

GUNDARS DĀVIDSONS

# MODELLING LONG-TERM COMPETITIVENESS OF LATVIA



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COMPETITIVENESS OF LATVIA**

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## ABSTRACT

The paper aims to measure competitiveness of exports and, hence, also competitiveness of Latvia as a state using foreign trade data. To find out whether Latvia's export capacity and the potential of competitiveness have improved after the country regained independence, a particular focus is on the respective recent dynamics. The theoretical model presented in the paper is a version of the assessment of current export dynamics. The model treats processes of the last decade as a more profound specialisation. Latvia is producing almost the same output as in the early-1990s, without much extra value added embedded in it. The EU accession undeniably boosts the export market share providing competitive advantages vis-à-vis other low-cost economies. Nonetheless, even in the presence of a positive short-term effect, it may adversely affect human capital over longer horizons. This implies that on behalf of the state a more active involvement in the build-up of industrial basis is desirable.

**Key words:** *competitiveness, comparative advantage, real convergence*

**JEL classification codes:** *F14, F19, O33, O47*

The views expressed in this publication are those of the author, senior econometrist of the Monetary Policy Department of the Bank of Latvia. The author assumes responsibility for any errors or omissions.

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## *ABBREVIATIONS*

ASEAN – Association of South East Asian Nations  
CIF – Cost Insurance and Freight at the Importer's Border  
CIS – Commonwealth of Independent Countries  
EU – European Union  
EU10 – Member States which joined the EU on May 1, 2004  
EU15 – EU before expansion on May 1, 2004  
FOB – Free on Board at the Exporter's Border  
GDP – Gross Domestic Product  
NAFTA – North American Free Trade Agreement  
S.E. – standard error  
SITC – Standard International Trade Classification  
UN – United Nations  
US – United States of America

## INTRODUCTION

The paper aims to measure competitiveness of exports and, hence, also that of the State of Latvia, using foreign trade data. To find out whether Latvia's export capacity and potential of competitiveness have improved after the country regained independence, a particular focus will be on the recent related dynamics. It is not simply a theoretical issue; for a small country, the anticipated long-term export performance underpins, to a great extent, the future equilibrium GDP level, because imports, as a rule, are related to income and must not notably exceed exports over a longer horizon. Accordingly, provided that the policy or model parameters do not change, exports are directly related to GDP in terms of foreign currency.<sup>1</sup> Theoretically, it is the potential exports of a small country that determine the national equilibrium development trends (GDP and, consequently, also welfare in terms of foreign currency).

When engaging in export growth forecasting for the coming months or even years, it is of little importance whether export indicators converge or do not converge toward some particular level over a longer term. In other situations, however, it is of considerable importance. First, exports of long-term equilibrium determine the amount of the current account deficit a country can afford. Under an optimistic forecast, the current account deficit does not pose problems; however, a likely future weakening of export activity may signal the need for early measures against potential future imbalances. Second, long-term export competitiveness is important as a "quality indicator" of the society, since exports are the best indicator of development trends within a country and its society, i.e. they show the extent to which the current policy and community architecture guarantee international competitiveness and, hence, also prosperity over time.

It should be noted that there are other competitiveness indicators. For instance, value added reflecting productivity growth in various sectors of the economy may be dealt with; however, this indicator may communicate inaccurate information and, therefore, other sector-specific indicators should be used as well. First, value added data are collected for excessively large product groupings. Second, data, often considerably affected by the short-time activity, are volatile and do not reflect long-term developments. For example, if more advanced technologies replace the out-dated equipment of a sawmill, value added picks up notably, yet competitiveness of the country (in terms of human ability to gradually improve skills and produce more advanced products) does not change due to the broadly unchanged level of overall skills.

Chapter 1 of the paper deals with Latvia's current export performance and its core weaknesses, which become apparent via modelling exports by applying standard

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<sup>1</sup> This, no doubt, is a simplified assumption, because other components of the current account are not taken into account (services imports and exports, transfers). The paper assumes that such other components are in equilibrium, i.e. they are balanced.

econometric methods to measuring equilibrium (long-term) exports. Chapter 2 addresses various methods usually used in measuring competitiveness and the long-term export potential of a country. Chapter 3 presents a theoretical model that might have underpinned Latvia's export dynamics so far.

Information from the UN Comtrade database, which uses SITC classification and also provides comparative data on other countries (a breakdown by the degree of processing, not materials involved), has been used in the study. Data for the period between 1994 and 2002 or 2003 have been analysed.

## 1. WEAKNESSES OF EMPIRICAL MODELLING

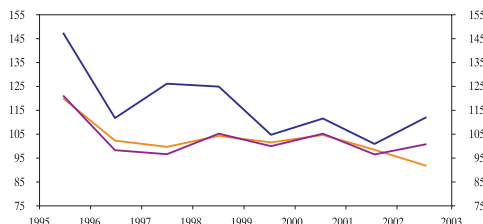
Since Latvia regained independence, its economic development has, to a great extent, been export-propelled, and the growth in Latvia's exports has significantly been above the EU average.<sup>1</sup>

Chart 1

**LATVIA'S EXPORT COMPETITIVENESS:  
ANNUAL GROWTH DYNAMICS OF  
LATVIA'S EXPORTS AND EU15 AND  
GERMAN IMPORTS<sup>1</sup>**

(year-on-year; %)

— Total import growth of EU15  
— Export growth of Latvia  
— Total import growth of Germany



<sup>1</sup> UN Comtrade database trade data (nominal; in US dollars).

Source: author's calculations using UN Comtrade data.

With Latvia's export growth exceeding the total growth of EU imports (also GDP growth, though to a lesser extent), data in Chart 1 seem to point to a high-level competitiveness of Latvian products over the last decade, which implies an increase in Latvia's export share. At the same time, the gap between import growth in EU countries and Latvia is shrinking.

In modelling exports, the key question is: what does export growth converge toward? Simple relationships of economic activity imply that in general over a longer horizon, export growth cannot exceed the global growth indicators without giving rise to a distorted situation where export growth of one country constantly exceeds that of all other countries, thus making the share of the former constantly expand but that of the latter shrink at the same rate. Over a longer term, such a situation is not possible as it would mean that the global economy becomes gradually dominated by exports from a single country.

<sup>1</sup> Export and import data recorded at different prices (CIF and FOB) cannot be compared, yet the growth rate should be comparable.

A simple model demonstrates how, by applying standard methods of modelling, an error in measuring long-term export potential may occur. Let us assume that the world is comprised of a number of similar states with the wage level  $w$  uniformly distributed (the pay for which people agree to work differs depending on wages in other sectors). Let us look at a simple commodity produced in conditions of perfect competition, with wages being the only related cost. For the sake of simplicity, let us also assume that each country produces only one unit of the given commodity and utilises only one unit of labour (this and other up-coming "unrealistic" assumptions meet the need of model streamlining for the purpose of making it easily understandable; similar results can be attained when more complicated production functions are involved).

Consequently, the given production function is  $p = w_i + \pi_i$ , and  $\pi_i > 0$  is the profit. Chart 2 shows the market situation for each product. The countries (companies) where wages exceed  $p$  do not produce for the given market, while those with wages below  $w_i$  do produce for the market but the profit level earned differs.<sup>1</sup> Thus, for a marginal country where  $p = w_i$  profit is zero, the move to  $w = 0$  is accompanied by an increase in the profit of its respective company. The price  $p$  is the global equilibrium price. The height of the square is constant  $c$  (amount that can be produced by one market participant), and the global market lacks elasticity regarding the price (a constant amount of goods irrespective of the price is demanded).

Chart 2

**DISTRIBUTION OF COMPANIES IN A SECTOR**

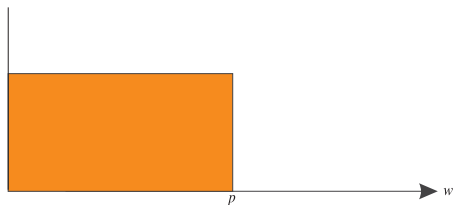


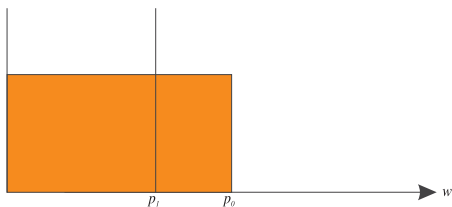
Chart 3 illustrates the situation where new countries able to manufacture goods at a lower price enter the market. We assume that production costs of all the new entrants in the global market are the same ( $w_i$ ). The former price is  $p_0$ , new countries enter the global market, and the potential producers are ready to produce at the minimum price  $w_i = p_1$ .

Nothing seems to change at the beginning, and no new companies enter the market (as there are simply no vacant market segments for them). Those enterprises whose costs exceed the price ( $w_i > p_1$ ), suffer losses. It does not necessarily imply that they

<sup>1</sup> The part above  $w_i$  is profit. It seems a hardly logical assumption implying different profit levels in different countries, which, in turn, points to disequilibrium (in search of profits all companies are eager to move to low-cost countries). In author's opinion, however, it efficiently reflects the situation in some sectors with so-called natural boundaries, e.g. wood industry where the production scope is limited by the state through imposing felling quotas, and also sectors with limited resources, e.g. agriculture.

Chart 3

**ENTRY OF NEW LOW-COST RIVALS INTO THE SECTOR**



immediately go bankrupt, as there are always hopes for the market dynamics to reverse. Thus, we assume that companies exit from the market only at the point when the income of the respective period does not cover the amount of their accrued debt (the amount lost). Hence the condition for exiting from the market is

$$p_l + \sum_0^l (p_l - w_i) < 0 \quad [1]$$

or, assuming that there are no currency revaluations or devaluations in period

$p_l < -t(p_l - w_i)$ , the effective time for a business to exit from the market is

$$t = - \frac{p_l}{(p_l - w_i)} \quad [2].$$

Consequently, the exit from the market directly depends on the loss incurred by the company at each given period. The smaller the loss incurred, the later the exit from the market occurs (longer  $t$ ).

As the distribution of companies is uniform, the share of those going bankrupt at time

$t$  is  $\frac{p_0 - \omega_i}{p_0}$ , with  $\omega_i \neq p_l$  being the highest wages in the sector at period  $t$ .

