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Are Trades Related to Technology? Evidences From The Baltic States: Estonia, Latvia and Lithuania*

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Abstract

This paper provides empirical evidences from the Baltic States on the relationship between technology and trades. In this study, regression and correlation analysis were employed an attempt to reveal the relationship between technology index and net-export coefficient, as well as the relationship between technology index and import coefficient. In this research, technology level was measured by technology index, while trades included of domestic and foreign trades; export and import. The data used for this study were collected from world input-output databases of Estonia, Latvia and Lithuania for the period 2000, 2005, 2010, and 2014. The findings remarked that the relationship between technology and domestic trade was positive and statistically significant. The result of the study implies that the higher was the technology index leads to the higher domestic transaction. Furthermore, relationship between technology and net-export was unpredictable. In year 2000, data from Estonia and Latvia showed that the relationship between variables was negative and in other years of the study, the relationship was positive. However, the relationship between variables was not statistically significant. Lastly, the relationship between technology and import was negative and statistically significant. It implies that the higher was technology index, will have a consequence the smaller was import.

Keywords: Technology Index, Net-Export Coefficient, Import Coefficient.

JEL Classification Code: B17, F10, O30.

1. Introduction

Relationship between technology and trade has been identified since long time (Vernon, 1970; Eaton & Kortum, 1997; Grossman & Helpman, 1995). In certain countries, Ministry of Industry, Trade and Technology or variations established to deal with the problems in technology and trade. The correlation between technology and trade performance could be illustrated by several trade characteristics such as production, trade and technological capability in each development step in a certain industry (Thanaphol & Tang, 1998). Eaton and Kortum (2001) presented a parsimonious framework in order to reveal the connection between the forces driving innovation and productivity and the implications of technology for trade. In input-output model, coefficient input-output can be disaggregated into technical coefficient and trade coefficient, in which trade coefficients consist of intra-regional (county) trade coefficients and inter-regional (country) trade coefficients (Raa, 2007).

Technology is embodied in production or operation process of integrating variations material inputs in order to appropriate for consumption (Kotler, Armstrong, Brown, & Adam, 2006). Meanwhile, in economics theory, productions function is a formula which presents the correlation between the quantities of production factors used and the amount of product obtained. It means that the amount of product that can be acquired from every combination of factors, assuming that the most efficient available methods of production are used. The production function can be described as the specification of the least input requisites needed to provide designated quantities of output (Mishra, 2007). In the production function, the relationship of output

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to inputs is non-monetary; that is a production function relates physical inputs to physical outputs and prices are not reflected in the function (Malakooti, 2013).

In the input-output model, total input encompasses of intermediate consumption input and value-added. Total input is summation of local and imported input (Miller & Blair, 2009). Technical coefficient is the ratio of total intermediate input including both domestic and imported to total input which is equal to total output. Noticeable studies carried out related to technical coefficients by using Input-Output Analysis (Raa, 2007; Raa & Rueda-Cantuche, 2007; Levinson; 2009; Ghanbari & Ahmadi, 2017; Muchdie, 2017).

International trades have occurred throughout history for instances economic, social and political (see among other: Vernon, 1970; Grossman & Rogoff, 1995). The Ricardian model intends on comparative advantage, which emerges due to distinction in technology or natural resources (Marrewijk, Otten, & Schueller, 2007). The Heckscher-Ohlin model remarked that the pattern of international trade is decided by distinction in factors endowment. It forecasted that countries will export those goods that make intensive use of locally abundant factors whilst will import goods that make intensive use of factors that are locally scarce (Mark, 2007). In 1953, Wassily Leontief published a study in which he tested the validity of the Heckscher-Ohlin theory (Leontief, 1953). The Gravity model of trade for instance, it provides deeply analysis of trading pattern. Moreover, the model estimates trade according to the differences between countries and the interaction of the countries' economic scales. The model has been illustrated to have significant empirical validity (Akman, 2016).

In modern economy, there are three waves of expansions and generalizations. First at all, major general result about technology and trades were obtained by McKenzie (1954, 1956). McKenzie was more interested in the patterns of trade specializations, whereas Jones was more interested in the patterns of complete specialization, in which the prices move freely within certain limited range. Second, Ricardo's idea was even expanded to the case of continuum of goods by Dornbusch, Fisher, and Samuelson (1977). The model estimates following two countries case. It is employed for instance by Matsuyama (2000). These theories use a spatial property that is appropriate only for two-country case. They normally assume fixed expenditure coefficients. Lastly, Shiozawa (2007) revealed to construct a Ricardian theory with many-country, many-commodity model which permit choice of production techniques and trade of input goods.

In the other hand, trade balance has an acquaintance with Balance of Payment (Levi, 2009). Balance of trade distinguishes between the monetary value of a country's exports and imports over a particular period (O'Sullivan & Sheffrin, 2003). By definition export is the goods and services provided in a country and purchased by citizens of the other countries. The seller of such goods and services is referred to as an exported; the foreign buyer is referred to as an imported (Joshi, 2009).

In opposite, import consists of transactions for goods and services to a resident of a jurisdiction such as a nation from non-residents (Lequiller & Blades, 2006). An import of a good exists when there is a change of ownership from a non-resident to a resident. Imports of services consist of all services rendered by non-resident to residents. In national accounts, import includes and excludes specific borderline case. In the macroeconomic theory, the value of imports can be modelled as a function of the domestic absorption and the real exchange rate (Burda & Wyplosz, 2005). There are two fundamental types of import: industrial and consumer goods and intermediate goods and services. Companies import goods and services to supply to the domestic market a lower price and better quality than competing goods manufactured in the domestic market.

The purpose of this paper is to present the results of analysing empirical relationship between technology and international trade using data from the Baltic States: Estonia, Latvia and Lithuania. Hypothesis will be tested that trades depended on technology level. Domestic trade and net-export have positive relationship with technology level; but import has negative relationship with technology level.

