

KONSTANTĪNS BEŅKOVSKIS

COMPETITIVENESS OF LATVIA'S EXPORTERS



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ABBREVIATIONS

CEEC – Central and Eastern European countries
CES – constant elasticity of substitution
CESEE – Central, Eastern and Southeastern Europe
CIF – cost, insurance and freight at the importer's border
Comext – Eurostat database for external trade
CPI – Consumer Price Index
EU – European Union
GMM – Generalised Method of Moments
HS – Harmonised System
OECD – Organisation for Economic Co-operation and Development
PPI – Producer Price Index
ULC – unit labour costs
Comtrade – United Nations Commodity Trade Statistics Database
VAT – value added tax
RXP – relative export price
INTRASTAT – system for collecting information and producing statistics on trade in goods between countries of the European Union

ABSTRACT

The paper evaluates competitiveness of Latvia's exporters from various aspects by using detailed trade data from Comtrade. Competitiveness represented by the market share of Latvia's products in world trade was on the rising trend, growing almost two times between 1999 and 2010. Such a dynamic improvement was mainly accounted for by intensive margin, as Latvia's exporters increased their presence on traditional markets. Moreover, the contribution of extensive margin was also positive due to geographical expansion. The analysis of non-price competitiveness signals that although Latvia's export unit values were increasing faster than those of its main rivals, relative quality and taste for Latvia's products were rising even faster, and, overall, competitiveness of Latvia's exporters improved.

Keywords: exports, extensive margin, intensive margin, non-price competitiveness, Latvia

JEL codes: C43, F12, F14, L15

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INTRODUCTION

Despite the scope of discussion and empirical work on the topic, the concept of competitiveness is still elusive. The definition of competitiveness is so broad that it includes an extremely large set of macroeconomic and microeconomic issues: per capita income levels, performance of institutions, levels of productivity, comparative costs, and many other not mentioned here. As a result, the number of ways a researcher can evaluate competitiveness of a country is vast. This paper is restricted to only few approaches, which can be applied to highly disaggregated trade data. Thus we are narrowing the definition of competitiveness to one given by the OECD: "Competitiveness is a measure of a country's advantage or disadvantage in selling its products in international markets"¹, and concentrate on the performance of Latvia's exporters.

The motivation for focusing on export activities is obvious: Latvia is a very open and an extremely small economy, where exports are the main source of economic growth in the long run. Our research is by no means a unique attempt to discuss competitiveness of Latvia's exports. However, some of the empirical papers are already outdated and observe years before the accession to the EU (like those by Dulleck et al. (2005) or Fabrizio et al. (2007)), some authors (like Purfield and Rosenberg (2010)) are relating competitiveness issues mostly to effective exchange rates, others are not covering all Latvia's exports (Beņkovskis and Wörz (2012)). Therefore, there is a need for updating the assessment of competitiveness and broadening the set of available indicators.

Are Latvia's products gaining export market shares? Are exporters doing it by expanding in new markets or do they intensify their presence in traditional markets? Who are the main competitors of Latvia's enterprises in external markets? Is the real effective exchange rate a complete measure of competitiveness? Can we assess non-price competitiveness of Latvia's enterprises? Our paper tries to address these questions. Detailed trade data from Comtrade allow us not to restrict the analysis to some specific geographical area or subset of products, while disaggregation gives possibility to track the performance of separate sectors and to take into account structural differences.

Section 1 illustrates the data, which are extracted from Comtrade. Section 2 then focuses on value data, decomposing market share changes into extensive and intensive margins as well as presenting geographical breakdown of Latvia's main competitors. Section 3 makes use of information on trade volumes and prices, briefly describes the methodology behind the evaluation of price and non-price competitiveness at a highly disaggregated level, and presents the empirical results. The last section concludes.

1. DESCRIPTION OF DATABASE

For the empirical analysis in this paper, we use trade data from Comtrade. The main reason for such a choice of the data source is almost full country coverage. Although the data in Comtrade have a lower level of disaggregation and a longer publication

¹ See <http://stats.oecd.org/glossary/detail.asp?ID=399>.

lag in comparison with Comext, the world-wide coverage of the UN database is a significant advantage, for the view on Latvia's exports will not be complete without such important trade partners as Russia or Belarus. Moreover, despite the low shares of such countries as China, India and Brazil in Latvia's exports currently, these markets are huge, dynamically growing, and have significant potential for Latvia's products. Comext contains detailed data on Latvia's exports outside the EU, but only Comtrade can give information on the product and partner structure of non-EU markets.