Expressing from equation [2]  $\omega_i = p_l \left( I + \frac{I}{t} \right)$ , and combining it with  $\frac{p_0 - \omega_i}{p_0}$ , we obtain

$$\frac{p_0 - \omega_i}{p_0} = I - \frac{p_l}{p_0} \left( I + \frac{I}{t} \right).$$

The first derivative of time  $t$  is positive in this equation, while the second one is negative; it implies that the number of bankrupt companies does increase with time but the

pace decelerates. It is, likewise, immediately clear that  $\lim_{t \rightarrow \infty} \left( I - \frac{p_0 - \omega_i}{p_0} \right) = \frac{p_l}{p_0}$ , i.e. the

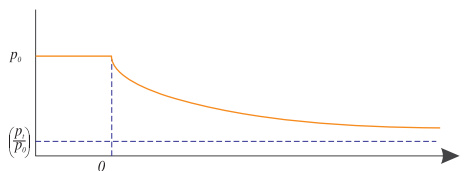
non-bankrupt part of the so-called "old companies" moves toward a new equilibrium over time where the "old companies" are represented by remaining  $\frac{p_l}{p_0}$ , while the rest

of the market has been occupied by the new entrants. The exit of the "old companies" from the market can be graphically depicted as shown in Chart 4.



Chart 4

DECREASE IN MARKET SHARE OF  
"OLD COMPANIES"



How does it refer to exports of Latvia? This simple model reflects the mechanism for ousting. Initially, in the "newly-discovered countries" (like former "ex-socialist bloc" countries) whose exporters take the place of those exiting from the market, export expansion proceeds at an extremely rapid pace. At the same time, the expected long-term growth of the sector in this model is equal to zero (the outcome is the same also under a long-term "equilibrium" growth; then the long-term growth, though exceeding zero, still differs from the short-term indicator). At time periods slightly to the right from zero, the forecasting of export growth (first derivation) will always produce positive coefficients irrespective of the empirical method used (e.g. the ordinary least squares), meaning that the long-term growth forecast will not be zero but always a positive figure. Moreover, the application of, say, ECMs (error correction models) will result in this positive model relationship being misleadingly interpreted as a long-term one.

To a great extent, the results stem from the assumption of uniform distribution. It is true that other distribution models can be used, yet they would not change the point because the initial export growth is a weak indicator of the long-term situation under almost any type of distribution.<sup>1</sup>

For instance, Chart 1 shows that, if the long-term export function were to be modelled on the basis of GDP in the EU in 1996, the application of any generally-accepted technique would produce predominantly optimistic coefficients that would not be consistent with the actual developments later: at that time, it could have been sound to forecast that Latvia would capture a large share of the EU market within 10–15 years. It has not happened in reality, and, taking into account the size of Latvia's economy compared to the total EU market, such a trend is not logical.

For a shorter time period, however, including current data will always produce a more efficient forecast than that of the zero growth. It also gives an insight into general problems of forecasting country exports (or any other indicators of transition economies); on the one hand, the state cannot incessantly expand its market share and there does exist a value (share) toward which it converges, but on the other hand, it might be wrong to reckon with this value in forecasting, as the convergence point

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<sup>1</sup> To preserve a stable export growth under this model, only "sloping distribution" will be suitable, with profit positively correlating with the number of companies (manufactured units), i.e. the market is dominated by companies earning enormous excess profit and only few do not make any profit at all.

might be unreachably far away and have little impact on current indicators. Therefore, it is important to determine, at least indicatively, the point, usually also referred to as country's competitiveness, toward which a country converges. Using indirect data offered by foreign trade statistics, the paper aims at investigating whether convergence points under generally accepted models are at least consistent with the previous experience.

## **2. LONG-TERM COMPETITIVENESS OF LATVIA**

We shall deal with export potential (competitiveness) by applying various generally accepted methods involving export data. Theoretically, all such research methods are based on the assumption that in their international specialisation countries use the resources that are abundantly available and, therefore, cheaper. Thus, avoiding problems related to resource accounting (e.g. human capital or simple labour capital accounting, which may turn into a relatively problematic activity), it may be assumed that the current export structure truly reflects the resources endowment.

### **2.1 Export Production-Specific Features**

One of the most widely-spread methods for measuring competitiveness of a country is to identify production-specific skills via studying its production processes. Thus, export goods demonstrate the actual relative competitive advantages of a country. As the task of categorising is time-consuming and technically complicated, the division already employed in other research papers is used.<sup>1</sup> The so-called Schulmeister taxonomy (14) is applied in this study. According to it, exports of manufactured goods are divided into several groups depending on product-specific qualities:

- a) human capital, high technologies, labour intensive products;
- b) human capital, high technologies, physical capital intensive products;
- c) human capital, medium technologies, labour intensive products;
- d) human capital, medium technologies, physical capital and resources intensive products;
- e) human capital, medium technologies, physical capital intensive products;
- f) human capital intensive, other products;
- g) resources intensive, weak products;
- h) resources intensive, strong, human capital intensive products;
- i) resources intensive, strong, other products;
- j) physical capital intensive products;
- k) labour intensive products.

This breakdown refers only to manufactured goods according to SITC Rev. 3 classification. It implies that the bulk of goods manufactured in Latvia do not fall under this division as they are classified as inputs (despite the fact that in some instances such goods may be complicated to produce, they are marked as "unprocessed goods" in charts).

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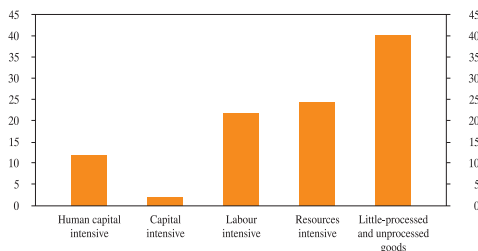
<sup>1</sup> In measuring competitiveness, such an approach has been used starting with a simplified (13; 5) and finishing with a rather complicated distribution (14).

Charts 5 and 6 show that in 2003 a relatively small share of Latvian exports came under the groups providing for long-term competitive advantages (such may be human capital intensive and, in part, also resources intensive industries) and, hence, considered sustainable in a long-term perspective. Major industries in the human capital intensive group are those under codes 778 (manufacture of electrical machinery and apparatus n.e.s.), 541 (manufacture of medical and pharmaceutical products, excluding those under code 542) and 764 (manufacture of telecommunication equipment and components n.e.s. and relating to code 76). Groups of labour intensive as well as little-processed and non-processed goods are subject, to a great extent, to a risk of future cost increases (particularly wage increases).

Chart 5

**LATVIA'S EXPORTS IN THE BREAKDOWN BY COMMODITY PRODUCTION FACTOR INTENSITY IN 2003<sup>1</sup>**

(% of total exports)



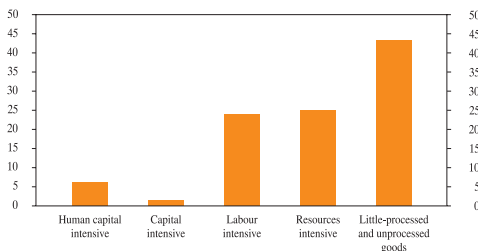
<sup>1</sup> Data in compliance with SITC Rev. 3 classification.

Source: author's calculations using UN Comtrade data and the Schulmeister taxonomy (14); see Appendix 1.

Chart 6

**LATVIA'S EXPORTS TO THE EU, NAFTA AND ASEAN IN THE BREAKDOWN BY COMMODITY PRODUCTION FACTOR INTENSITY IN 2003**

(% of total exports)



Source: author's calculations using UN Comtrade data and the Schulmeister taxonomy (14); see Appendix 1.

The analysis of exports to countries outside the CIS (in this case, exports to the EU, NAFTA and ASEAN; see Chart 6) provides an even less favourable picture. It testifies to a different level of competitiveness in different markets, i.e. a great number of Latvian producers of human capital intensive output are competitive only in the CIS market. Latvia's advantages in the EU market are related only to exporting resources intensive and labour intensive goods. In 2003, major sub-sections in the human capital intensive export output classes were groups under "other"<sup>1</sup> products – code 773 (equipment for distributing electricity, n.e.s.) and 793 (ships, boats (including hovercraft) and floating structures; this class notably grew in 2003 implying an effect of a one-off sales factor).

<sup>1</sup> See the breakdown in Appendix 1.

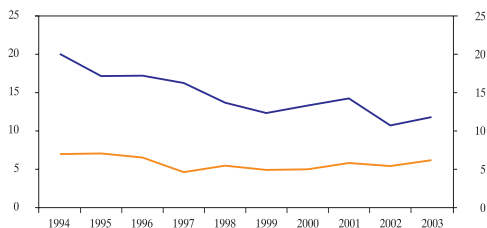
It should be noted that figures in the given charts do not feature absolute export volumes but the ratios to total exports, yet the structure is important, as it indicates the market-dominating type of companies and highlights the skills that are demanded by the labour market. However, for the estimation of the growth trends, the development dynamics in 2003 rather than its indicators would be more interesting to analyse. If over a longer time horizon substantial expansion of exports is projected, the only way for the state to attain it would be a gradual transition from lower production levels to higher ones. Export dynamics over some last years will be assessed from this perspective (see Chart 7).

Chart 7

**DYNAMICS OF HUMAN CAPITAL INTENSIVE OUTPUT RATIO TO EXPORTS IN 1994-2003**

(% of total)

— Ratio of human capital intensive output to exports to the EU, NAFTA and ASEAN  
 — Ratio of human capital intensive output to total exports



Source: author's calculations using the Schulmeister taxonomy (14); see Appendix 1.

The results obtained do not suggest that the tendency to manufacture more human capital intensive products is observable Latvia. Also, the shift of export markets from Russia to the EU in the late-1990s due to the 1998 financial crisis in Russia cannot be assessed as favourable because comparative advantages of the Russian and EU markets differ. With an exit from Russia's market, Latvia also lost its human capital intensive industries. EU, NAFTA and ASEAN markets seem to stagnate, and the ratio of human capital intensive products has long remained broadly unchanged at slightly above 5% (with declines in 1996 and 1997 primarily due to a substantial expansion of wood exports).

This approach according to which the inclusion of a product into a definite class depends only on the technological complexity of the production process, i.e. what knowledge and other resources are required to produce the particular commodity, has several drawbacks.

First, it is not accounted that a commodity may not be produced in a single country but its production may be moved to another state if it proves cheaper at some stage of the production process. In recent decades, the international trade has primarily strengthened due to a more sophisticated labour division within the production process, not the growth in final goods trade. All production activities requiring no specific knowledge and consisting of monotonous labour where simple skills are needed are moved to countries with cheap labour or low labour costs. For example, cars and electric equipment are mainly assembled in low-cost countries, while the processes

requiring more sophisticated skills are carried out in developed countries. This may make people in developing countries have a distorted perception of their export potential. In the case of Latvia, it only points to a probably much the same situation in other countries as well. Hence the export potential may become exaggerated, implying a number of high-tech industries in areas where they are actually absent (see Box); the opposite, however, is unlikely.