2. Methodology

This study presents empirical the relationship between technology and trades. This research gathered data from world input-output databases of Estonia, Latvia and Lithuania for the year 2000, 2005, 2010, and 2014. Technology level was measured by technology index, whilst trades included of domestic and foreign trades; export and import. Regression and correlation analysis were employed to reveal the relationship between technology index and net-export coefficient, as well as the relationship between technology index and import coefficient. In more detail, Table 1 informs the input composition of the total supply of each products *j* (X*j*), this is comprised by the national production and also by imported products. The value of domestic production consists of intermediate consumption of several industrial inputs *i* plus value-added. The inter-industry transactions table is a nuclear part of this table, in the sense that it provides a detailed portrait of how the different economic activities are interrelated. Since intermediate consumption is of the total-flow type, this implies that true technological relationships are being considered. In fact, each column of the intermediate consumption table describes the total amount of each input *i* consumed in the

production of output *j*, regardless of the geographical origin of that input.

The input-output interconnection can be translated analytically into accounting identities. On the supply perspective, if X_{ij} denote the intermediate use of product *i* by industry *j* and y_i denote the final use of product *i*, it may be written, to each of the *n* products:

$$^{A}X_i = {}^{AA}X_{ij} + {}^{BA}X_{ij} + {}^{CA}X_{ij} + \ldots + {}^{ZA}X_{ij} + {}^{A}VA_i \quad (1)$$

On the demand side, it is known that:

$$^{A}X_j = {}^{AA}X_{ij} + {}^{AB}X_{ij} + {}^{AC}X_{ij} + \ldots + {}^{AZ}X_{ij} + {}^{A}FD_j \quad (2)$$

Technology coefficient is calculated as ration of total intermediate input to total input:

$$TC = ({}^{AA}X_{ij} + {}^{BA}X_{ij} + {}^{CA}X_{ij} + \ldots + {}^{ZA}X_{ij})/{}^{A}X_i \quad (3)$$

Technology index is an inverse of technology coefficient, TI = (1/TC).

Domestic trade coefficient is calculated as ratio of domestic input to total input, and calculated as:

$$DT = ({}^{AA}X_{ij})/{}^{A}X_i \quad (4)$$

Net-export is calculated as the different between export and import. Export coefficient is calculated as ration of total export to output produced:

$$XC = ({}^{AB}X_{ij} + {}^{AC}X_{ij} + \ldots + {}^{AZ}X_{ij})/ ({}^{A}X_j) \quad (5)$$

Import coefficient is calculated as ration of total import to input used:

$$IC = ({}^{BA}X_{ij} + {}^{CA}X_{ij} + \ldots + {}^{ZA}X_{ij})/({}^{A}X_i) \quad (6)$$

3. Results and Discussion

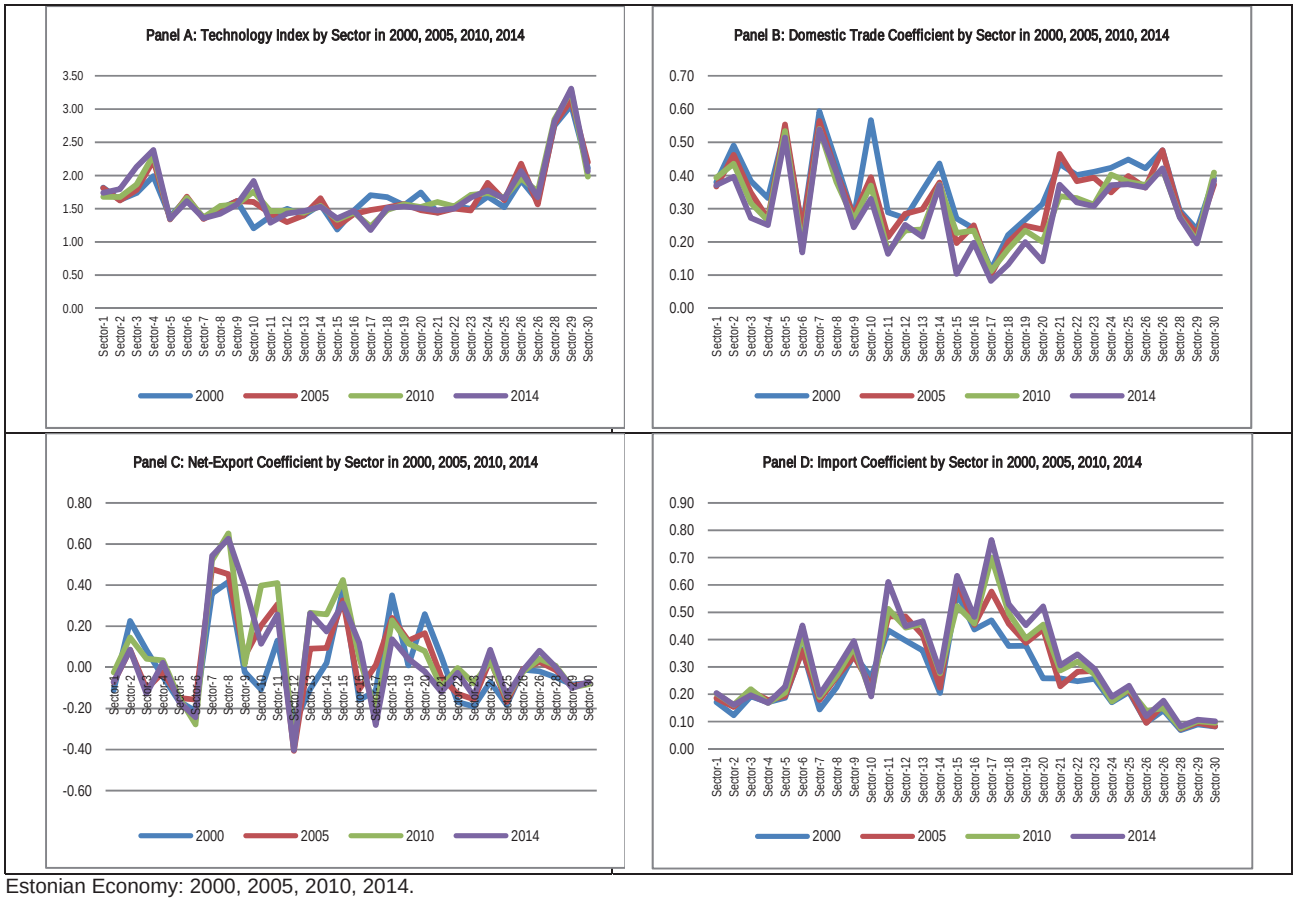
3.1. Evidence from Estonia

Figure 1 provides information about Technology Index, Domestic Transaction, Net-Export and Import Coefficient in Estonian Economy during 2000, 2005, 2010 and 2014. Overall, the all variables in Estonian economy experienced a noticeable fluctuation during period. In more detail, the average of technology index in Estonian economy was about 1.67, with minimum index of 1.19 (Sector-15) and maximum index of 3.06 (Sector-29). There are numerous sectors with technology index more than 1.67 including Sector-1 (1.82), Sector-3 (1.74), Sector-4 (1.99), Sector-17 (1.70), Sector-18 (1.67), Sector-20 (1.75), Sector-24 (1.68), Sector-26 (1.93), Sector-28 (2.75), Sector-29 (3.06) and Sector-30 (2.11), respectively.