Comtrade provides a reasonably good disaggregation of export and import flows, and we are using the most detailed available. i.e. at the six-digit level of the HS (Harmonised System, 1996), which includes 5 132 different products. As mentioned above, this level of disaggregation is lower than provided by the Eurostat (more than 10 000 products) but is still reasonably high to calculate unit values.

Notwithstanding our final goal to evaluate competitiveness of Latvia's exports, this paper achieves it by using import data of partner countries in several cases. The reason for focusing on imports from Latvia rather than on Latvia's exports is driven by the theoretical framework underlining the evaluation of price and non-price competitiveness. The methodology used in Section 3 is based on consumers' utility maximisation problem. Import data are clearly more preferable in this case, as imports are reported in CIF (cost, insurance, freight) prices and include transportation costs to importers' border; therefore, import data provide a better comparison of prices from consumers' point of view. On the other hand, the usage of import data implies some drawbacks. Obviously, the data on imports from Latvia do not fully coincide with Latvia's export data due to differences in valuation, timing, sources of information, and incentives to report. The problem can be more severe for intra-EU trade, as the measurement of trade in goods within the EU relies on VAT reports. This creates a greater incentive for the reporting of export activities, which are subject to VAT return.² For that reason, we are still using Latvia's export data where possible, namely while calculating extensive and intensive margins as well as determining the structure of Latvia's exports for computations of competitors' double-weights and aggregated adjusted relative export price index.

In this paper, the import dataset contains annual data on imports of 75 countries at the six-digit HS level between 1999 and 2010.³ The list of reporters (importers) can be found in Appendix, Table A1. By collecting the data on imports of abovementioned 75 countries we are covering more than 96% of world imports in 2010. Several importer countries (the United Arab Emirates, Vietnam, Egypt and Kazakhstan) were not included in the dataset due to the lack of detailed data or missing information for 2010. To avoid calculation burdens, we restrict the list of partners (exporters) to 75 countries as well. The list of exporters can also be found in

² An extreme case of such problem is a VAT missing trader intra-Community fraud, which was not captured in import data and significantly overstated the UK trade balance in 2001–2002 (see Ruffles et al. (2003)).

³ For some countries data are not available for several years at the beginning or middle of sample period: import data for South Africa, Philippines, Oman and Tunisia are not available for 1999, Ukraine and Ethiopia for 1999–2000, Malaysia, Bahrain and Dominican for 1999–2001, Pakistan and Bosnia Herzegovina for 1999–2002, Serbia for 1999–2004, Sri Lanka for 2000, Panama for 2004, and Nigeria for 2004–2005.

Table A1 (it should be noted that the list of exporters is not fully coinciding with the list of importers). These 75 most important exporter countries cover around 93% of world imports in 2010; therefore, our database is a representative reflection of world trade flows.

We use unit value indices (dollars per kg) as proxy for import prices and trade volumes (in kg) as proxy for imported quantities. If data for either values or volumes are missing or data on volumes are not observed directly and are estimated by statistical authorities, no unit value index can be calculated. Unfortunately, the possibility to estimate unit values is relatively scarce for many reporting countries. Even the import database of the US, the major world importer, allows for calculating unit values only for approximately 70% of imports in 2010 (in value terms). The situation is much better for the EU countries, China and Japan, but there are countries (e.g. Canada, Mexico and Australia) where the coverage is around 50% or even less. In addition, the coverage is usually worse for the first half of sample period. This problem makes the analysis of non-price competitiveness more challenging, and the results of this study should be treated with a pinch of salt. However, the low coverage of available unit values in several countries is rather homogenous across different products, and we can argue that this problem should not bias our results significantly. Another adjustment made to the database is related to structural changes within the categories of goods. Although we use the most detailed classification available, it is still possible that sometimes we are comparing apples and oranges within one particular category. One indication of such a problem is the large price level differences within a product code. Consequently, all observations with outlying unit value indices were excluded from the database.⁴

As to Latvia's export dataset, which is mainly used for the analysis of extensive and intensive margins, it contains annual data on exports to abovementioned 75 importer countries (actually 74, as obviously there are no data on Latvia's exports to Latvia) at the six-digit HS level between 1999 and 2010. In the case of export dataset, we are restricting ourselves only to the value data, which is enough to calculate market shares and export structure.