**Box**  
**Estonian "Miracle"**

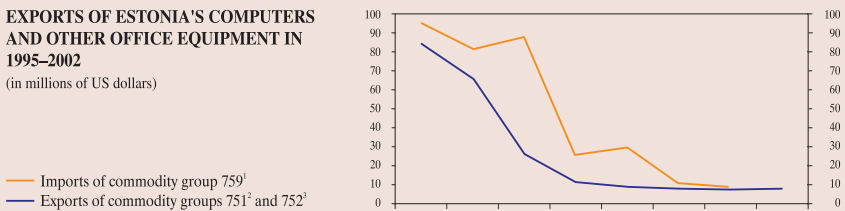
Of the Baltic States, Estonia, largely owing to the efforts of foreign journalists, was ranked as the leader of the economic growth in the mid-1990s. This ranking was underpinned by the strong foreign trade performance, which pointed to an extremely notable increase in high-tech exports. For example, commodity group 75 under SITC classification (office machines and automatic data-processing machines) accounted for almost 10% of the total exports in 1995, pointing to an eventual Estonian "leap" in the production of high-technology output.

However over time, exports in these areas fell rapidly (see Chart 8), which seems contradictory to the theory according to which it is the production of high-technology goods that should be less dependent on various shocks or wage growth.

Chart 8

**EXPORTS OF ESTONIA'S COMPUTERS AND OTHER OFFICE EQUIPMENT IN 1995–2002**

(in millions of US dollars)



<sup>1</sup> Parts and accessories (other than covers, carrying cases and the like) suitable for use solely or principally with the machines of groups 751 and 752.

<sup>2</sup> Office machines.

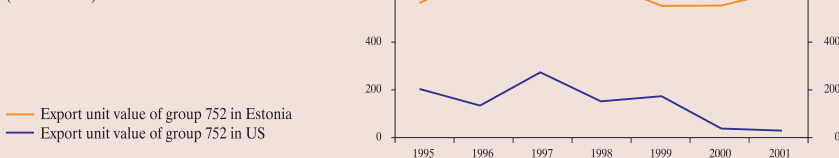
<sup>3</sup> Automatic data-processing machines and units thereof; magnetic or optical readers, machines for transcribing data onto data media in coded form and machines for processing such data, n.e.s.

Source: author's calculations using UN Comtrade data.

Why did it happen? Chart 8 demonstrates that, to a great extent, exports are correlated with imports of parts in group 75 (the greater amount of parts might seem to point to negative value added, yet their large share is intended for local use; hence total imports of parts are not to be related to the export volume, though the trend is unambiguous). Possible reasons for such a collapse of the industry are clear from Chart 9. In comparison with US sales, the export unit value is substantially lower, which might point to low revealed product quality and indicate that products belong to different categories.

Chart 9

**EXPORT UNIT VALUE OF GROUP 752 IN US AND ESTONIA**  
(in US dollars)



Source: author's calculations using UN Comtrade data.

It leads to a conclusion that, possibly, exports of high-technology products were mainly secured by simple assembly activities, while the sharp fall in the output of this product group was a mere adverse result of a wage rise, which, in turn, deprived the respective goods of competitiveness, particularly in an overall crisis situation of the sector.

The decline in this industry was substantial. Other industries, like the branch of telecommunication and sound recording and reproducing equipment and apparatus, did not display any shrinkage, though it is also true that neither export volumes nor ratios to total exports of these industries had grown. Over time, the EU accession is expected to lower transport and business costs compared to other low-cost countries; over a longer horizon, however, these export sectors will figure as risk factors compared to, for instance, exports of resources intensive goods.

Second, various combinations of inputs can be used in manufacturing products of one group. For example, agricultural production is likely to become more capital intensive in the EU countries, while in less advanced economies it continues to be labour intensive (it might greatly refer to the commodity group previously classified as "little-processed and unprocessed goods", though production technologies are relatively highly standardised). Accordingly, wine produced in France would be classified under "unprocessed goods", but footwear of Italy would fall in the category of "labour intensive goods". It is not quite accurate, as the bulk of value added for both product groups is not generated via production process but rather by reputation and marketing, i.e. they are more likely advertising intensive (or human capital intensive according to the terminology used in this study) but such classification is missing in this division. Though this effect is apparently typical for the output of the old EU countries, it does not greatly distort the assessment of Latvia's export structure, relative to exports to the EU countries in particular.

Third, changes in technologies used should be accounted for. The division used in the study (14) refers to the early-1990s. A great part of the then innovative and knowledge intensive output currently is no longer such, hence the data may, in part, be obsolete.

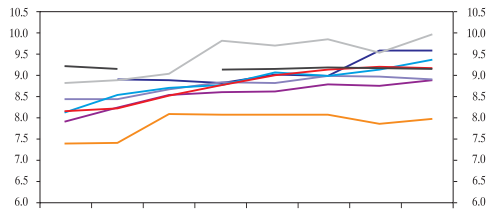
## 2.2 Potential Sectoral Export Growth

Another way how to estimate the potential export growth is to assess progress in those sectors in which an economy is specialising. Building on the previously experienced trade pattern in particular goods, the latter are divided into dynamic (trade has notably increased) and stagnant (with almost no growth in trade) sectors. Provided that exports have recorded a constant rapid increase but the sectors of economic specialisation are stagnating, the growth rate is likely to decelerate swiftly in the future, i.e. shrinkage in future exports should be reckoned with when modelling the long-term export potential.

Aggregated UN information on export growth in various SITC 3-digit code classification categories between 1980 and 1998 has been used in the study.<sup>1</sup>(13, p. 87) For measuring Latvia's potential export growth, the weighted indicator in the breakdown by export groups has been used (weighted against a ratio to total exports). Chart 10 reveals that of the eight new EU Member States (Cyprus and Malta excluding), Latvia's indicators are not among the best. On the back of the global trade growth in the 1980s and 1990s, Latvia's export growth should have been around 8% in 2001 (the weighted average of all groups of Latvia's export goods). Compared to the 8.4% weighted average of the global export growth, the gap is relatively insignificant. However, no signs of any significant export restructuring to more dynamic export-oriented sectors have been observed.

Chart 10

### EU10 POTENTIAL EXPORT GROWTH DYNAMICS IN 1994–2001<sup>1</sup>



<sup>1</sup> Cyprus and Malta are not included; 1996 data for Slovenia and 1994 data for Estonia are not available.

Source: author's calculations using UN Comtrade data.

The weakness of this method consists in the fact that growth in trade between advanced and less advanced countries usually depends on technological developments rather than an increase in the demand for the goods of some sector, implying that the streamlining of technological processes encourages a partial relocation of production processes to countries offering lower costs. Accordingly, countries that recently opened their markets to goods and investment specialise in the production of such categories of goods whose trade has grown more substantially. However, this regularity is unlikely

<sup>1</sup> According to this approach, data presented in this paper do not include classes of petroleum and fuels (SITC Rev. 2 has been used; codes 322 – coal, 323 – coke and briquettes, 334 and 335 – oil products, 341 – gas) as well as inadequately defined classes (286 – uranium or thorium ores and concentrates, 333 – crude oil, 351 – electric current, 675 – iron, steel hoop, strip, 688 – uranium and thorium, 911 – postal packages, 931 – not classified goods, 961 – coins and 971 – gold).

to refer to the future developments. For example, if competition compels many EU15 clothing producers to move their businesses to low-cost countries, the expansion of trade volume is the result; yet it does not necessarily imply that the expansion will be permanent. Following the relocation of enterprises, the growth rate returns to the standard indicators of the sector, which depend on technological progress and changes in the demand.

### 2.3 Unit Value as Estimator of Export Potential

The comparison of unit values is another method for assessing export competitiveness. It has been used in a number of papers (see, for instance, 11; 1). Nonetheless, the significance of this approach can be subject to doubt for the same reason as the division previously described, for it is the processes rather than the degree of processing that are important. For example, in the car industry the labour intensive car assembly is often carried out in a country where labour costs are low, whereas knowledge intensive activities are the prerogative of high-cost labour countries. Such a division of labour results in the low-cost labour country exporting final products and the country intensively using knowledge in the production process exporting parts. Consequently, the unit value produces a distorted picture of the generated value added.

However, in forecasting export growth and determining its quantitative or qualitative character, a greater focus should be on export dynamics. Indeed, the latter can be measured by changes in unit value, i.e. even in a situation similar to the one previously described where the unit value plays an insignificant role, *relative changes in the unit value* still show whether processes taking place in a country have or have not been subject to adjustments. An increase in the unit value relative to respective industry's export unit value in Latvia would indicate that the Latvian commodity, compared to previous periods, has gained some extra value added and that export restructuring has taken place.

A simple dynamic model has been tested by regressing relative export unit values of the previous period to the existing ones (in this case, Latvia's export unit value data are those of EU imports from Latvia).

$$\frac{UV_{LV,j,t}}{UV_{EU,j,t}} = A_t \cdot \varepsilon_{j,t} \cdot \left[ \frac{UV_{LV,j,t-1}}{UV_{EU,j,t-1}} \right]^\alpha \quad [3]$$

where

- $UV_{LV,j,t}$  is the unit value of EU imports from Latvia for product group  $j$  in period  $t$ ;
- $UV_{EU,j,t}$  is the unit value of imports within EU for product group  $j$  in period  $t$ ;
- $A_t$  is overall trend of the relative export unit value;
- $\varepsilon_{j,t}$  is random effect for each product group;
- $\alpha$  is elasticity.



It is expected that by regressing the equation, the coefficient  $\alpha$  would be positive but smaller than or equal to  $I$  (a negative coefficient would mean that values  $t$  and  $t+I$  are constantly growing, and the coefficient above  $I$  would point to the system where the growth rate of the unit value is constantly increasing, which is rather unrealistic).

In the equation, coefficient  $A_t$  describes overall impact on all groups. If the coefficient is above  $I$ , the value increases for all product groups relative to the EU average value; if it falls below  $I$ , worsening has happened, and if  $A_t = I$ , the trend is neutral.

As in any model, this is a simplified approach to the real situation and as such it has a number of drawbacks. Thus, the possibility of an asymmetric technological improvement (i.e. an unrelated technological innovation instead of a human capital improvement) in a sector is not accounted for (e.g. the equation represents the replacement of the previously used material by a lighter substance as an increase in human capital). Nevertheless, it should be noted that such changes do not seem to be regular and similar for all sectors, i.e. they are occasional in nature and already embedded in coefficient  $\varepsilon_{j,t}$ .

