between exporters and non-exporters. These benefits are computed from a regression of log labour productivity on the current export status dummy and a set of control variables (usually including industry, region, company size measured by the number of employees, and year):

$$\ln LP_{it} = \alpha + \beta Export_{it} + cControl_{it} + e_{it} \tag{1}$$

where i is the index of the company, t is the index of the year, LP is labour productivity, Export is a dummy variable for current export status (1 if the company exports in year t, 0 else), Control is a vector of control variables (like four-digit industry dummies, dummies for regions, company size, and year dummies), and e is an error term.

The export benefits, calculated from the formula, shows the average percentage difference between exporters and non-exporters controlling for the characteristics included in the vector Control. If good companies become exporters then we should expect to find significant differences in performance measures between future export starters and future non-starters several years before some of them begin to export.

While most of the empirical studies that use variants of standard approach described in this section compare exporters and non-exporters across all manufacturing industries, some studies focus on companies from selected industries only and document interesting similarities and differences (see e.g. Alvarez and Lopez (2004), Blalock and Gertler (2004), De Loecker (2004), and Greenaway and Kneller (2004b)). Furthermore, Damijan, Polanec and Prasnikar (2004) recently looked at differences by foreign markets served and found that it matters whether companies exported to advanced countries or developing countries.

Review of the methods

The standard approach has its weaknesses and problems. Paper analyses some recent developments that are used in dozen empirical investigations, namely the comparison of productivity between matched companies, and differences in the distribution of productivity as a whole between exporters and non-exporters.

However, we cannot observe whether they would really do so because they do start to export today; we simply have no data for the counterfactual situation. The use of a matching approach to search for causal effects of starting or stopping to export on productivity (and other dimensions of company performance) has been performed by Wagner (2002) and Girma, Greenaway and Kneller (2003, 2004), and it has been used in a growing number of empirical studies ever since (including De Loecker (2004), Arnold and Hussinger (2004), and Alvarez and Lopez (2004)).

The comparison of productivity (or productivity growth) between exporters and non-exporters usually represents mere productivity distribution. It is very difficult to deny stochastic dominance of the productivity distribution for exporters over the productivity distribution for non-exporters.

Recent studies on this relationship are another standard approach used in the investigation of the relationship between exports and productivity with the application of quantile regression, introduced to this field of analysis by Yasar, Nelson and Rejesus (2003) and Roger Koenker, Kevin F. Hallock, (2001).

This method examines the productivity effect of exporting at different points of the conditional output distribution. To describe it differently, quantile regression allows to test for differences in the effects of exporting on company's productivity as one moves from the lower to the upper tail of the conditional productivity distribution, and to identify the regions where these effects are especially weak, or strong, or not significantly different from zero at all.

Quantile regression can be illustrated as follows (see Koenker and Basset (1978) and Buchinsky (1998))

$$\ln y_{it} = x_{it}'\beta_\theta + u_{it} \, with \, Q_\theta(\ln \tfrac{y_{it}}{-}) = x_{it}'\beta_\theta \tag{2}$$

where ln **y** is the vector of log output, **x** is a vector of all the regressors in (1), **β** is the vector of parameters to be estimated, and **u** is a vector of residuals.

Hirano and Imbens (2004) suggest also a three-stage approach to implementing another method. In the first stage, the conditional distribution of the treatment variable given the covariates is estimated. In particular, it has many limit observations at the value zero, representing firms without any international sales (export). The latter group of companies decided that their optimal volume of exports was zero. Following Wagner (2001, 2003), fractional logit model developed by Papke and Wooldridge (1996) to estimate the export intensity of the companies. The estimation procedure maximises the Bernoulli log function given by

$$l_i(\beta) \equiv D_i * \log[\Delta(X_i\beta)] + (1 - D_i) * \log[1 - \Delta(X_i\beta)] \tag{3}$$

with D as the firm's export-sales ratio [the treatment], X as the vector of covariates, and $\Lambda(\cdot)$ as the cumulative distribution function of the logistic distribution) using the generalised linear models (GLM) framework developed by McCullagh and Nelder (1989).

Labour Impact on Productivity Growth

The effects of shifts in sectorial shares on aggregate productivity growth can severely impact productivity and result. This factor is one of the most important involved in our research. It can be calculated using different techniques. In all cases, it is crucial to consider the shift of employment not only from sectors with low-productivity growth to sectors with high-productivity growth but also from sectors with low-productivity levels to those with high-productivity levels. The reason is that the positive contribution to aggregate productivity of the high-growth sectors may be offset by their lower-than-average productivity levels. Standard approach is to express the productivity for the economy as a whole as the sum of the productivity level of each sector weighted by the sectorial employment shares:

$$P_n = \frac{Y_m}{L_m} = \frac{\sum_{j=1}^{n} \frac{Y_j}{L_j * L_j}}{L_m} = \sum_{j=1}^{n} P_j * S_j \tag{4}$$

where Y is output, L is employment by sector (j = 1…..n) and the total economy (m), P is labour Productivity (Y/L), and S is the sectorial employment share.