However, other sectors had technology index less than 1.67. In 2005, average technology index in Estonian economy was 1.69, with minimum index of 1.23 (Sector-15) and maximum index of 3.14 (Sector-29). Sectors with technology index more than 1.69 included Sector-1 (1.81), Sector-3 (1.79), Sector-4 (2.23), Sector-24 (1.89), Sector-26 (2.18), Sector-28 (2.77), Sector-29 (3.14), and Sector-30 (2.20). Other sectors had technology index less than 1.69. In 2010, average technology index was 1.71, with minimum index of 1.23 (Sector-17), and maximum index of 3.28 (Sector-29). Other sectors had technology index less than 1.69. In year 2014, average technology index was 1.72, with minimum index of 1.18 (Sector-17) and maximum index of 3.31 (Sector-29). Sectors with technology index more than 1.72 included Sector-1 (1.74), Sector-2 (1.80), Sector-3 (2.13), Sector-4 (2.38), Sector-10 (1.92), Sector-24 (1.78), Sector-26 (2.07), Sector-28 (2.81), Sector-29 (3.31), and Sector-30 (2.06). Other sectors had technology index less than 1.72.

Trade coefficient by sector in Estonian economy had fluctuated during 2000, 2005, 2010 and 2014. In the beginning of period, the average domestic trade coefficient was about 0.37. The lowest minimum coefficient was Sector-17 while the maximum coefficient was Sector-7. Compared to previous period, in 2005, average domestic trade coefficient in Estonian economy in 2010 was approximately 0.33, with minimum coefficient in Sector-17 and maximum coefficient in Sector-7. In the next two research periods, in 2010 and 2014, the highest score was occurred in Sector-17, whilst the lowest point was in Sector-7. In 2010, the average domestic trade coefficient in Estonian economy was 0.31, with minimum coefficient of 0.11 and maximum of 0.54. In 2014, the average domestic trade coefficient in Estonian economy was 0.29, with minimum coefficient of 0.08 and maximum coefficient of 0.54.

In the other hand, Net-export coefficient by sector in Estonian economy for year had showed remarkable movement. In 2000, average net-export coefficient in Estonian economy was 0.00, with minimum coefficient was Sector-12 and maximum coefficient was Sector-8 which was about -0.28 and 0.42, respectively. Sectors with net-export coefficient more than 0.00 included Sector-2 (0.23), Sector-3 (0.08), Sector-7 (0.36), Sector-8 (0.42), Sector-11 (0.13), Sector-14 (0.02), Sector-15 (0.38), Sector-18 (0.35), Sector-19 (0.01), Sector-20 (0.26), and Sector-21 (0.05). In year 2005, average net-export coefficient in Estonian economy was 0.03, with minimum coefficient of -0.41 (Sector-12) and maximum coefficient of 0.48 (Sector-7). Other sectors had net-export coefficient less than 0.03.



Estonian Economy: 2000, 2005, 2010, 2014.

Figure 1: Technology Index, Domestic Transaction, Net-Export and Import Coefficient in

In year 2010, average net-export coefficient in Estonian economy was 0.07, with the lowest coefficient was about -0.39 (Sector-12) and the highest coefficient was 0.65 (Sector-8). In 2014 also experienced almost indifferent result. The average net-export coefficient in Estonian economy was 0.04, with minimum coefficient of -0.40 (Sector-12) and maximum coefficient of 0.63 (Sector-8). Sectors with net-export coefficient more than 0.04 included Sector-2 (0.09), Sector-7 (0.54), Sector-8 (0.63), Sector-9 (0.39), Sector-10 (0.11), Sector-11 (0.26), Sector-13 (0.26), Sector-14 (0.17), Sector-15 (0.31), Sector-16 (0.12), Sector-18 (0.14), Sector-19 (0.04), Sector-24 (0.09) and Sector-27 (0.08). Other sectors had net-export coefficient less than 0.04.

The import coefficient by sector in Estonian economy for year 2000, 2005, 2010 and 2014 showed a downward trend. In year 2000, average import coefficient in Estonian economy was 0.26, with minimum coefficient of 0.07 (Sector-28) and maximum of 0.57 (Sector-15). Sectors with import coefficient more than 0.26 was about 14 sectors including Sector-6, Sector-9, Sector-10, Sector-11, Sector-12, Sector-13, Sector-15, Sector-16, Sector-17, Sector-18, Sector-19, Sector-20, Sector-21, and Sector-23, respectively. Other sectors had import coefficient less than 0.26. In year 2005, average import coefficient in Estonian economy was 0.28, with minimum coefficient of 0.07 (Sector-28) and maximum coefficient of 0.61 (Sector-15).

In year 2010, average import coefficient in Estonian economy was 0.30, with minimum coefficient of 0.08 (Sector-28) and maximum coefficient of 0.70 (Sector-17). In year 2014, average import coefficient in Estonian economy was 0.32, with minimum coefficient of 0.08 (Sector-28) and maximum coefficient of 0.76 (Sector-17). Sectors with import coefficient more than 0.32 included: Sector-6 (0.45), Sector-9 (0.39), Sector-11 (0.61), Sector-12 (0.45), Sector-13 (0.47), Sector-15 (0.63), Sector-16 (0.48), Sector-17 (0.76), Sector-18 (0.53), Sector-19 (0.45), Sector-20 (0.52), and Sector-22 (0.35). Other sectors had import coefficient less than 0.32.