Taking the log of the equation for the ease of calculations, we obtain:

$$\log\left[\frac{UV_{LV,j,t}}{UV_{EU,j,t}}\right] = \log(A_t) + \alpha \log\left[\frac{UV_{LV,j,t-I}}{UV_{EU,j,t-I}}\right] + u_{j,t} \quad [4].$$

So written, the equation refers to only one group of goods and would be difficult to solve because, first, coefficients have a limited descriptive capacity due to the absence of other variables for each group, and, second, in Latvia's circumstances time series would be too short to engage in significant computations.

As the overall country is in the focus of this study, the solution can be reached by the random effects panel regression in the breakdown by commodity groups employing the ordinary least squares estimation. In this case, it is assumed that effects of other variables on commodity groups are random and a large number of observations are obtained. The resulting equation is as follows (the relative value expressed as equation

$$\log\left(\frac{UV_{LV,j,t}}{UV_{EU,j,t}}\right) = rv_{j,t} \text{ and } \log(\varepsilon_{j,t}) = u_{j,t} \text{ } \log(A) = a): \quad \begin{bmatrix} rv_{1,t} \\ rv_{2,t} \\ \cdot \\ \cdot \\ rv_{j,t} \end{bmatrix} = \begin{bmatrix} a \\ a \\ \cdot \\ \cdot \\ a \end{bmatrix} + \begin{bmatrix} \alpha \\ \alpha \\ \cdot \\ \cdot \\ \alpha \end{bmatrix} \begin{bmatrix} rv_{1,t-I} \\ rv_{2,t-I} \\ \cdot \\ \cdot \\ rv_{j,t-I} \end{bmatrix} + \begin{bmatrix} u_{1,t} \\ u_{2,t} \\ \cdot \\ \cdot \\ u_{j,t} \end{bmatrix}.$$

The equation also foresees a total  $\alpha$  value. As on the average the relative value should converge toward value  $I$ , it could be a realistic assumption because it implies that under realistic  $\alpha$  values ( $0 < \alpha < I$ ),  $rv_{j,t}$  tends to decrease if they are above  $I$ , and to increase if they are below  $I$  (i.e. the model accounts for the fact that the relative value

in an individual commodity group cannot continuously be much higher than the relative value in the EU). Consequently, the value harmonisation effect (tendency for  $rv$  converge toward 1) has been distinguished.

## Data

For comparative purposes, the data of the UN Comtrade database over 1994 to 2002 for all SITC (Rev. 3) 3-digit code commodity groups with the total export value within each group exceeding USD 10 000 per annum are used. Calculations involve only exports to the EU as a more efficient determinant of Latvia's international competitiveness in contrast to exports to the CIS countries, which still bear, at least in part, some resemblance with the USSR export trends. Data for commodity groups are:

$UV_{LV,j,t}$  is the unit value: USD/kg for EU imports from Latvia, expressed in US dollars for commodity group  $j$  in year  $t$ ;

$UV_{EU,j,t}$  is the unit value: USD/kg for EU imports from other EU countries, expressed in US dollars for commodity group  $j$  in year  $t$ .

This calculation builds solely on values that exceed USD 10 000 but, as the panel data are not balanced, incomplete time series are also taken into account. Calculations rest upon those commodity groups whose volume is measured in tons. It means that commodity groups where litres or pieces are the only unit of measure are ignored (it would not bring about a significant difference, for in a lot of commodity groups where accounting under "alternative categories" exists, it is carried out also in tons).

## Calculation results

As noted before, all product groups, when building on particular assumptions, display a common trend towards a relative decrease in the unit value. The shrinking of the human capital share, which is embedded in any export commodity, might figure as one of a number of explanations. Nonetheless, combining of empirical description with a theoretical model should be approached with caution. Any empirical fact can be supported by a great number of theoretical models.

On the other hand, however, it can be stated with considerable certainty that the human capital share in exported goods has not increased (as no data point to it).

Table 1 shows that Latvia lags behind other Baltic States in terms of competitiveness. In fact, none of the Baltic States displayed any sharp improvement in competitiveness compared to EU countries in the period between 1994 and 2002, and nothing points to a possibility of an automatic economic convergence toward an "EU average indicator". Over a longer horizon, the Lithuanian economy seems to be the strongest in terms of competitiveness, with the coefficient insignificantly deviating from zero, which implies that  $A_t = 1$ ; in Estonia, the coefficient deviates from zero significantly ( $-0.055$ ), implying that  $A_t = 0.95$ .

Table 1

CHANGES IN THE RELATIVE UNIT VALUE<sup>1,2</sup>

	Coefficient of log( $A$ )	$A$	$\alpha$
Latvia	-0.10 (0.000)	0.90	0.62
Estonia	-0.055 (0.001)	0.95	0.63
Lithuania	-0.003 (0.84)	1	0.86

<sup>1</sup>  $p$  value in the brackets. See the results in Appendix 2.

<sup>2</sup>  $R^2$  equation values are very low, as each sector is influenced by sector-specific factors. In this case, the focus is on revealing the overall development trend irrespective of its strength. That explains the choice of these results despite the low  $R^2$  values.

Unfortunately, the coefficients in the Table are not quite correct, because, as in all conventional dynamic models, coefficients are biased in a limited sample, and all tests and coefficient values build on asymptotic properties, i.e. time series models if  $t \rightarrow \infty$ . In the case of a panel regression where  $t$  is only 8, this assumption may not be realistic.<sup>(9)</sup> The assumption that  $N \rightarrow \infty$  would, likewise, be absurd, because the commodity groups are limited in number and, accordingly, the assumption  $t \rightarrow \infty$  is to be used, which, in turn, makes the tests asymptotically unbiased (an approach similar to, for instance, 4).

## 2.4 Export Restructuring

The method used in the previous chapter did not reveal any notable adjustments in export structure within trading groups. This method uses SITC (Rev. 3) 3-digit code classification; if export potential strengthens due to the transition from one SITC classification category to another, this effect is not observed. Moreover, these changes cannot be estimated by methods developed so far; at the same time, it is possible to assess whether such changes have been of any significance at all.

To accomplish it, the simplest way is to employ an index. This study uses an index calculated on the same grounds as the Export Similarity Index (employed, as a rule, to compare export structures of two countries, i.e. to assess to what extent the two countries are rivals in a given market segment), which might reveal how significant the on-going structural changes are:  $INDEX = \sum_i \min[share_{i,t}; share_{i,t-1}]$ .

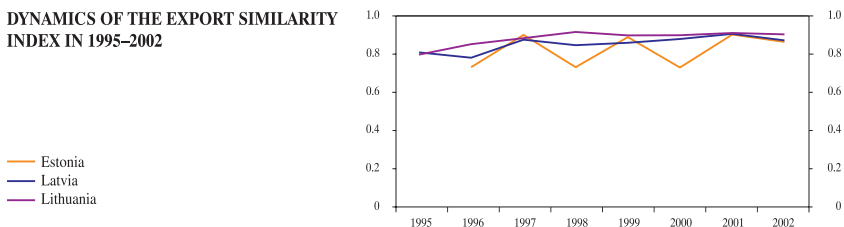
First, the export ratio of a particular commodity group to total exports is calculated, then via comparing it with the indicator of the previous year, the smallest number is selected, and finally, all the smallest indicators are added up.<sup>1</sup> The calculation of this

<sup>1</sup> For example, in the model of two countries and two sectors, if one country specialises in production of agricultural products and the other in manufacturing of industrial goods, the index is 0 ((min (1.0) + (min (0.1))).

index for industrial output<sup>1</sup> in the three Baltic States using SITC classification 3-digit code database suggests that export restructuring mainly took place in the mid-1990s (see Chart 11). However, it is quite a problem to draw statistically significant conclusions. The data for Lithuania and Latvia seem to indicate that export restructuring has, to a great extent, been accomplished, resulting in a stable specialisation model. Vastly ranging fluctuations of the Estonian data are peculiar and complicated to explain. They are quite likely to be associated with the trends discussed above: the geographical proximity to Finland allows of quick location (and later also dislocation) of various plants enjoying short-term advantages in Estonia.

Chart 11

**DYNAMICS OF THE EXPORT SIMILARITY INDEX IN 1995–2002**



Source: author's calculations using UN Comtrade data.

## 2.5 Other Methods

For the purpose of assessing the ability to compete, economic competitiveness-related indicators of different sectors are widely used. There is a great number of studies, among them also the work by J. Sachs *et al.* published in 2000 (11), using weighted averages of a variety of indices that, according to the authors, are determinants of competitiveness: exports, international organisation-constructed indices of economic openness and democracy, foreign direct investment, education, life expectancy etc (see Chart 11 for detail). Table 2 presents indices calculated by the above group of authors for EU10 (excluding Cyprus and Malta).

This method has a number of drawbacks. It is somewhat subjective (weights attributed to various indices are freely selected, and a direct theoretical link with country's competitiveness and indicators is missing). On this background, the unclear causality is likely to rank as the most distorting weakness. A large part of employed competitiveness indicators can be interpreted as effects of the attained welfare (e.g. life expectancy, foreign investment, existence of stock markets etc).

<sup>1</sup> The 4th to 9th categories of SITC Rev. 3 classification; agricultural products and mineral fuels are not included, as these commodities present sizable variations and depend primarily on assigned quotas, thus being unimportant determinants of competitiveness; moreover, the results obtained with mineral fuels included are similar.

Table 2

**COMPETITIVENESS INDICES**

State	Competitiveness index
Hungary	2.027
Czech Republic	1.847
Poland	1.555
Estonia	1.228
Slovenia	0.920
Lithuania	0.774
Latvia	0.738
Slovakia	0.702

**3. POSSIBLE THEORETICAL BACKGROUND**

A model built in this Chapter provides an explanation for the previously observed paradox: the high percentage growth combined with an increasing specialisation in producing output with low value added. It should be noted that the given model and the resulting conclusions are to be taken as one of several possible explanations for economic interaction dynamics between Latvia and other countries.

The following model can be described as a "learning by doing" type based on the works by P. Romer (10) and K. Arrow (2). It discusses several trends of the last decades:

- 1) increasing welfare differences in developed countries;
- 2) increasing welfare differences between developed and developing countries;
- 3) expansion of global trade;
- 4) support to liberalisation of global trade and capital flows in both developed and developing countries;
- 5) GDP short-term convergence.

**3.1 The Model of One Country**

**3.1.1 Labour Market, Companies and Consumption**

a) Consumers

For consumption structure, intertemporal optimisation set-up has not been used in this paper, and the saving rate from income  $\theta < \left(\frac{\beta}{\beta + I}\right) < 1$  is assumed as constant: in period  $t$ , a person saves a total amount  $\left(\frac{\beta}{\beta + I}\right)w_t$ , where  $w_t$  is wages.