Concluding remarks

Talking about conclusion that emerges after fifteen years of existing microeconometric research in the relationship between exporting and productivity is that exporters are more productive than non-exporters, while exporting does not necessarily improve productivity.

Nonetheless, there are some difficulties concerning comparison of the results from the vast numbers of studies in detail, it still seems to be early to speak of these findings as solid facts, and to discuss any policy conclusions to be based thereon. Furthermore, there are a number of important issues that have only been touched upon recently in some studies, and that deserve future research efforts that cover more countries:

Furthermore, there is a different area of future research that is driven by an emerging theoretical literature. A number of theoretical papers, including Bernard, Eaton, Jensen and Kortum (2003), Melitz (2003), Helpman, Melitz and Yeaple (2004), and Yeaple (2005), take the results from the empirical literature on companies and exports as a starting point and develop models of international trade with heterogeneous companies which focus on the relationship between productivity and exports.

There are two alternative but not mutually exclusive hypotheses as to why exporters can be expected to be more productive than non-exporting companies (Bernard and Jensen 1999; Bernard and Wagner 1997). The first hypothesis refers to self-selection of the more productive companies into export markets. The reason for this is that selling goods in foreign countries involves additional costs. The range of extra costs includes not only transportation costs, distribution or marketing costs, but also the cost of personnel with skill to manage foreign networks, or production costs from modifying domestic products for foreign consumption. These costs provide an entry barrier that less successful companies cannot overcome and often

neglect to continue. Based on the Ricardian theory of comparative advantage (Classical Economics Theory), Bernard et al. (2003) derived a theoretical trade model that traces back the self-selection of companies with higher productivity into the export market to company-specific differences in efficiency.

Export activities give a higher "efficiency hurdle" (Bernard et al. 2003: 15) than domestic sales. Thus, companies with higher efficiency are more likely both to export and to have higher measured productivity. Similarly to Bernard et al., Melitz (2003) developed a competitive model of trade with company heterogeneity. According to his model, only more productive companies export while companies with low productivity may not survive, or survive but only serve the domestic market.

The authors show that globally intensified companies generate more innovative outputs due to, among other things, more learning from sources like suppliers and customers, universities, and the intra-company worldwide pool of information. Thus, exporting makes companies more productive.

In 2009, the domestic demand in Latvia continued decreasing. Also the rapid decline of external demand left a huge impact on the manufacturing in the 1st half of 2009, which resulted in the overall decline of production volumes by 25% in 2007-2009. The decrease of output of manufacturing has been observed particularly at the beginning of 2009. Such tendency was typical not only in Latvia, but also in the whole European Union. It was substantially affected by the global financial crisis. Due to the worsening of welfare in the majority of households in the world and due to a high uncertainty, the households and enterprises started cutting down expenses, thus weakening the demand all over the world, especially the demand for consumer and capital goods. The declining demand and decrease in global industrial production were the key factors leading to a large decrease of international trade. In the result, recession in developed countries affected developing countries more rapidly. The decline of global trade at the end of 2008 and at the beginning of 2009 was intensified by the increasing difficulty to access the credit resources. In the 2nd half of 2009, the revival of growth gradually replaced the decline of economic activities in the biggest developing economies and several developed economies. The increase of external demand provided positive growth stimulus also to Latvian producers – the speed of decline in manufacturing was reducing and the level of manufacturing capacity load was rising in the 2nd half of 2009. Moreover, production volumes in the individual sectors already at the end of 2009 exceeded the level of the respective period of the previous year.

In the empirical investigation we used data from local production branch, from cross sectional data collected in regular surveys by the Central Statistical Bureau. The research cover general data gathered Latvian manufacturing industries that employ at least 20 persons in the local production unit or in the company that owns the unit. Therefore, companies (small and microsmall) with less than 20 employees in total do not report to the surveys. In this paper annual data for 2000 to 2010, in order to minimize statistical error, are used.

The most anticipated result of year-specific estimations is the severe recession in labor productivity growth in 2009. The labor productivity growth rate at very high levels of the export-sales ratio is even smaller than the growth rate of non-exporting companies, although not significantly so.

Conclusion

In this research we analyzed the possible relationship between companies' labor productivity growth rates and their export orientation. We described that there is an effect of companies' export activities on labor productivity growth. During our research we found that the relationship between labor productivity growth and the export sales ratio is not necessarily stable over time. This is an unanticipated result.

Our results, describes a time-varying relationship between labor productivity growth and the export-sales ratio. The reason for this result might be that companies also sell their products not necessarily in European Union, but also in more distant and technologically less advanced countries. This could increase the costs of coordination and control of exporting companies, but companies are less likely to benefit from this kind of exporting, if they export to a technologically less advanced country this means that innovation level of their product is also not so important as for advanced countries in EU.