Table 1: Regression and Correlation Analysis for Estonian Economy

Correlation between:	Year 2000	Year 2005	Year 2010	Year 2014
Technology and Domestic Trade	r = 0.913 b = 0.203 t-cal = 12.010 t-tab =1.699*	r = 0.913 b = 0.183 t-cal = 12.016 t-tab = 1.699*	r = 0.915 b = 0.170 t-cal = 12.231 t-tab = 1.699*	r = 0.900 b = 0.159 t-cal = 11.121 t-tab = 1.699*
Technology and Net-Export	r = -0.017 b = -0.002 t-cal = -0.090 t-tab = 1.699*	r = 0.113 b = 0.013 t-cal = 0.612 t-tab = 1.699*	r = 0.236 b = 0.033 t-cal = 1.307 t-tab = 1.699*	r = 0.136 b = 0.018 t-cal = 0.737 t-tab = 1.699*
Technology and Import	r = -0.553 b = -0.182 t-cal = -3.509 t-tab = 1.699*	r = -0.633 b = -0.222 t-cal = -4.327 t-tab = 1.699*	r = -0.630 b = -0.229 t-cal = -4.295 t-tab = 1.699*	r = -0.660 b = -0.258 t-cal = -4.649 t-tab = 1.699*

Note: *t-tab = 1.699 at α = 0.05 and DF = 29

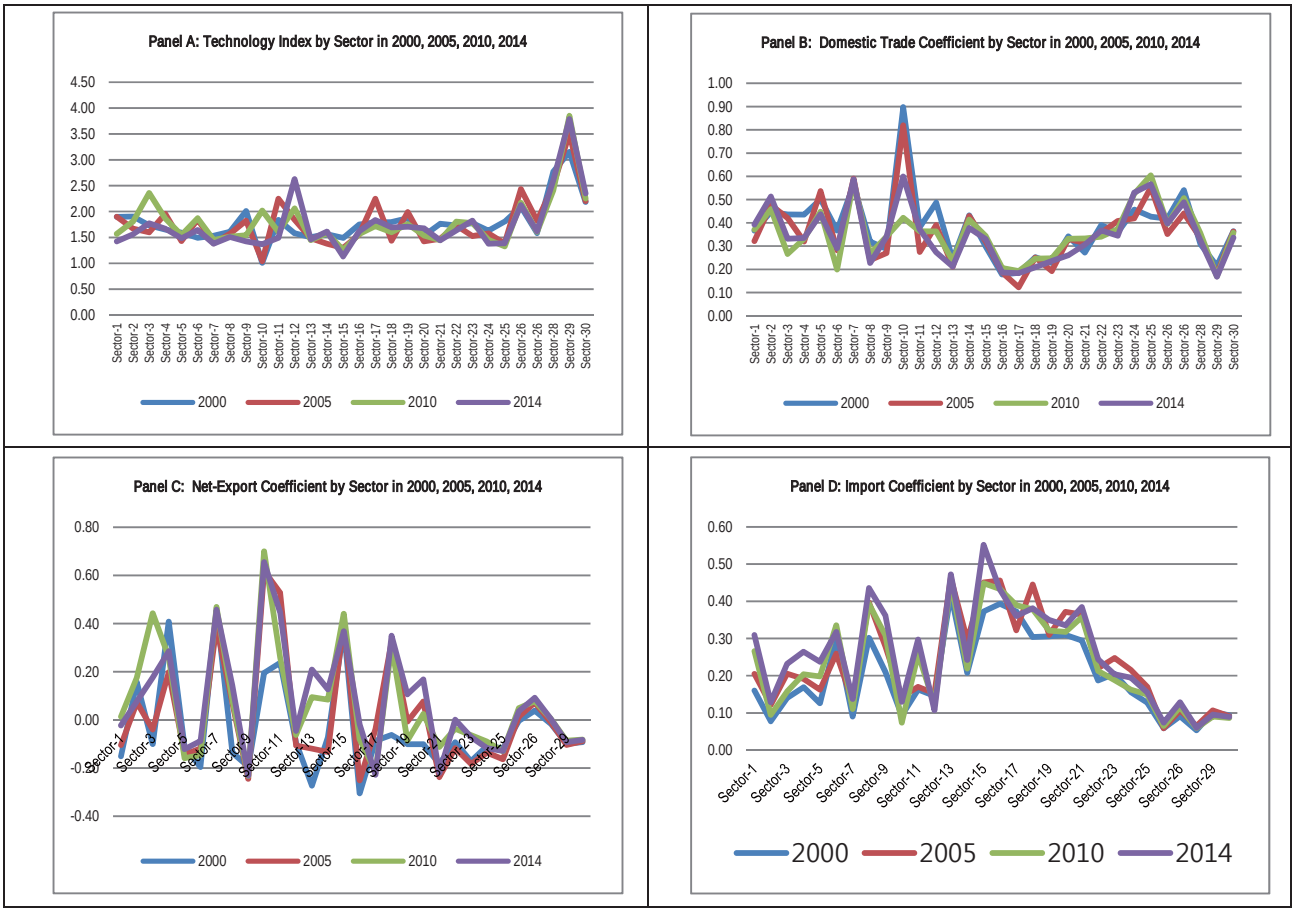
Table 1 provides the results of regression and correlation analysis between technology index and domestic trade coefficient, technology index and net-export coefficient and between technology index and import coefficient in Estonian economy for the year 2000, 2005, 2010 and 2014. Correlation coefficients between technology index and domestic trade coefficient were very strong (r=0.913 in year 2000 and year 2005, r=0.915 in year 2010 and r=0.900 in year 2014). Regression coefficients were positive (b= 0.203in year 2000, b=0.183 in year 2005, b=0.170 in year 2010 and b=0.159 in year 2014) and statistically significant as t-calculated were more than t-table at α = 5% and DF=29, in all years of study. Theoretically, the relationship between technology and domestic trade is positive. The higher is technology index, the higher is domestic trade coefficient. Regression analysis showed that regression coefficients were positive and statistically significant. Data from Estonian economy empirically supports the theory.