## b) Labour market

The labour market is divided, with its labour force made up of two – human capital and simple labour – types of workers:

$$\bar{H} + \bar{L} = N$$

where

$\bar{H}$  is the stock of human capital type workers available in a country;

$\bar{L}$  is the stock of simple labour type workers available in a country;

$N$  is the total labour force (the bar means "the whole stock"; letters not topped with a bar imply that not all workers of this type are used and other factors determine their number).

It is assumed that the shares of simple labour type and human capital type workers are constant. Simple labour type workers cannot be used in sectors where human capital type workers are needed. The latter, however, are able to work in any sector:

- manufacturing requiring only human capital type workers;
- manufacturing where only simple labour is needed;
- agriculture.

Compared to other human capital models, the concept of human capital here is somewhat different. Human capital does not represent any particular profession; in this model, any person able to increase the advantages of a country-specific product using previous knowledge belongs to the group of human capital type workers. It may be a researcher with rich scientific background, or a marketing specialist with basic education and the right feeling for market needs. However, a skilled engineer without an ability to produce a new country-specific commodity shall not be treated as belonging to human capital type workers.

## c) Production

The economy of a country consists of the following three sectors:

– agricultural goods sector. To ensure the production process, this sector can do with simple labour ( $L$ ; but human capital type workers can also be employed). By using simple technologies and only simple labour, this sector produces homogenous products that can be internationally traded. Applicability of the model prompts the assumption that the product is consumed by agricultural producers only. Grain may be an example of such a product;

– inputs manufacturing sector. This production segment makes use of only simple labour ( $L$ ) and physical capital ( $K$ ). Constant returns to scale and free entry/exit characterise it. No build-up of knowledge is typical for those working in this sector, and production per capita of capital and labour does not increase along with an overall

strengthening of production. The output of this sector is solely consumed as inputs by the final goods production, and may include such products as TV sets traded under a transnational brand or wood made ready for furniture or paper manufacturing. The production of these goods does not require any build-up of country-specific knowledge, i.e. the process can easily be moved to another country;

– final goods manufacturing sector. It is characterised by constant returns to scale at the company level but increasing returns to scale at the industry level. This sector uses only human capital type workers ( $H$ ), and its final output is consumed by simple labour type workers of the inputs sector, human capital type workers and capital owners. These production processes require substantial, previously built-up country-specific knowledge and may include maintaining of brands, research and development intensive activities, knowledge of specific markets etc.

The sectors have the following production functions.

### *Agricultural production*

The sector of agricultural production is characterised by constant returns to scale production function with simple labour as its only production factor. Its market is ruled by perfect competition and wages are paid according to the marginal product. The production function is

$$Q_A = L_A.$$

If a country does not take protectionist measures, agricultural products can be internationally freely traded at price  $I$ , which implies that also wages paid to those in the sector should be  $w_A = I$ , because in the absence of profit, revenues should equal expenditures:

$$p_A Q_A = w_A L_A.$$

Under this model, the so-called hidden unemployment is typical for the sector of agricultural production. Workers get involved in it only at times when there are no employment possibilities in other production sectors. Products contributed by this sector are consumed by agricultural workers themselves. Accordingly,  $w_A = I$  is the opportunity wages, which are always accessible to manufacturing sector workers (under the condition that agricultural products can easily be traded abroad at price  $I$ ).

### *Manufacturing of inputs*

Manufacturing of inputs is characterised by constant returns to scale production function  $Z = \min\{aL_I, bK_I\}$  (subscript  $I$  is used for resources/production factors used in the inputs sector). As the assumption of free entry and exit is used, zero profit condition also applies:

$$p_t \min\{aL_t, bK_t\} - w_t L_t - rK_t.$$

As zero profit condition means that  $p_t aL_t - w_t L_t - rK_t = 0$ , under the condition that no unnecessary labour or capital is used, equation  $p_{I,t} = \frac{w_t}{a} + \frac{r}{b}$  should always hold.

Irrespective of the production volume, the sector is assumed to be small relative to the production sector. Hence  $r$  and  $w$  are treated as exogenous for the inputs manufacturing sector. Compared to the agricultural sector, employment in the inputs manufacturing is considered to be better (on the back of the assumption that in the latter wages are by an infinitely smaller amount above those in the agricultural sector).

### *Final goods production*

Human capital type workers, inputs and physical capital are used in production of final goods (see the production function). Inputs  $Z$  are complimentary to physical capital. The final goods production is characterised by constant returns to scale at the company level and by increasing returns to scale at the level of the whole sector. Index  $Q$  denotes resources used in it (in this case attributable only to physical capital type workers, as only human capital type workers and inputs are used consistently with the definition in this sector).

Company profit maximising choice is as follows:

$$\max_{K_{Q,t}, H_t, Z_t} \left( A \min\left\{K_{Q,t}, \frac{1}{c}Z_t\right\}^\alpha H_t^{1-\alpha} - w_t H_t - rK_{Q,t} - p_{I,t} Z_t \right)$$

where

$A = K_{Q,t}^\gamma$  is learning effect at the industry level that increases with  $K$  growing ( $0 < \gamma < 1$ ) and is small compared to  $0 < \alpha < 1$ , i.e.  $0 < \alpha + \gamma < 1$ ;

$H_t$  is the number of human capital type workers employed in the company;

$Z_t$  are goods from the inputs manufacturing sector;

$P_{I,t}$  is the price of inputs;

$K_{Q,t}$  is physical capital used in production of final goods;

$w_t$  are wages of human capital type workers;

$c$  is a constant characterising proportions of inputs and capital of the production function.

Usually,  $A$  is a parameter describing sector technologies, yet in this case it denotes a function, which depends on sector capital ( $A = K_{Q,t}^\gamma$ ).

### **3.1.2 One Country Equilibrium**

Two steps are distinguished in the analysis of a country's industrialisation process. The model assumes that at the beginning all the population is engaged in the agricultural sector; with industrialisation unfolding, part of it is gradually drawn into inputs



and final goods production sectors. Consequently, the abundance of human capital type labour in the agricultural sector initially keeps wages down, resulting in large dividends (in terms of interest) to physical capital type owners. However, when all human capital type labour is engaged in the final goods production (assuming that this type of labour drains out prior to simple labour, which actually corresponds to the real situation), wages start to rise, hence capital owners' income per unit of capital shrinks.

*Step 1: it is the beginning of industrialisation and human capital type labour is freely available ( $H < \bar{H}$  in final goods production).*

In this case, human capital type workers not employed in the final goods sector are engaged in agriculture as simple labour, thus keeping wages at a fixed level  $w_t = 1$  (any human capital type worker can be fired and replaced by another human capital type person from the countryside willing to work for lower wages). Simple labour  $L$  works both in agriculture and the inputs sector where the production volume fully depends on that of the final goods sector. The profit maximisation problem of final goods producers is expressed by the following equation:

$$\max_{K_{Q,t}, H, Z} \left( A \min \left\{ K_{Q,t}, \frac{1}{c} Z_t \right\}^\alpha H_t^{1-\alpha} - wH_t - r_t K_{Q,t} - p_{1,t} c K_{Q,t} \right).$$

As consistently with this production function inputs  $Z$  are complimentary to capital, the maximisation problem can also be restated as

$$\max_{K_{Q,t}, H} (AK_{Q,t}^\alpha H_t^{1-\alpha} - wH_t - (r_t + p_{1,t}c)K_{Q,t}).$$

The price is not included in the final goods production function, for it would only compound the model (price formation mechanism would have to be defined). It is not necessary in this case, as the price is embedded in  $A$ , i.e. it is a part of productivity.

First order conditions of the maximisation problem equation are as follows:

$$w_t = (1-\alpha) \frac{Q}{H_t} \tag{5}$$

and

$$(r_t + p_{1,t}c) = \alpha \frac{Q}{K_{Q,t}} \tag{6}$$

where

$$Q \text{ is the production volume in the final goods sector } A \min \left\{ K_{Q,t}, \frac{1}{c} Z_t \right\}^\alpha H_t^{1-\alpha}.$$

Assuming that  $w_t = I$  (as long as human capital type labour is available and willing to work in the agricultural sector for wages  $w_t = I$ , the latter are the same also in the final goods sector),  $r$  can be solved as a function from  $K_{Q,t}$ :

$$r_t = \frac{b}{c+b} (\alpha(1-\alpha)^{(1-\alpha)/\alpha} K_{Q,t}^{\gamma/\alpha} - \frac{c}{a}) \quad [7],$$

which, depending on  $K_{Q,t}$ , is increasing, and, if  $\alpha K_{Q,t}^{\gamma/\alpha}$  is sufficiently large, also positive. For all values  $H < \bar{H}$ , wages, by assumption, are

$$w_t = I \quad [8].$$

On the basis of these two conditions characterising interest income from capital and wages, it is possible to arrive at the amount of simple labour employed in the inputs sector. It is assumed that simple labour is redundant, i.e. the focus is only on the situation where the shortage of human capital type labour occurs in the final goods sector prior to the shortage of simple labour in the inputs sector, or when  $H_t = \bar{H}$ , still  $L_t < \bar{L}$ .

*Step 2: depletion of human capital labour ( $H_t = \bar{H}$ ).*

When all human capital type labour is extracted from the agricultural sector and moved to the final goods sector the situation changes: the marginal product of inputs determines the price of all inputs according to the following formula:

$$w_t = (1-\alpha) \frac{Q}{H} \quad [9],$$

$$(r_t + p_{I,t}c) = \alpha \frac{Q}{K_{Q,t}} \quad [10].$$

The wages are not fixed at  $w_t = I$  as before, yet it is possible to solve the set of equations because now the amount of human capital type labour used in the final goods sector  $H_t = \bar{H}$  is fixed, hence  $r_t$  can be expressed in terms of  $K_{Q,t}$ . In this case, the respective equations corresponding to [7] and [8] are

$$r_t = \frac{b}{c+b} K_{Q,t}^{\gamma+\alpha} \bar{H}^{-\alpha} \left[ \alpha \left( \frac{\bar{H}}{K_{Q,t}} \right) - \frac{c}{a} (1-\alpha) \right] \quad [11]$$

and

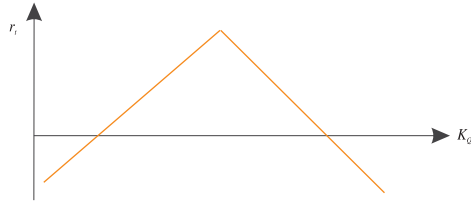
$$w_t = (1-\alpha) K_{Q,t}^{\gamma+\alpha} \bar{H}^{-\alpha} \quad [12].$$

In this case, the relationship between  $r_t$  and  $K_{Q,t}$  is negative (the first derivative in equation [11] is negative).