One possible reason for these results is that most previous studies are restricted to analysing the relationship between a companies' export status and the growth of its labour productivity, using the companies' export *status* as a primary treatment variable and comparing the performance of exporting and non-exporting companies.

As a first step of our research, there is not yet clear from our modelling is whether these exporting status effects will occur primarily through their indirect effects from post export returns, or directly from company's' transformation powers. There is not yet fully approved direct correlation between these factors.

As limitations in our data this research was unable to identify does exporting status is critical for high productivity, and therefore author is forced to use in future researches more information analysis presented by authority institutions.

References

1. Arnold, Jens Martin and Katrin Hussinger. 2004. "Export Behavior and Company Productivity in German Manufacturing. A Company-level Analysis." Centre for European Economic Research Discussion Paper 04-12.

2. Balassa, Bela (1988): "Outward orientation" in Chenery and Srinivasan, T. N (ed) In Handbook of Development Economics, Vol (2), Amsterdam: North-Holland.

3. Baldwin, Robert. 2000. "Trade and Growth: Still Disagreement about the Relationships." Organisation for Economic Co-operation and Development, Economics Department Working Paper EC0/WKP(2000)37, October.

4. Beckerman, Wilfred (1962): "Projecting Europe's growth", *Economic Journal,* Vol 72, 912-925

5. Bernard, Andrew B. and J. Bradford Jensen. 2004b. "Why some companies export." *Review of Economics and Statistics* 86, 561-569.

6. Bradford Jensen. 2004a. Exporting and Productivity in the USA. *Oxford Review of Economic Policy* 20, 343-357.

7. Buchinsky, M. (1998). "Recent Advances in Quantile Regression Models: A Practical Guide for Empirical Research." Journal of Human Resources 33(1): 88-126.

8. Calculated based upon Eurostat and Centrālais Statistikas birojs CSB Retrieved: <http://epp.eurostat.ec.europa.eu/pls/portal/docs; http://data.csb.gov.lv/Dialog/ varval.asp?ma=03- accessed 01.november 2010.

9. Centrālais Statistikas birojs. CSB Retrieved: http://data.csb.gov.lv/DATABASE/zin/Ikgad Access: 05. november 2010

10. Clerides, Sofronis K., Saul Lach and James R. Tybout. 1998. "Is Learning by Exporting Important? Micro-dynamic Evidence from Colombia, Mexico, and Morocco." *Quarterly Journal of Economics* CXIII, 903-947

11. Foreign trade portal of Investment and Development Agency of Latvia (LIAA) Retrieved: http://www.exim.lv/?object_id=5255 Access: 11.jaunary 2011

12. *Eastern European Outlook* - March 2010. SEB, Economic Research Retrieved: http://www.seb.lv/lv/private/research/analytic-info/SEBreviews/EEoutlook/2005/apskati/march/ Access: 08.jaunary 2011

13. Garrick and Paul J. Gertler. 2004. "Learning from exporting revisited in a less developed setting." *Journal of Development Economics* 75, 397-416. Castellani, Davide. 2002. "Export Behavior and Productivity Growth: Evidence from Italian Manufacturing Companies." *Weltwirtschaftliches Archiv /Review of World Economics* 138, 605-628.

14. Grossman, Gene M and Elhanan Helpman (1991): Innovation and growth in the global economy (Cambridge, Mass: MIT Press).

15. Kaldor, Nicholas (1970): "The case for regional policies", *Scottish Journal of Political Economy,* Vol 17 (3): 337-448.

16. Koenker, R. and G. Basett (1978). "Regression Quantiles." Econometrics 46: 33-50.

17. Melitz, Marc J. "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity." *Econometrica* 71, 1695-1725.

18. Monthly newsletter from Swedbank's Economic Research Department by Lija Strašuna Nr.3 July 2010

    Retrieved: http://www.swedbank.lv/lib/en/Swedbank%20monthly%20newsletter%202010-05-12.pdf Access: 12.jaunary 2011

19. Rivera-Batiz, Luis A and Paul M. Romer (1991): "Economic integration and endogenous growth", *Quarterly Journal of Economics,* Vol 106 (1): 531-555.

20. Roger Koenker, Kevin F. Hallock, (2001) "Quantile Regression", Journal of Economic Perspectives, 15 (4), 143–156 Retrieved: http://www.econ.uiuc.edu/~roger/research/rq/QRJEP.pdf Access: 18 December 2010**.**

21. The Bank of Latvia The gap between wages and productivity is narrowing rapidly Retrieved: http://www.bank.lv/eng/main/all/sapinfo/commentary/gap_between/ Access: 16 December 2009.

22. Wagner. 1997. "The Good go Abroad: Evidence from Longitudinal Micro Data on German and U. S. Exporters." in Seppo Laaksonen (Ed.), *The Evolution of Companies and Industries - International Perspectives.* Helsinki: Statistics Finland, 489-500.