Correlation coefficients between technology index net-export coefficients were very weak and negative for year 2000 (r= -0.017 in year 2000), but positive and very weak in year 2005 (r=0.113), 2010 (r=0.236) and 2014 (r=0.136). Regression coefficients were negative (b=-0.002 in year 2000), but statistically not significant in year 2000 and they were positive (b=0.013 in year 2005, b=0.033 in year 2010, b=0.018 in year 2014) and statistically not significant for year 2005, 2010 and 2014. Theoretically, the relationship between technology and net-export is positive; the higher is the technology index, the higher would be the net-export coefficient. Empirical evidence from Estonian data showed unclear relationship; it was negative in year 2000 and positive in rest years of study. Moreover, the relationships were not statistically significant.

Correlation coefficients between technology index and import coefficient were negative and moderate in year 2000 (r=-0.553) and strong (r=-0.633 in year 2005, r=0.630 in year 2010 and r=-0.660 in year 2014). Regression coefficients were negative (b=-0.182 in year 2000, b= -0.222 in year 2005, b= -0.229 in year 2010 and b=-0.258 in year 2014) and statistically significant as t-calculated were higher than t-table at α=5% and DF=29. Theoretically, the relationship between technology and import is negative; the higher is the technology, the smaller is import. Empirical evidence from Estonian data support the theory; the higher is the technology index, the smaller would be the import coefficient.

3.2. Evidence from Latvia

Figure 2 explains the Technology Index, Domestic Transaction, Net-Export and Import Coefficient in Latvian Economy. Precisely, technology index by sectors in Latvian economy remained stable for all period. In 2000, average technology index in Latvian economy was about 1.79, with minimum index of 1.01 (Sector-10) and maximum index of 3.15 (Sector-29). Sectors with technology index more than 1.79 included Sector-1 (1.90), Sector-2 (1.91), Sector-9 (2.01), Sector-11 (1.84), Sector-17 (1.79), Sector-18 (1.80), Sector-19 (1.87), Sector-25 (1.81), Sector-26 (2.10), Sector-28 (2.77), Sector-29 (3.15) and Sector-30 (2.18). Other sectors had technology index less than 1.79. In year 2005, average technology index in Latvian economy was 1.78, with minimum index of 1.04 (Sector-10) and maximum index of 3.50 (Sector-29). While in year 2010, average technology index in Latvian economy was 1.79. The lowest index was in Sector-15 while the highest index was in Sector-29 with the score index was about 1.26 and 3.85, respectively. In year 2014, average technology index in Latvian economy was 1.74, with minimum index of 1.13 (Sector-15) and maximum index of 3.79 (Sector-29). Sectors with technology index more than 1.74 included: Sector-3 (1.77), Sector-12 (2.63), Sector-17 (1.84), Sector-23 (1.82), Sector-26 (2.12), Sector-28 (2.60), Sector-29 (3.79) and Sector-30 (2.35). Other sectors had technology index less than 1.74.



Latvian Economy: 2000, 2005, 2010, 2014

Figure 2: Technology Index, Domestic Transaction, Net-Export and Import Coefficient in

Domestic trade coefficient by sector in Latvian economy had followed similar pattern for year 2000, 2005, 2010 and 2014. In year 2000, average domestic trade coefficient was 0.38, with minimum coefficient of 0.18 (Sector-16) and maximum coefficient of 0.90 (Sector-10). In year 2005, average domestic trade coefficient in Latvian economy was 0.36, with minimum coefficient of 0.12 (Sector-17) and maximum coefficient of 0.82 (Sector-10). In 2010, average domestic trade coefficient in Latvian economy was 0.35 with minimum coefficient of 0.17 and maximum coefficient of 0.60 in Sector-25. Numerous sectors have more than 0.35 while only few sectors had domestic trade coefficient less than 0.35. In the end of period, average domestic trade coefficient in Latvian economy was 0.35, with minimum coefficient of 0.17 (Sector-29) and maximum coefficient of 0.60 (Sector-10).

Net-export coefficient in Latvian economy showed different changes for each year period. In 2000, average net-export coefficient in Latvian economy was -0.03, with minimum coefficient of -0.30 (Sector-16) and maximum coefficient of 0.45 (Sector-7). Sectors with net-export coefficient more than -0.03 included Sector-2 (0.16), Sector-4 (0.41), Sector-7 (0.45), Sector-10 (0.20), Sector-11 (0.24), Sector-15 (0.38), Sector-26 (0.00), Sector-27 (0.04) and Sector-28 (-0.02). In year 2005, average net export coefficient in Latvian economy was 0.01, with minimum coefficient of -0.25 (Sector-16) and maximum coefficient of 0.62 (Sector-10). In year 2010, average net export coefficient in Latvian economy was 0.06, with minimum coefficient of -0.23 (Sector-9) and maximum coefficient of 0.70 (Sector-10). In year 2014, average net-export coefficient in Latvian economy was 0.07, with minimum coefficient of -0.23 (Sector-9) and maximum coefficient of 0.66 (Sector-10).

Import coefficient by sector in Latvian economy followed a downward trend for sectors. In 2000, average import coefficient in Latvian economy was 0.20, with minimum coefficient of 0.05 (Sector-28) and maximum coefficient of

0.42 (Sector-13). Sectors with import coefficient more than 0.20 included Sector-6 (0.30), Sector-8 (0.30), Sector-9 (0.21), Sector-13 (0.42), Sector-14 (0.21), Sector-15 (0.37), Sector-16 (0.39), Sector-17 (0.37), Sector-18 (0.30), Sector-19 (0.31), Sector-20 (0.31), Sector-21 (0.29) and Sector-23 (0.21). Other sectors had import coefficient less than 0.20. In year 2005, average import coefficient in Latvian economy was 0.24, with minimum coefficient of 0.06 (Sector-26) and maximum coefficient of 0.46 (Sector-13 and Sector-16). In year 2010, average import coefficient in Latvian economy was 0.23, with minimum coefficient of 0.06 (Sector-26 and Sector-28) and maximum coefficient of 0.45 (Sector-13 and Sector-15). In year 2014, average import coefficient in Latvian economy was 0.26, with minimum coefficient of 0.06 (Sector-28) and maximum coefficient of 0.55 (Sector-15).