Thus, looking at industrialisation as a process where Step 1 is followed by Step 2, changes in  $r_t$  are obtained as showed in Chart 12. At the beginning when labour market conditions do not allow wages to rise,  $r_t$  increases due to the largest part of gains resulting from learning and amassed experience in the industry passing over to capital owners (as was the case in developed states during industrialisation). When the labour market cannot provide a sufficient number of individuals able to give an additional impetus to growth in the final goods sector, labour force strengthens its bargaining power and wages rise. Consequently, the interest rate ( $r_t$ , income from capital) decreases.

Chart 12

**RELATIONSHIP BETWEEN CAPITAL AND INTEREST<sup>1</sup>**



<sup>1</sup> In this example, under a combination of certain circumstances, parameter  $r$  may become negative. In this case,  $r$  is return on capital that may be also negative. Latvia's heavy industry after market liberalisation serves as a typical example. The negative return on capital (i.e. inability, in the majority of cases, to achieve satisfactory profitability levels even via substantial investment in sector's enterprises) was one of the causes for the decline in this sector in the early 1990s. It, undoubtedly, is a rather theoretical assumption. In reality, strong shocks are needed for companies to find themselves in such circumstances (which occasionally happens when a country suddenly shifts its trade regime from closed to open).

To find equilibrium solution, the capital accumulation equation is to be introduced.

Physical capital depreciates at rate  $\delta K_t$  per period. Capital is accumulated from consumers' savings, hence equation  $\dot{K}_t = s_t w_t N - \delta K_t$ , which characterises the rate at which capital is accumulated, is obtained.

For a steady state of equilibrium (capital increase  $\dot{K}_t = 0$ ), we obtain  $\frac{\delta K_t^*}{N} = s_t(K_{Q,t}^*)$

where the savings function is determined as  $s_t(K_{Q,t}^*) = w_t \frac{\beta}{\beta + I} = \frac{\beta(1-\alpha)K_{Q,t}^{\gamma+\alpha} \bar{H}^{-\alpha}}{[\beta + I]}$

(with the wage level inserted from equation [12]).

It is assumed that after the first phase of industrialisation (Step 1), the wage system in the country is uniform, i.e. workers in agriculture, the inputs and final goods sectors receive the same wages as in the production sector. It implies protectionism because the price of agricultural output abroad continues to be  $I$ . Despite being a rather awkward assumption, it reflects the historical truth to a great extent.<sup>1</sup> In this model, it guarantees that wages are equal across countries, and simple labour  $L$  receives the same pay as producers of final goods and inputs.

<sup>1</sup> For example, the situation described can be used in dealing with the EU Common Agricultural Policy.

Of the savings function, the first derivative is negative and the second one is positive. It indicates that at certain parameter values the system is in a steady equilibrium state similar to standard neoclassical models of Solow–Swan (showed by the curve in Chart 13).

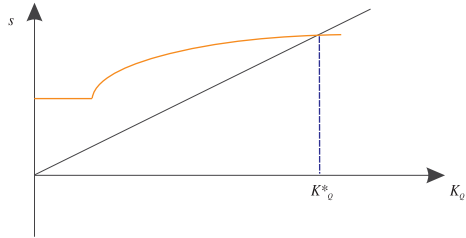
Using equation  $K_t = K_{Q,t} + K_{M,t}$  and taking into account the fact that inputs are complementary to capital (from which  $K_{M,t} = \frac{c}{b} K_{Q,t}$  can be derived) result in  $K_t = K_{Q,t}(1 + c/b)$ . Thus, it is possible to derive equilibrium value  $K_{Q,t}^*$  from savings equation

$$\frac{\delta K_{Q,t}^*(1 + c/b)}{N} = \frac{\beta(1 - \alpha)K_{Q,t}^{*\gamma + \alpha} \bar{H}^{-\alpha}}{[\beta + I]} \quad [13].$$

The equation is showed graphically in Chart 13. The left-hand side of equation [13] is a straight line and the right-hand side is a concave line (notably, this equilibrium is possible under certain assumptions). The Chart suggests that the solution of multiple equilibria is also possible; nevertheless, they are not dealt with and it is assumed that wages initially are constant and equal to  $I$ .

Chart 13

**DETERMINATION OF EQUILIBRIUM VALUE OF CAPITAL**



The solution of equation [13] leads to the equilibrium value of capital

$$K_{Q,t}^* = \left[ \frac{\delta(c/b + I)(1 + \beta) \bar{H}^\alpha}{(1 - \alpha)\beta N} \right]^{\frac{1}{\alpha + \gamma - 1}} \quad [14].$$

**3.2 The Case of Two Countries**

It is assumed that the world consists of two countries, conditionally denoted as the Home Country and the Foreign Country, plus a huge outside area where agricultural produce can always be traded at a constant price  $I$ . The following additional assumptions are used in the model:<sup>1</sup>

- 1) the Foreign Country is assumed as an already industrialised country in equilibrium,

<sup>1</sup> To the greatest extent possible, the assumptions reflect the global historical situation in the last four decades.

i.e. capital stock in the economy is determined by equation [14]. All other equilibrium values are derived from it;

2) the Home Country is in the initial stage of its industrialisation, i.e. the economy is in disequilibrium;

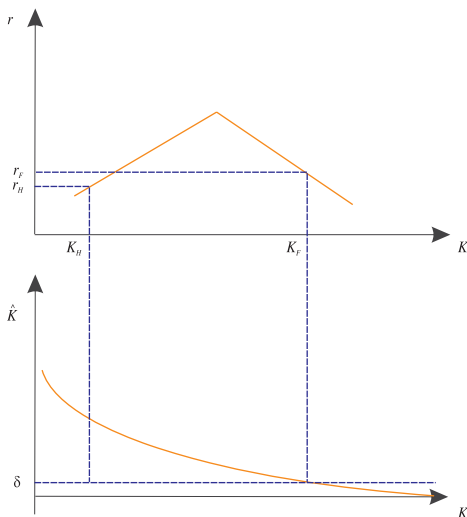
3) initially, protectionist policy is pursued in inputs and final goods sectors of both countries; however, the policy of Foreign Country is also protectionist in the agricultural sector;

4) the Foreign Country is under a strong influence of trade unions. This assumption, supported by protectionism, guarantees that wages in the agricultural sector are set in line with those in the final goods production sector. Being higher, such wages are a guarantor of trading agricultural produce at a higher price on the domestic market. Consistently with these assumptions, agricultural products are consumed only by those working in the agricultural sector.

These assumptions are supposed to reflect the situation experienced in the 1960s and 1970s when the trade policy was relatively constrained due to social factors. The developed countries protected their markets of agricultural products. Chart 14 depicts the situation where  $K_F$  denotes capital abundance in the Foreign Country and  $K_H$  stands for the shortage of capital in the Home Country. In the described circumstances, the interest rate in the final goods sector, even despite the low wages, is higher in the Foreign Country due to either knowledge build-up or, in pure mathematical terms, increasing returns to scale (see Chart 14;  $r_F > r_H$ ).

Chart 14

**EFFECTS OF CAPITAL AND GOODS MARKET LIBERALISATION**



### Free trade and capital flows

Liberalisation of capital and goods markets triggers three main effects:

- 1) immediate capital outflow from the Home Country. Due to a lower interest rate (see Chart 14), capital owners invest funds in the Foreign Country, thus terminating the production of final goods in the Home Country;
- 2) inputs can be produced cheaper in the Home Country (due to low wages). As this sector does not have any country-specific advantages, it may, sooner or later, be moved to a country with lower costs, i.e. the Home Country (followed by physical capital used in the inputs industry);
- 3) agricultural production in the Foreign Country becomes non-competitive, with wages returning to  $w = 1$  in this sector. Be it so, the assumption regarding a uniform pay system is to be scrapped, i.e. trade liberalisation implies that wages cannot be maintained at the previous level in the agricultural sector. Though the model might preserve uniform wages for the Foreign Country (the state proceeds with its protectionist policy in a single sector as is the case with the EU agriculture), the results would be little affected.

Such a situation can be modelled as a new equilibrium with the two countries treated as a uniform single entity where human capital type workers of the Home Country are regarded as simple labour (due to increasing returns to scale in the production function, human capital workers are productive only when included as a part of the already-existing final goods production sector; if such a sector is missing, their only opportunity is to get engaged in the simple production or agricultural production sectors); free movement of the labour force between the countries is non-existent.

Post-integration equilibrium can be expressed as following:

$$\delta K_t^* = s_{t,H} N_H w_H + s_{t,F} N_F w_F \quad [15].$$

Wages in the Home Country do not change and are equal to  $1$ , whereas those in the Foreign Country are not the same for all; in the latter, the inputs sector has ceased to operate and simple labour  $L$  returns to the agricultural sector where workers receive  $w = 1$ .

In the Home Country, everybody receives  $w = 1$ , savings per person are  $s_{t,H} = \left( \frac{\beta}{1 + \beta} \right)$ ,

and  $s_{t,H} w_H N_H = \left( \frac{\beta}{1 + \beta} \right) N_H$  are total savings.

In the Foreign Country, human capital type workers receive previous wages  $w_t = (1 - \alpha) K_{Q,t}^{\gamma + \alpha} \bar{H}^{-\alpha}$ , the rest are to put up with lower wages due to market liberalisation: all former input producers move back to the agricultural sector where their wages are  $1$ . Accordingly, savings per person are  $w_{t,F} s_{t,F} = \frac{\beta}{(1 + \beta)} (1 - \alpha) K_{Q,t}^{\gamma + \alpha} \bar{H}^{-\alpha}$  for human

capital type workers  $\bar{H}$  and  $w_{i,F} s_{i,F} = \left( \frac{\beta}{I + \beta} \right)$  for  $\bar{L}$ . The overall equilibrium condition (taking into account that  $K_{Q,t}$  is a constant fraction of  $K_t^*$ :  $K_t^* = K_{Q,t}^*(I + c/b)$ , hence equation [16] contains only one unknown variable) is

$$\delta K_t^* = \left[ \frac{\beta}{(I + \beta)} (I - \alpha) K_{Q,t}^{\gamma + \alpha} \bar{H}_F^{-\alpha} \right] \bar{H}_F + \left( \frac{\beta}{I + \beta} \right) (\bar{L}_F + N_H) \quad [16]$$

and

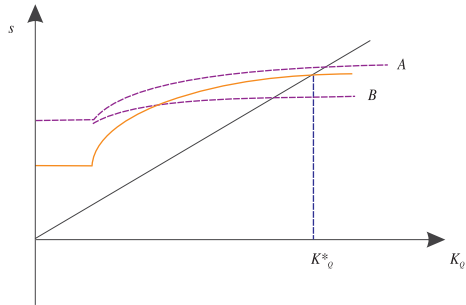
$$\delta K_{Q,t}^* (I + c/b) = \left[ \frac{\beta}{(I + \beta)} (I - \alpha) K_{Q,t}^{\gamma + \alpha} \bar{H}_F^{-\alpha} \right] \bar{H}_F + \left( \frac{\beta}{I + \beta} \right) (\bar{L}_F + N_H) \quad [17].$$

In this case,  $K_{Q,t}^*$  cannot be derived analytically, i.e. without solving the equation numerically, yet it is of little significance because, as previously, the function preserves the form of a concave.