Overall, the import and export database gives information about 379 768 potential markets for Latvia's products (5 132 products times 74 importing countries), which can be used in detailed analysis of Latvia's competitiveness. At the beginning, the analysis is restricted to the value data for calculating extensive and intensive margins as well as for the description of Latvia's main rivals, while further on the volume and unit value data will also be used.

⁴ An observation is treated as an outlier if the absolute difference between the unit value and the mean unit value of the product category in the particular year exceeds three standard deviations. The exclusion of outliers does not significantly reduce the coverage of the database. In majority of cases only less than 1% of total import value was treated as an outlier.

2. MARKET SHARES AND COMPETITORS

2.1 Extensive and intensive margins of trade

Trade theories suggest that there are different ways by which a country can increase its exports and market share in world trade. Models that follow Armington (1969) stress the intensive margin or exported quantity on a single market. The only way to increase exports in such a model is to increase the average exported quantity in each market without altering the set of markets. On the other hand, monopolistic competition models like one developed by Krugman (1979, 1980) assume that countries produce an endogenous number of exported varieties, and put emphasis on the role of extensive margin, maintaining that in such a way exports can be boosted by conquering new markets (in geographical or product variety sense).

There is a considerable debate in empirical economic literature about the relative role of extensive and intensive margins in trade. Some authors state that the extensive margin is prevailing (e.g. Hummels and Klenow (2005) who report that the extensive margin accounts for 62% of export increases in larger economies), while others find the intensive margin contributing more (e.g. Amiti and Freund (2010) who conclude that China's export growth was mainly accounted for by a notable growth in exports of existing products). These debates are important both from theoretical and practical points of view, as the dominance of one margin dictates the choice of the modelling framework, underpins divergent predictions about the terms-of-trade effect of export expansion, and alters conclusions about consumer welfare gains. In this paper, however, it gives the possibility to answer the question whether the growth of export market shares and competitiveness was mainly driven by increasing diversification of export products and/or destinations or producers were able to gain competitiveness in traditional markets.

One of the most popular ways to measure the extensive margin is by counting the number of products that a country exports (e.g. Dennis and Shepherd (2007)). This measure is simple and intuitive and consistent with theoretical concepts. In a similar way, one can compute the number of markets (a specific product exported to a specific country) and the average number of countries to which one product is exported. Table 1 reports these calculations for Latvia's exports.

Table 1
Number of markets, products and importers per product

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Markets	8 959	9 550	10 055	11 035	11 686	13 412	18 968	20 472	20 827	21 033	22 593	24 905
Products	2 638	2 674	2 747	2 817	2 854	3 065	3 377	3 490	3 416	3 462	3 562	3 610
Importers per product	3.4	3.6	3.7	3.9	4.1	4.4	5.6	5.9	6.1	6.1	6.3	6.9

Sources: Comtrade and author's calculations.

The number of markets where the Latvian enterprises are present increased almost three times between 1999 and 2010. This leads to the conclusion that the extensive margin was an important factor behind Latvia's export growth. The growing number of Latvia's export markets was partly due to an increasing set of exported goods, while the main driver was significant enlargement of geographical diversification: in

2010, one product was on average exported to 6.9 countries in comparison with only 3.4 countries in 1999.

Although the measures presented in Table 1 are informative and simple, they are not shedding light on the role of the intensive margin and do not allow comparison with the contribution of the extensive margin. There are several papers proposing ways to decompose growth in trade (e.g. Felbermayr and Kohler (2006) or Besedes and Prusa (2011)). Our goal, however, is export competitiveness which is usually associated with the market share. Therefore, we need to decompose the export market share, which is a more complicated task. Hummels and Klenow (2005) proposed methodology to decompose relative exports (and the export market share) into extensive and intensive margins. However, their methodology is developed to compare different exporters at one point in time,⁵ while we are interested in a dynamic analysis of Latvia's competitiveness.