Table 3 provides the results of regression and correlation analysis between technology index and domestic trade coefficient, technology index and net-export coefficient and between technology index and import coefficient inLatvian economy for the year 2000, 2005, 2010 and 2014. Correlation coefficients between technology index and domestic trade coefficient were positive and very strong (r= 0.883 in year 2000, r=0.852 in year 2005, r=0.895 in year 2010 and r=0.872 in year 2014). Regression coefficients were positive (b=0.195 in year 2000, b=0.178 in year 2005, b=0.179 in year 2010 and b=0.178 in year 2014) and statistically significant as t-calculated were more than t-table at α = 5% and DF=29, in all years of study. Theoretically, the relationship between technology and domestic trade is positive. The higher is technology index, the higher is domestic trade coefficient. Regression analysis showed that regression coefficients were positive and statistically significant. Data from Latvian economy empirically supports the theory.

Correlation coefficients between technology index net-export coefficient were negative and weak in year 2000 (r= -0.205) and positive but very weak in year 2005 (r=0.018), positive and weak in year 2010 (r=0.254) and in year 2010 (r=0.237). Regression coefficients were negative (b=-0.022 in year 2000) but statistically not significant in year 2000, and were positive (b=0.002 in year 2005, b=0.032 in year 2010, b=0.030 in year 2014) and statistically not significant for year 2005, 2010 and 2014. Theoretically, the relationship between technology and net-export is positive; the higher is the technology index, the higher would be the net-export coefficient. Empirical evidence from Latvian data showed unclear relationship; it was negative in year 2000 and positive in rest years of study. Moreover, the relationships were not statistically significant.

Correlation coefficients between technology index and import coefficient were negative and weak in year 2000 (r= -0.323) and year 2005 (r=-0.449) but moderate and negative in year 2010 (r=-0.513) and year 2014 (r=-0.517). Regression coefficients were negative (b=-0.091 in year 2000, b=-0.116 in year 2005, b=-0.133, b=-0.0131 in year 2014) and statistically significant as t-calculated were higher than t-table at α=5% and DF=29. Theoretically, the relationship between technology and import is negative; the higher is the technology, the smaller is import. Empirical evidence from Latvian data supports the theory; the higher was the technology index, the smaller would be the import coefficient.

3.3. Evidence from Lithuania

Figure 3 depicts about technology index, domestic transaction, net-export and import coefficient in Lithuanian Economy by sectors. In more detail, in 2000, average technology index in Lithuanian economy was 2.07, with minimum index of 1.21 (Sector-5) and maximum index of 3.64 (Sector-29). Sectors with technology index more than 2.07 included: Sector-2 (2.58), Sector-3 (2.21), Sector-4

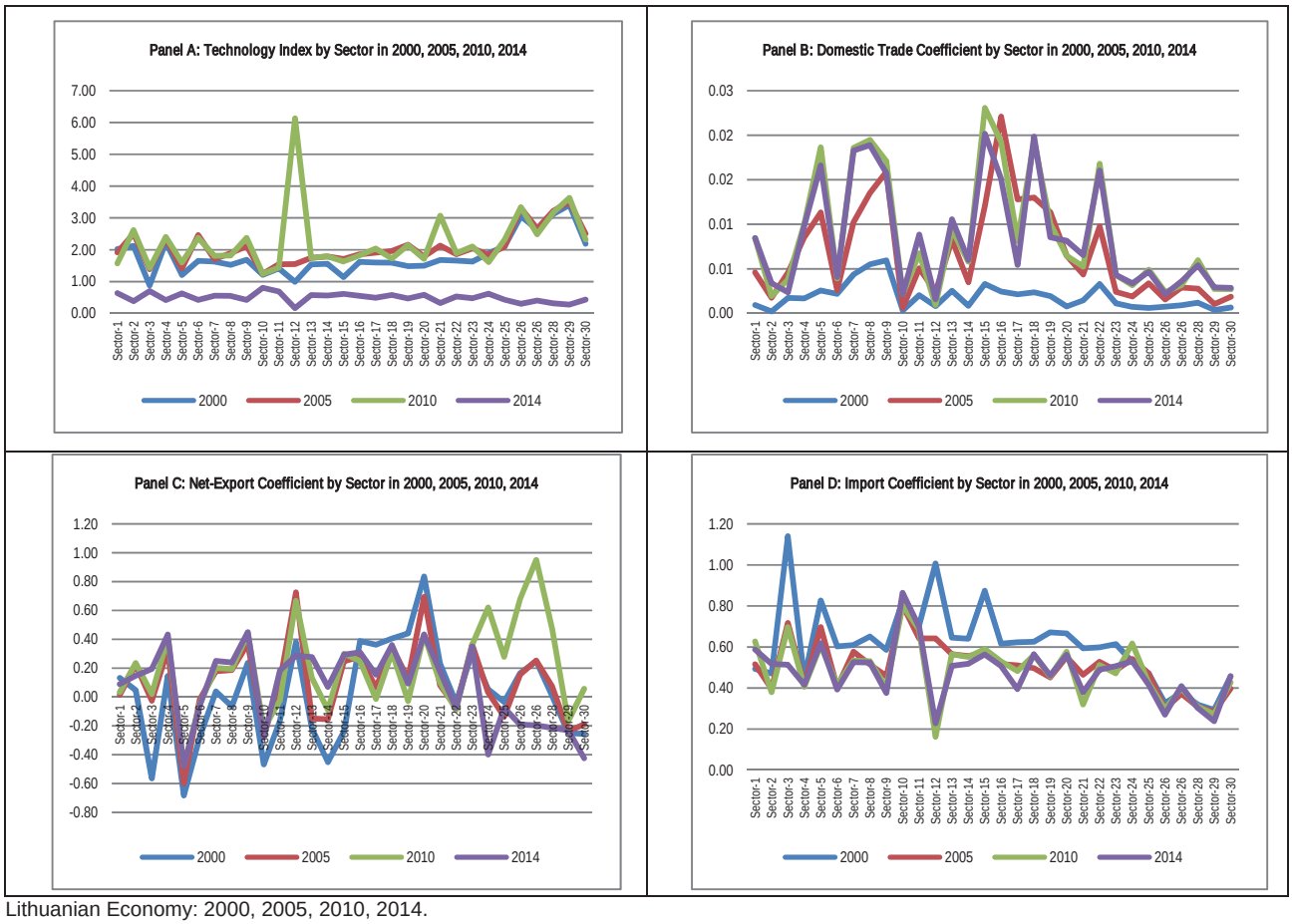
Table 2: Regression and Correlation Analysis for Latvian Economy