Contrary to equation [14], it is impossible to say whether the equilibrium capital level increases or decreases, as it may go either way (see Chart 15; A captures the increase but B reflects the decrease in equilibrium capital level). Overall, equilibrium savings increase due to additional savings from the Home Country but decrease because wages have contracted for a large part of workers in the Foreign Country ( $\bar{L}_F$ ).

Chart 15

**EQUILIBRIUM LEVEL OF CAPITAL AFTER FOREIGN TRADE LIBERALISATION**



Further, the focus will be on the following inference: the total amount of capital in an economy can increase because the equilibrium level of capital rises if  $N_H \rightarrow \infty$ .

Be it so (A in Chart 15), the majority of workers in the developed country (the Foreign Country; provided that they belong to human capital type) will support liberalisation of capital and trade flows because of higher wages. Capital owners will do the same because of rising interest rates (see equations [11] and [12]). Indeed, interest rates

will increase at any level of capital because the price in equation [10] is no longer  $p_I = \frac{w_I}{a} + \frac{r_I}{b}$ , but  $p_I = \frac{l}{a} + \frac{r_I}{b}$ , and, thus, even though the amount of capital shrinks and wages fall, capital owners gain due to increases in interest rates. The Home Country also can support liberalisation, particularly, if relative to the Foreign Country, it is a small economy: production volumes grow, workers do not lose anything in terms of wages, and capital owners gain due to rising interest rates.

### 3.3 Implications of the Model

#### *Winners and losers*

Due to a higher interest rate, capital owners in the Home Country gain, while the situation of the workers is broadly unchanged because of wages remaining constant. If the scope of production in the Home Country formerly was relatively narrow and the Foreign Country is large, production volumes grow as a result of liberalisation. Thus, overall, liberalisation is valued as a positive phenomenon. Over a longer horizon, however, the opportunity to re-establish final goods production may be lost, i.e. establishing the final goods sector becomes considerably more expensive. The amount of the subsidy needed for mitigating the negative dynamics will be notably larger. Chart 14 shows that in the given circumstances the subsidy to ensure positively-driven development is  $r_F(K_F) - r_H(K_H)$ . If, however, the Home Country has completely abandoned the final goods sector, the necessary subsidy is  $r_F(K_F) - r_H(K_H = 0)$  (where  $r_H(K_H = 0)$  is the interest rate under zero capital and zero production in the sector). In such a way, the opportunity to establish its own final goods production seems to have been traded for welfare improvements by the Home Country.

By contrast, capital owners and human capital type workers in the Foreign Country are the winners because the total amount of capital goes up; workers in the agricultural sector and inputs industry are the losers because their wages go down. Overall effects may be of either type, but if the negative effect outweighs the positive one, the Foreign Country seems to be a losing party on the whole.

If measured statistically, such liberalisation may produce a picture of converging income level and production volume (hence also GDP), encouraging politicians to plunge into computations regarding the precise time needed for Latvia to rise to the EU average despite the fact that, consistently with this model, the trends of the past developments do not imply any outlook for the future, as equilibrium dynamics primarily rest upon technological advance in various sectors.

#### *Technological changes*

The impact of anticipated technological advance is the core reason why capital and market liberalisation, despite apparent disadvantages at the beginning, may seem



acceptable for the Foreign Country. Let us include labour-saving technological advance in the production function by inserting "productive labour force"  $\rho \bar{H}$  instead of  $\bar{H}$ , where  $\rho$  is a technical parameter of labour force productivity and  $\bar{H}$  is human capital type workers. In this case, savings equation [17] looks as follows (the new parameter  $\rho^{1-\alpha}$  appears on the right-hand side):

$$\delta K_{Q,t}^*(I+c/b) = \left[ \frac{\beta}{(I+\beta)} (I-\alpha) K_{Q,t}^{*\gamma+\alpha} \rho^{1-\alpha} \bar{H}_F^{-\alpha} \right] \bar{H}_F + \left( \frac{\beta}{I+\beta} \right) (\bar{L}_F + N_H) \quad [18].$$

The impact of technological advance can be estimated via modelling the increase on  $\rho$ . By definition, it does not affect the number of human capital type workers  $\bar{H}_F$  employed in the final goods sector, which remains unchanged. Whether  $\frac{\partial K_{Q,t}^*}{\partial \rho}$  is positive or negative can be determined using the implicit differentiation technique:

$$\frac{d}{d\rho} \delta K_{Q,t}^*(I+c/b) - \frac{d}{d\rho} \left[ \frac{\beta}{(I+\beta)} (I-\alpha) K_{Q,t}^{*\gamma+\alpha} \rho^{1-\alpha} \bar{H}_F^{-\alpha} \right] \bar{H}_F - \frac{d}{d\rho} \left( \frac{\beta}{I+\beta} \right) (\bar{L}_F + N_H) = 0.$$

Simplification and omission of zero items lead to:

$$\begin{aligned} \delta(I+c/b) \frac{dK_{Q,t}^*}{d\rho} - \frac{\beta}{(I+\beta)} (I-\alpha) \bar{H}_F^{1-\alpha} \frac{d}{d\rho} \left[ K_{Q,t}^{*\gamma+\alpha} \rho^{1-\alpha} \right] &= 0 \\ \delta(I+c/b) \frac{dK_{Q,t}^*}{d\rho} - \frac{\beta}{(I+\beta)} (I-\alpha) \bar{H}_F^{1-\alpha} \left[ (\gamma+\alpha) K_{Q,t}^{*\gamma+\alpha-1} \rho^{1-\alpha} \frac{dK_{Q,t}^*}{d\rho} + (I-\alpha) K_{Q,t}^{*\gamma+\alpha} \rho^{-\alpha} \right] &= 0 \\ \frac{dK_{Q,t}^*}{d\rho} \left[ \delta(I+c/b) - \frac{\beta}{(I+\beta)} (I-\alpha) \bar{H}_F^{1-\alpha} (\gamma+\alpha) K_{Q,t}^{*\gamma+\alpha-1} \rho^{1-\alpha} \right] &= \frac{\beta}{(I+\beta)} (I-\alpha) \bar{H}_F^{1-\alpha} (I-\alpha) K_{Q,t}^{*\gamma+\alpha} \rho^{-\alpha} \end{aligned}$$

This equation implies that  $\frac{\partial K_{Q,t}^*}{\partial \rho} > 0$  only if

$$\delta(I+c/b) > \frac{\beta}{(I+\beta)} (I-\alpha) \bar{H}_F^{1-\alpha} (\gamma+\alpha) K_{Q,t}^{*\gamma+\alpha-1} \rho^{1-\alpha} \quad [19].$$

With regard to equation [18], inequality  $\delta K_{Q,t}^*(I+c/b) > \frac{\beta}{(I+\beta)} (I-\alpha) K_{Q,t}^{*\gamma+\alpha} \bar{H}_F^{1-\alpha} \rho^{1-\alpha}$  should always hold because  $\left( \frac{\beta}{I+\beta} \right) (\bar{L}_F + N_H)$  is invariably larger than zero. If both sides are divided by  $K_{Q,t}^* > 0$ , the following inequality is obtained:

$$\delta(I+c/b) > \frac{\beta}{(I+\beta)} (I-\alpha) \bar{H}_F^{1-\alpha} K_{Q,t}^{*\gamma+\alpha-1} \rho^{1-\alpha} \quad [20].$$

Inequalities [19] and [20] differ only in term  $(\gamma + \alpha)$  on the right-hand side of the former. As by assumption  $0 < (\gamma + \alpha) < l$  and the rest of the terms on the right-hand side of inequality [20] are positive, the right-hand side of the latter is always larger than the right-hand side of the former. It means that inequality [19] always holds at all values.

In other words,  $\frac{\partial K_{Q,t}^*}{\partial \rho}$  is continuously positive, and under the impact of technological advance the capital stock increases in the economy.

From here we may arrive at the effect of capital stock increases on other variables. First order conditions for post-liberalisation are similar to equations [5] and [6]; in contrast to Step 2 derivations, the input price is not  $p_I = \frac{w_I}{a} + \frac{r_I}{b}$  but  $p_I = \frac{l}{a} + \frac{r_I}{b}$  because now all inputs are produced in the Home Country. Thus, the corresponding wage and interest rate equations are

$$r_I = \frac{b}{c+b} \left[ \alpha K_{Q,t}^{\gamma+\alpha-l} \bar{H}^{l-\alpha} \rho^{l-\alpha} - \frac{c}{a} \right] \text{ and } w_I = (l-\alpha) K_{Q,t}^{\gamma+\alpha} \bar{H}^{-\alpha} \rho^{l-\alpha}.$$

The effect of technological advance is an unambiguous increase of wages (in this case, both  $\rho$  and  $K_{Q,t}$  increase and are positive), while the effect on  $r_I$  remains ambiguous because, on the one hand, the increase in  $\rho$  has a positive impact on  $r_I$ , but on the other hand, it causes a decrease in  $r_I$  through the effect on  $K_{Q,t}^{\gamma+\alpha-l}$ . The exact direction of changes depends on the values of those parameters that can be derived from the results already obtained in respect of the sign (+ or -) for  $\frac{\partial K_{Q,t}^*}{\partial \rho}$ . As in this case the

Foreign Country dominates the world, changes in  $r_I^*$  are of little significance. What matters is the technological advance that does not affect employment and has a positive impact on wages.

Looking at the impact of technological advance on the inputs sector, the input production function of equation  $p_I Z = p_I \min\{aL_I, bK_I\}$  is considered. In this function, technological advance implies an increase in  $a$ , which, in turn, causes a decrease in labour force of the inputs sector (no other variables change as wages and, consequently, the savings level remain the same). Thus, in a longer term, the population of the Home Country returns to the agricultural sector under the impact of technological advance. Provided that the expansion of production is coupled with technological advance, GDP (and value added) growth over a shorter horizon when specialisation is not yet stable is not necessarily ruled out.