This paper proposes disaggregation of the changes in export market share (MS_t) into three parts instead of two. Besides variations in the intensive (IM_t) and extensive (EM_t) margins, a shift in the demand structure may also affect changes in the market share. The reasoning for such decomposition is twofold. First, as changes in the market share depend also on changes in world imports, we need to include a demand factor in the analysis. Second, our decomposition gives an opportunity to distinguish between the endogenous and exogenous components of market share changes. While the extensive and intensive margins are affected by the behaviour of exporting firms, shifts in the demand structure are exogenous with respect to exporters at least in the medium term. The changes in market shares can be expressed as

$$\frac{MS_t}{MS_{t-1}} = \frac{\sum_{i \in I} \sum_{g \in G} X_{ig,t}}{\sum_{i \in I} \sum_{g \in G} M_{ig,t}} \frac{\sum_{i \in I} \sum_{g \in G} M_{ig,t-1}}{\sum_{i \in I} \sum_{g \in G} X_{ig,t-1}} = \frac{IM_t}{IM_{t-1}} \frac{EM_t}{EM_{t-1}} \frac{DS_t}{DS_{t-1}} \quad (1)$$

where $X_{ig,t}$ is Latvia's nominal exports of good g to country i at time t , $M_{ig,t}$ is total nominal imports of good g by country i at period t , I is the set of importing countries, and G is the set of products in world trade.

Crucial point of the analysis is the decision on distinction between the intensive and extensive margins. The analysis can be done at the product level (like in Amiti and Freund (2010)), country level (like in Felbermayr and Kohler (2006)) or country-product level (like in Besedes and Prusa (2011)). We follow the latter approach and define distinctions at the product-country level, which means that the exporting of an existing product to a new destination or a new product to an existing destination is also qualified as the extensive margin. This, together with the detailed 6-digit HS

⁵ Dynamic analysis of margins evaluated by methodology of Hummels and Klenow (2005) will lead to incorrect conclusions. As the intensive margin is evaluated using set of non-zero export categories in the current period, the comparison of intensive margins at different points in time will include also shifts in the product set, thus also accounting in part for changes in the extensive margin.

classification, obviously leads to higher contribution of extensive margin to exports in comparison with alternative definitions.

Another important issue is the time dimension in the definition of intensive and extensive margins (see discussion in Besedes and Prusa (2011)). Here we follow the mainstream and examine year-to-year survival of an exporter in a particular market. Exports to a new market are clearly classified as an extensive margin during the first year of appearance; however, if it survives further, it is reclassified into the intensive margin. In other words, the definition of extensive margin is restricted to those markets in which no exports are observed either in period $t - 1$ or period t ; all cases when Latvia's exports are present in both periods are classified as an intensive margin. Such a definition will clearly decrease the contribution of the extensive margin, which should be kept in mind while interpreting the results.

Thus, changes in the intensive margin are calculated as follows:

$$\frac{IM_t}{IM_{t-1}} = \frac{\sum_{i \in I} \sum_{g \in G_{i,t,t-1}} X_{ig,t} \sum_{i \in I} \sum_{g \in G_{i,t,t-1}} M_{ig,t-1}}{\sum_{i \in I} \sum_{g \in G_{i,t,t-1}} M_{ig,t} \sum_{i \in I} \sum_{g \in G_{i,t,t-1}} X_{ig,t-1}} \quad (2)$$

where $G_{i,t,t-1}$ is the set of products exported by Latvia to country i in both periods. It is possible, that Latvia has no exports to some countries in several periods; in such cases, $G_{i,t,t-1}$ is an empty set. Simply speaking, equation (2) calculates the changes in market shares in "old" or "traditional" markets. Following Amiti and Freund (2010), we define the contribution of extensive margin as follows:

$$\frac{EM_t}{EM_{t-1}} = \frac{\sum_{i \in I} \sum_{g \in G} X_{ig,t} \sum_{i \in I} \sum_{g \in G_{i,t,t-1}} X_{ig,t-1}}{\sum_{i \in I} \sum_{g \in G_{i,t,t-1}} X_{ig,t} \sum_{i \in I} \sum_{g \in G} X_{ig,t-1}} \quad (3).$$

This is similar to Feenstra's (1994) index accounting for changes in import variety. Equation (3) compares the share of traditional markets in Latvia's total exports in periods $t - 1$ and t . If this share is decreasing over time, it means that the share of disappeared export markets was smaller than the share of new export markets, and the contribution of the extensive margin to changes in the export market share is positive. However, as mentioned by Amiti and Freund (2010), it should be kept in mind that Feenstra's (1994) index reports the balance between new and disappearing markets and could somewhat understate the importance of new markets.