Correlation between:	Year 2000	Year 2005	Year 2010	Year 2014
Technology and Domestic Trade	r = 0.883 b = 0.195 t-cal = 10.131 t-tab = 1.699*	r = 0.852 b = 0.178 t-cal = 8.777 t-tab = 1.699*	r = 0.895 b = 0.179 t-cal = 10.830 t-tab = 1.699*	r = 0.872 b = 0.178 t-cal = 9.568 t-tab = 1.699*
Technology and Net-Export	r =-0.205 b = -0.022 t-cal = -1.129 t-tab = 1.699*	r = 0.018 b = 0.002 t-cal = 0.098 t-tab = 1.699*	r = 0.254 b = 0.032 t-cal=1.416 t-tab= 1.699*	r = 0.237 b = 0.030 t-cal = 1.315 t-tab = 1.699*
Technology and Import	r = -0.323 b = -0.091 t-cal = -1.807 t-tab = 1.699*	r = -0.449 b = -0.116 t-cal = 2.659 t-tab = 1.699*	r = -0.513 b = -0.133 t-cal = -3.158 t-tab = 1.699*	r = -0.517 b = -0.131 t-cal = -3.196 t-tab = 1.699*

*t-tab = 1.699 at α = 0.05 and DF = 29

(2.67), Sector-9 (2.10), Sector-21 (2.15), Sector-25 (2.15), Sector-26 (3.18), Sector-27 (2.92), Sector-28 (3.41), Sector-29 (3.64), and Sector-30 (2.53). Other sectors had technology index less than 2.07. In year 2005, average technology index in Lithuanian economy was 2.07, with minimum index of 1.24 (Sector-10) and maximum index of 3.51 (Sector-29). In year 2010, average technology index in Lithuanian economy was 2.25, with minimum index of 1.24 (Sector-10) and maximum index of 6.13 (Sector-12). In year 2014, average technology index in Lithuanian economy was 2.24, with minimum index of 1.15 (Sector-10) and maximum index of 4.35 (Sector-12). Sectors with technology index more than 2.24 included: Sector-4 (2.35), Sector-6 (2.52), Sector-9 (2.55), Sector-12 (4.35), Sector-17 (2.50), Sector-21 (2.59), Sector-25 (2.38), Sector-26 (3.67), Sector-27 (2.42), Sector-28 (3.26) and Sector-29 (4.14). Other sectors had technology index less than 2.24.

Domestic trade coefficient by sector in Lithuanian economy for year 2000, 2005, 2010 and 2014 showed an increasing trend. In year 2000, average domestic trade coefficient in Lithuanian economy was 0.38, with minimum coefficient of 0.25 (Sector-4, Sector-10, Sector-28, Sector-29) and maximum coefficient of 0.67 (Sector-5). In year 2005, average domestic trade coefficient in Lithuanian economy was 0.32, with minimum coefficient of 0.18 (Sector-10) and maximum coefficient of 0.60 (Sector-3). In year 2010, average domestic trade coefficient was 0.28, with minimum coefficient of 0.14 (Sector-12) and maximum coefficient of 0.59 (Sector-3). In year 2014, average domestic trade coefficient in Lithuanian economy was 0.25, with minimum coefficient of 0.11 (Sector-9) and maximum index of 0.42 (Sector-3). Sectors with domestic trade coefficient more than 0.25 included: Sector-1 (0.33), Sector-2 (0.36), Sector-3 (0.42), Sector-5 (0.41), Sector-7 (0.25), Sector-14 (0.30), Sector-20 (0.34), Sector-22 (0.30), Sector-23 (0.37), Sector-24 (0.30), Sector-25 (0.32), Sector-27 (0.31) and Sector-30 (0.38). Other sectors had domestic trade coefficient less than 0.25.



Lithuanian Economy: 2000, 2005, 2010, 2014.

Figure 3: Technology Index, Domestic Transaction, Net-Export and Import Coefficient in

Net-export coefficient by sector in Lithuanian economy had fluctuated. In year 2000, average net-export coefficient in Lithuanian economy was 0.01, with minimum coefficient of -0.30 (Sector-10) and maximum coefficients of 0.42 (Sector-20). Sectors with net-export coefficient more than 0.01 included: Sector-4 (0.03), Sector-7 (0.17), Sector-12 (0.03), Sector-15 (0.30), Sector-16 (0.04), Sector-17 (0.19), Sector-18 (0.09), Sector-19 (0.21), Sector-20 (0.42), Sector-21 (0.09), Sector-26 (0.13) and Sector-27 (0.06). Other sectors had net-export coefficient less than 0.01. In year 2005, average net-export coefficient in Lithuanian economy was 0.04, with minimum coefficient of -0.24 (Sector-9) and maximum coefficient of 0.63 (Sector-15). In year 2010, average net-export coefficient in Lithuanian economy was 0.06, with minimum coefficient of -0.25 (Sector-9) and maximum coefficient of 0.58 (Sector-15). In year 2014, average net-export coefficient in Lithuanian economy was 0.09, with minimum coefficient of -0.24 (Sector-9) and maximum coefficient of 0.56 (Sector-15).

Lastly, in Figure 3, it presents import coefficient by sector in Lithuanian economy for year 2000, 2005, 2010 and 2014. In year 2000, average import coefficient in Lithuanian economy was 0.14, with minimum coefficient of 0.03 (Sector-26) and maximum coefficient of 0.57 (Sector-10). Sectors with import coefficient more than 0.14 included: Sector-5 (0.15), Sector-6 (0.19), Sector-7 (0.19), Sector-8 (0.18), Sector-9 (0.18), Sector-10 (0.57), Sector-11 (0.31), Sector-13 (0.26), Sector-15 (0.17), Sector-16 (0.14), Sector-17 (0.17), Sector-18 (0.19), Sector-21 (0.14) and Sector-24 (0.14). Other sectors had import coefficient less than 0.14. In year 2005, average import coefficient in Lithuanian economy was 0.20, with minimum coefficient of 0.03 (Sector-29) and maximum coefficient of 0.63 (Sector-10). In year 2010, average import coefficient in Lithuanian economy was 0.22, with minimum coefficient of 0.03 (Sector-12) and maximum coefficient of 0.65 (Sector-10). In year 2014, average import coefficient in Lithuanian economy was 0.24, with minimum coefficient of 0.04 (Sector-26) and maximum coefficient of 0.73 (Sector-10). Sectors with import coefficient more than 0.24 included: Sector-1 (0.27), Sector-4 (0.24), Sector-7 (0.30), Sector-8 (0.33), Sector-9 (0.28), Sector-10 (0.73), Sector-11 (0.53), Sector-13 (0.39), Sector-14 (0.22), Sector-15 (0.35), Sector-16 (0.28), Sector-17 (0.27), Sector-18 (0.39), Sector-19 (0.29) and Sector-24 (0.24). Other sectors had import coefficient less than 0.24.