These facts highlight the main reasons why liberalisation may seem acceptable also for the Foreign Country, even if losses are incurred immediately after it. Work in the final goods sector promises the labour force, at least human capital type workers, protection against falls in wages and employment (this is associated with a certain risk

because nobody knows for sure to what extent sectors, if any, can maintain their country-specific character over longer horizons).

The results do not come as a surprise, if we reckon that the neoclassical production function for the final goods sector has been used and that such functions always end up in full-employment equilibrium in any model. Hence the results are determined by the very structure of the model. There is no intention to propose the model as a "correct one" or one that holds; it may, however, be one of relatively trustworthy ways to provide the explanation for the high GDP growth in East European countries, the weak link between trade performance and GDP, drivers behind trade liberalisation in different countries, changes in the wage structure etc, as well as eventual long-term effects of all these factors.

### **Historical background**

It must be admitted that such theses are not new; they stem from the well-known "infant industry" argument. The idea of such model has been precisely defined by P. Streeten who observed the emerging specialisation and formation of transnational corporations as early as in the 1970s:

*It is foreign, not domestic, capital, know-how and management that are highly mobile internationally and that are combined with plentiful, immobile domestic semi-skilled labour. Specialisation between countries is not by commodities according to relative factor endowments, but by factors of production: the poor countries specialising in low-skilled labour, leaving rewards for capital, management and know-how to the foreign owners of these scarce but internationally mobile factors. The situation is equivalent to one in which labour itself rather than the product of labour is exported. For the surplus of the product of labour over the wage ... accrues abroad. ... Since the firms operate in oligopolistic and oligopsonistic markets, cost advantages are not necessarily passed on to consumers in lower prices or to workers in higher wages, and the profits then accrue to the parent firms. The continued operation of this type of international specialisation depends upon the continuation of substantial wage differentials...* (Quoted from 13, p. 76).

This model leads to a major conclusion that the existence of empirical convergence of some duration does not tell anything about the long-term outlook, and the assumption that a state is converging toward some benchmark level in its development in "X years" is erroneous in itself.

However, if the model is at least partially true, it has a number of implications and risks. For the Home Country, it is the risk of the above-discussed technological progress, which is complemented by the emigration risk. The existence of wage differences determines labour division between the countries with a long-term implication: there is a gap between the wages a human capital type worker can earn in the Home Country and the opportunity wages he/she could receive in the Foreign Country. This inevitably figures as a strong motivation for emigration.

In the given set-up, Latvia meets the description of the Home Country (provided that the structure of the model is acceptable), and it can explain a number of observed paradoxes. On the one hand, there is a shortage of human capital type workers (Latvia would only benefit from larger numbers of researchers), but on the other, there is no political will to recompense for researchers' prowess and skills. Hence the human capital type workers' pay greatly differs from that of the respective category of workers in the developed countries, and, what is more important, there are no qualified job vacancies (requiring innovation and creativity, e.g. in science, product development and elsewhere) for any pay. In the model terms, Latvia currently has only the input goods and agricultural sector (e.g. wood as an input in paper industry whose output later is imported from Sweden, textile goods as an input in brand textile industry, etc) where the required know-how and qualification levels are relatively low. This gives rise to a situation where human capital type workers see emigration as the only escape.

Most notably, the wage gap is unavoidable. If, for example, the state would, by any means, attempt to maintain human capital type workers and raise wages, say, for those working in the public sector, it would be difficult to accomplish, for it might have implications on overall wages and the inputs manufacturing sector, the foundation of the entire economy, causing the latter to either collapse or be moved to countries with even lower costs. Thus, the country seems to be locked in a trap of low wages, with the latter triggering a continuous outflow of labour force from the Home Country, which, having reached its maximum point  $\bar{H}_H = 0$ , would indicate that the country's attempts to re-establish the final goods production sector are vain at any level of subsidies.

The only possible solution would consist in skill-based distinction between human capital type workers and the rest of the labour force, so that the wage rise for human capital type workers does not exert pressure on the simple labour market. Unfortunately, it is unattainable for less developed countries because it is the labour market that ranks labour force according to its skills in the developed economies; as such market is non-existent in the poor countries, the type, either "human capital" or "simple labour", to which workers belong is revealed only *post factum*, i.e. when they have already emigrated.

As early as in 1841, economist F. List gave the following description of pre-industrialisation Germany in his work *National System of Political Economy*:

*New inventions and improvements in the mere agricultural State are of but little value. Those who occupy themselves with such things in such a State fall themselves, as a rule, a sacrifice to their investigations and endeavours, while in the manufacturing State there is no path which leads more rapidly to wealth and position than that of invention and discovery. Thus, in the manufacturing State genius is valued and rewarded more highly than skill, and skill more highly than mere physical force. In the agricultural State, however, excepting in the public service, the reverse is almost the rule.* (Quoted from 8).

## CONCLUSIONS

This study has dealt with various generally accepted methods for measuring competitiveness of a country on the basis of export data. True, the methods employed are not perfect, yet none of them has confirmed any improvements in Latvia's export structure in few last years, or a gradual transition from resources and labour intensive to human capital intensive production of goods.

The theoretical model presented in the paper is a version of current export dynamics assessment. The model treats the processes of the last decade as a more profound specialisation. Latvia is producing almost the same output as in the early-1990s, without much extra value added being embedded in it. This statement does not necessarily imply that Latvia's export potential is small. It primarily depends on the export market share still available for competitive capturing and the time needed for doing it. The EU accession undeniably boosts the export market share through advantages in the competition vis-a-vis other low-cost economies. Nonetheless, even in the presence of a short-term positive effect, it may have negative effects over longer horizons in terms of human capital depletion. This implies that a more active involvement of the state in the build-up of its industrial basis is needed (within a realistic and specific target-oriented policy framework).

It has a number of implications relative to modelling exports and competitiveness.

First, the theory about Latvia and other EU10 countries automatically converging toward an EU average in respect of exports does not seem to have any grounds, at least there is a slim possibility of empirical verification in favour of it. It is quite likely that the real economic mechanisms are more complex and may even have adverse long-term implications (as in the given theoretical model). The data dynamics point to the need of serious accounting for such a possibility when economic policy acceptable for Latvia is in view.

Second, if the national economy is subject to restructuring, there are no grounds to believe that the former experience may provide truthful information via a long-term export function derived by help of econometric methods.

Third, in the analysis of country's (Latvia in this case) export and production data, the focus should rather be on the *processes* underpinning exports and the *skills* underlying production than the types of commodities produced or exported. The analysis of this kind is likely to present a more realistic picture of Latvia's long-term export potential.

SITC REV.2 CLASSIFICATION OF GOODS<sup>1</sup>

Labour force	Human capital intensive production			Capital intensive production	Labour intensive production	Resources intensive production		Other industries	Manufacture and mining of raw materials	
	High technology	Medium technology				Weak	Strong			Other industries
		Capital	Labour force							
714, 718, 776, 778, 792, 871, 874	516, 525, 541, 542, 57594, 57595, 58219, 591, 572	691, 695, 723, 725, 726, 727, 728, 741, 744, 745, 746, 747, 748, 749, 751, 759, 761, 763, 764, 772, 774, 775, 811, 872 (excl. 8724), 873, 881, 884	533, 554, 592, 7812, 782, 882	652, 653, 654, 6574, 65793, 659, 67319, 67327, 67329, 67349, 67412, 67414, 67422, 67432, 6745, 67512, 67522, 67537, 67538, 67556, 67562, 67572, 67574, 678, 783, 89973	612, 62, 633, 642, 655, 656, 657 (excl. 6574, 65793), 658, 667, 692, 696, 697, 699 (excl. 69962), 721, 722, 724, 771, 784, 785, 786, 791, 812, 813, 821, 831, 84, 851, 8724, 883, 885, 891, 892, 893, 894, 895, 897, 899 (excl. 89973), 961	611, 613, 634 (excl. 6345), 635, 651, 661, 662, 663, 664, 665, 666, 694	511, 512, 513, 514, 562, 671, 672, 673 (excl. 67319, 67327, 67329, 67349), 67411, 67413, 67421, 67431, 6744, 67511, 67521, 67531, 67532, 67533, 67534, 67535, 67536, 67541, 67542, 67543, 6755, 67561, 67571, 67573, 676, 677	6345, 641, 68, 69962, 69965	639, 896, 911, 931, 971	01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49

<sup>1</sup> Deciphering of SITC classification is available in the Internet, e.g. <http://unstats.un.org/unsd/cr/registry/>.

Appendix 2

**CHANGES IN THE REALATIVE UNIT VALUE**

**Estonia**

Dependent Variable: LOG(UV?)

Sample (adjusted): 1995–2002

Variable	Coefficient	S.E.	<i>t</i> -statistic	Probability
C	-0.055576	0.018718	-2.969208	0.0030
LOG(UV?(-1))	0.632291	0.018771	33.68399	0.0000
$R^2$	0.422635	Mean dependent variable		-0.237046
Adjusted $R^2$	0.422263	S.D. dependent variable		0.929079
S.E. of regression	0.706184	Sum squared residual		772.9781
<i>F</i> -statistic	1134.611	Durbin–Watson statistical value		2.355911
Probability ( <i>F</i> -statistic)	0.000000			

**Lithuania**

Dependent Variable: LOG(UV?)

Sample (adjusted): 1996–2002

Variable	Coefficient	S.E.	<i>t</i> -statistic	Probability
C	0.024320	0.025612	0.949544	0.3425
LOG(UV?(-2))	0.803319	0.016006	50.18965	0.0000
$R^2$	0.669235	Mean dependent variable		-0.264541
Adjusted $R^2$	0.668969	S.D. dependent variable		1.531788
S.E. of regression	0.881318	Sum squared residual		967.0184
<i>F</i> -statistic	2519.001	Durbin–Watson statistical value		1.394931
Probability ( <i>F</i> -statistic)	0.000000			

**Latvia**

Dependent Variable: LOG(UV?)

Sample (adjusted): 1992–2002

Variable	Coefficient	S.E.	<i>t</i> -statistic	Probability
C	-0.104147	0.021559	-4.830723	0.0000
LOG(UV?(-1))	0.620823	0.020898	29.70777	0.0000
$R^2$	0.391627	Mean dependent variable		-0.304919
Adjusted $R^2$	0.391183	S.D. dependent variable		0.972223
S.E. of regression	0.758594	Sum squared residual		788.9615
<i>F</i> -statistic	882.5516	Durbin–Watson statistical value		2.163275
Probability ( <i>F</i> -statistic)	0.000000			

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