In order to fully decompose movements of the export market share, we need the following term, interpreted as changes in demand structure:

$$\frac{DS_t}{DS_{t-1}} = \frac{\sum_{i \in I} \sum_{g \in G_{i,t,t-1}} M_{ig,t} \sum_{i \in I} \sum_{g \in G} M_{ig,t-1}}{\sum_{i \in I} \sum_{g \in G} M_{ig,t} \sum_{i \in I} \sum_{g \in G_{i,t,t-1}} M_{ig,t-1}} \quad (4).$$

Equation (4) represents the changes in the share of Latvia's traditional markets in world trade. An increase in this share improves the total market share of Latvia's

exports, although it is problematic to qualify such effect as either an extensive or an intensive margin.

The extensive margin of exports in equation (3) can increase due to two reasons: either producers start to export a new product or an existing export product is sold to a new country. To distinguish between these two effects, we further decompose the extensive margin into the product and geographical/importer dimensions (EM_t^{prod} and EM_t^{imp}):

$$\frac{EM_t}{EM_{t-1}} = \frac{EM_t^{prod}}{EM_{t-1}^{prod}} \frac{EM_t^{imp}}{EM_{t-1}^{imp}} \quad (5)$$

$$\frac{EM_t^{prod}}{EM_{t-1}^{prod}} = \frac{\sum_{i \in I} \sum_{g \in G} X_{ig,t}}{\sum_{i \in I} \sum_{g \in G} X_{ig,t-1}}, \quad \frac{EM_t^{imp}}{EM_{t-1}^{imp}} = \frac{\sum_{i \in I} \sum_{g \in G_{i,t-1}} X_{ig,t}}{\sum_{i \in I} \sum_{g \in G_{i,t-1}} X_{ig,t-1}}$$

where $G_{i,t-1}$ is the set of products exported by Latvia in periods $t-1$ and t . The product dimension of extensive margin again is evaluated by Feenstra's (1994) index, although now it focuses on the share of "traditional" products in total exports. If this share diminishes, the extensive margin improves due to the appearance of some new exported products. The remaining part of the extensive margin is attributed to the importer dimension and includes establishing new geographical links by exporting the existing goods to new countries.

Finally, similar decomposition is carried out for the demand structure, which makes it close in spirit to the constant market share analysis (e.g. Richardson (1971)). The share of Latvia's traditional markets in world imports can shift either due to the changing demand for products or due to shifts in importers' relative demand.

$$\frac{DS_t}{DS_{t-1}} = \frac{DS_t^{prod}}{DS_{t-1}^{prod}} \frac{DS_t^{imp}}{DS_{t-1}^{imp}} \quad (6)$$

$$\frac{DS_t^{prod}}{DS_{t-1}^{prod}} = \frac{\sum_{i \in I} \sum_{g \in G_{i,t-1}} M_{ig,t}}{\sum_{i \in I} \sum_{g \in G} M_{ig,t}}, \quad \frac{DS_t^{imp}}{DS_{t-1}^{imp}} = \frac{\sum_{i \in I} \sum_{g \in G_{i,t-1}} M_{ig,t}}{\sum_{i \in I} \sum_{g \in G_{i,t-1}} M_{ig,t-1}}$$

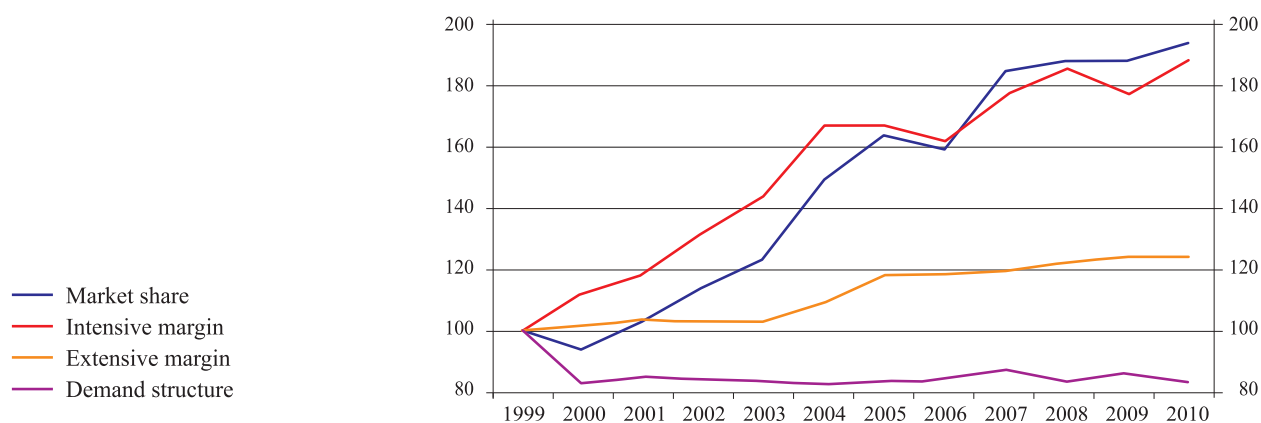
where DS_t^{prod} is the product dimension and DS_t^{imp} is the geographical/importer dimension of the demand structure effect.