Table 3 provides results of regression and correlation analysis between technology index and domestic trade coefficient, technology index and net-export coefficient and between technology index and import coefficient in Lithuanian economy for the year 2000, 2005, 2010 and 2014. Correlation coefficients between technology index and domestic trade coefficient were positive and very strong (r = 0.891 in year 2000, r=0.892 in year 2005, r=0.817 in year 2010, and r=0.871 in year 2014). Regression coefficients were positive (b=0.161 in year 2000, b=0.134 in year 2005, b=0.100 in year 2010 and b=0.098 in year 2014) and statistically significant as t-calculated were more than t-table at α=5% and DF=29, in all years of study. Theoretically, the relationship between technology and domestic trade is positive. The higher is technology index, the higher is domestic trade coefficient. Regression analysis showed that regression coefficients were positive and statistically significant. Data from Lithuanian economy empirically supports the theory.

Correlation coefficients between technology index net-export coefficient positive but very weak in year 2000 (r= 0.080), positive and weak in year 2005 (r=0.217), in year 2010 (r=0.283) and in year 2014 (r=0.381). Regression coefficients were positive (b=0.006 in year 2000, b=0.018 in year 2005, b=0.020 in year 2010) and statistically not significant, but statistically significant for year 2014 (b= 0.033). Theoretically, the relationship between technology

Table 3: Regression and Correlation Analysis for Lithuanian Economy

Correlation between:	Year 2000	Year 2005	Year 2010	Year 2014
Technology and Domestic Trade	r = 0.891 b = 0.161 t-cal = 10.577 t-tab =1.699*	r = 0.892 b = 0.134 t-cal = 10.602 t-tab = 1.699*	r = 0.817 b = 0.100 t-cal = 7.620 t-tab = 1.699*	r = 0.871 b = 0.098 t-cal = 9.548 t-tab = 1.699*
Technology and Net-Export	r = 0.080 b = 0.006 t-cal = 0.434 t-tab = 1.699*	r = 0.217 b = 0.018 t-cal = 1.197 t-tab = 1.699*	r = 0.283 b = 0.020 t-cal = 1.590 t-tab = 1.699*	r = 0.381 b = 0.033 t-cal = 2.216 t-tab = 1.699*
Technology and Import	r = -0.621 b = -0.109 t-cal = -4.191 t-tab = 1.699*	r = -0.618 b = -0.140 t-cal = -4.163 t-tab = 1.699*	r = -0.601 b = -0.089 t-cal = -3.977 t-tab = 1.699*	r =-0.668 b = -0.133 t-cal = -4.746 t-tab = 1.699*

*t-tab = 1.699 at α = 0.05 and DF = 29

and net-export is positive; the higher is the technology index, the higher would be the net-export coefficient. Empirical evidence from Lithuaniandata showed that the relationship was positive, however they were statistically not significant, except in year 2014.

Correlation coefficients between technology index and import coefficient were negative and strong in all year of study (r=-0.621 in year 2000, r=-0.618 in year 2005, r= -0.601 in year 2010 and r=-0.668 in year 2014). Regression coefficients were negative (b=-0.109 in year 2000, b=-0.140 in year 2005, b=-0.089 in year 2010, r=-0.133 in year 2014) and statistically significant as t-calculated were higher than t-table at α=5% and DF=29. Theoretically, the relationship between technology and import is negative; the higher is the technology, the smaller is import. Empirical evidence from Lithuaniandata support the theory; the higher was the technology index, the smaller would be the import coefficient.

This section highlights some important findings. Firstly, from descriptive analysis it could be seen that average level of technology in Estonian and Lithuanian economies tended to increase during the year of the study. However, in Latvian economy, average level of technology tended to decrease from 1.79 in year 2000 to 1.74 in year 2014. Average domestic trade in all countries tended to decrease. At the same time, average import tended to increase in all countries being studied. Net-export, positive balance of trade, tended to increase in all countries.

Secondly, technology determined domestic trade as correlation analysis revealed positive, very strong relationship between technology and domestic trade. Regression analysis showed that regression coefficients were positive and statistically significant. The higher was technology index, the higher was domestic trade coefficient. Data from Baltic states: Estonia, Latvia and Lithuania empirically support the theory. Thirdly, relationship between technology and net-export was unclear for Estonia and Latvia cases. For these cases, in year 2000 the relationship were negative but statistically were not significant. The highest point was technology index whilst the lowest index was net-export coefficient. In year 2005, 2010 and 2014, the relationship between technology and net export were positive and again, statistically were not significant. The higher was technology index, the higher was net-export. Data from Lithuanian economy, the relationship between technology and net-export was positive. The higher was technology index, the higher was net-export. However, the relationship was significant only for the year 2014. Empirical data for year 2000, 2005 and 2014 were not statistically significant. Finally, relationship between technology and import was clear. It was negative and statistically significant. Data from Estonia, Latvia and Lithuania support the theory. The highest index was technology index while the lowest was import coefficient.

4. Conclusions

Three conclusions could be taken. First, domestic trade relates to technology level. The higher was technology index, the higher was domestic trade. Data from Baltic states revealed that relationship between technology index and domestic trade coefficient was positive and very strong. Regression analysis showed that regression coefficient was positive and statistically significant. Second, relationship between technology level and net-export was unclear. In one case, the relationship was negative; the higher was technology index, the lower was net-export coefficient. In other case, the relationship was positive; the higher was technology index, the higher was net-export coefficient. Third, import was depended on technology level, but the relationship was negative. The higher is technology index, the lower would be the import coefficient.

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