Hummels and Klenow (2005) proposed to decompose the intensive margin further into price and volume effects, i.e. determining whether the share of exporters in traditional markets is growing due to more rapid price increases or due to larger physical volumes of exported production. Even though such information is potentially useful, the analysis of price and volume data is left for the next section. This is determined by the abovementioned problem concerning the availability of unit values and volume data, which will make the results incomparable with those for the total intensive margin.

Figure 1 presents the decomposition of Latvia's export market share dynamics between 1999 and 2010.⁶ It shows that competitiveness, indicated by the total market share of Latvia's exporters in the world, was rapidly enhancing during the observation period. Except two periods of marginal decrease (in 2000 and 2006), the changes in market shares were always positive and competitiveness almost doubled in ten years. As to the contribution of margins, the growth in competitiveness was largely determined by the increasing intensive margin, although also a growing extensive margin of Latvia's exports was observed. At the same time, the results point to negative changes in the demand structure. Overall, we can conclude that Latvia's producers are increasing their presence in already conquered markets, while the falling share of Latvia's traditional markets in world trade is compensated by the expansion of Latvia's exporters into new markets.

Figure 1

Extensive and intensive margins of Latvia's exports



Sources: Comtrade and author's calculations.

Notes: Calculated using equations (1)–(4); 1999 = 100.

Now we explore the way an increase in the diversification of exports is achieved (see Figure 2a) and discover why the effect of the demand structure was negative (see Figure 2b). Estimates show that major part of the growing diversification is due to Latvia's producers selling existing export products to a new partner country. Thus, the geographical dimension of the extensive margin is prevailing. Exports of new products are also observed, although the intensity of this process is modest. Moreover, it was driven by one-off effect in 2005, which could be explained by the EU accession and, to some extent, by changes in statistical methodology.⁷

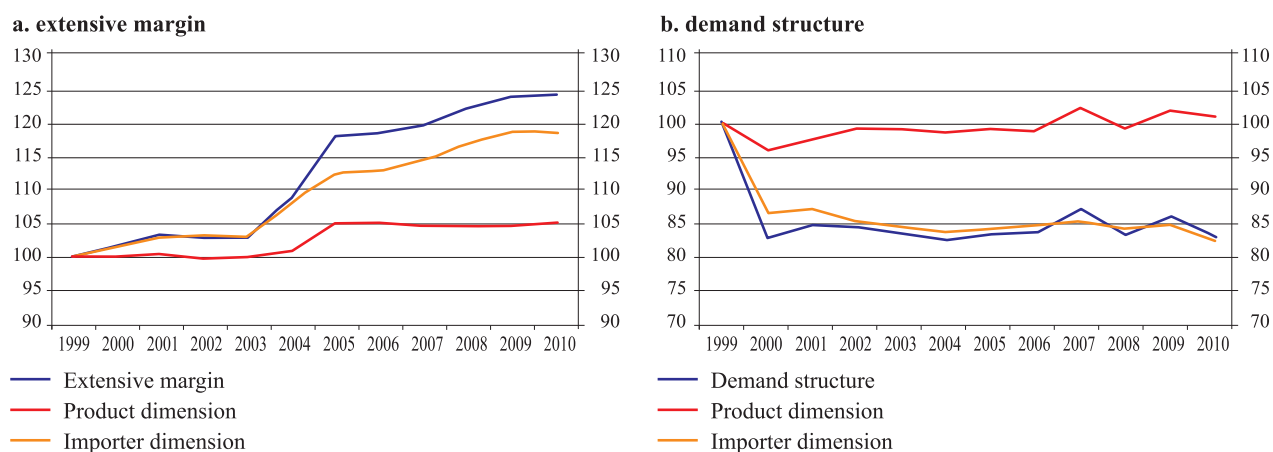
The small role of new products in increasing competitiveness contradicts the results presented in Table 1 and differs from conclusions of Funke and Ruhwedel (2005), and Benkovskis and Rimgailaite (2011) who report a significant increase in product

⁶ The list of countries for which data are not available for several years has been given above. Fortunately, all these countries do not play a significant role in Latvia's trade (except Ukraine), and the effect of missing years on the results is negligible.

⁷ Before May 1, 2004, foreign trade data were collected from customs declarations. Afterwards, data on trade with the EU countries were collected by INTRASTAT monthly surveys. Therefore, changes between 2003 and 2005 may be driven by this change in the source of information.

variety of Latvia's exports. In the case of Funke and Ruhwedel (2005), this is most likely determined by a different sample period (their paper analyses the years between 1993 and 2000 when the process of expanding the set of exported products should have been more intensive), and a different benchmark as well (they estimated product variety of Latvia's exports compared with the US exports). Benkovskis and Rimgailaite (2011) in their turn use a different approach for assessing the extensive margin in the EU market, where variety was calculated relative to German exports and the importance of new products in total exports was not taken into account (similar to Table 1 in this paper). A comparison with the results in Figure 2a may indicate that the share of products Latvia started to export recently in total exports is not very significant. Another possible explanation is relatively lower disaggregation level of UN Comtrade, which leads to an underestimated product set expansion.

Figure 2
Product and importer part



Sources: Comtrade and author's calculations.
Note: Calculated using equations (3)–(6); 1999 = 100.

The geographical dimension is also prevailing over the demand structure effect. While the share of traditional products exported by Latvia in world imports remained roughly unchanged, the share of traditional geographical destinations of Latvia's products decreased. On the one hand, this could be explained by Latvia's geographical location. Although the closest neighbours Estonia and Lithuania experienced a rapid growth in imports, other important partners like Germany, Sweden and UK did not increase their imports as fast as developing countries of Asia. On the other hand, most of the effect is observed in 2000, while demand structure is almost unchanged afterwards.

Extensive and intensive margins can be calculated for separate sectors of products, which is done in Table 2. A disaggregated view on export market shares and margins uncovers some interesting details. During the observed period market shares increased for all major product sectors. The market shares of vehicles improved more than ten times, machinery and mechanical appliances grew more than five times, for food products the increase exceeded four times; we also observe positive and dynamic changes in market shares of wood, metals and chemicals. The role of such a rapid improvement cannot be underestimated, as six abovementioned sectors

form almost two thirds of Latvia's total exports (see Table 4 for share of each sector in 2010). The analysis of extensive and intensive margins by sector of production (Table A2 in Appendix) confirms dominance of the intensive margin in the development of Latvia's competitiveness, with all main export sectors showing strongly growing shares in traditional markets. However, several sectors significantly expanded their export activities to new markets as well.

Table 2

Market shares of Latvia's exports by main product sector

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Wood and articles of wood	100.0	104.8	107.5	114.9	135.3	132.7	129.8	124.2	151.6	139.0	142.3	170.1
Base metals and articles thereof	100.0	110.1	111.1	132.7	133.5	175.1	167.8	158.7	170.6	206.5	187.7	197.9
Machinery and mechanical appliances	100.0	104.3	133.6	159.0	193.1	254.3	316.4	334.5	451.2	562.0	605.0	573.4
Prepared foodstuffs	100.0	101.4	172.9	221.4	191.1	279.4	324.7	358.3	428.2	449.4	386.2	413.2
Chemical products	100.0	95.5	104.9	95.5	103.1	120.0	127.7	159.2	199.8	233.6	209.5	199.2
Vehicles and other transport equipment	100.0	111.5	150.9	165.8	201.4	342.2	550.8	841.0	1117.2	1324.0	1316.1	1168.2

Sources: Comtrade and author's calculations.

Notes: Calculated using equation (1); 6 largest product sectors are chosen using 2010 export data of Latvia (6 largest export sectors cover 64.9% of Latvia' exports in our database); 1999 = 100.

Overall, the story of Latvia's exports is heterogeneous, and we can divide the main sectors into two broad groups. Exports of machinery, vehicles and food products showed the most impressive improvement of competitiveness, with both intensive and extensive margins being important. Latvia's producers of machinery, vehicles and food were able to increase diversification of their sales (mainly expanding the geographical dimension without losing product diversification, although exporters of vehicles were also able to increase their set of products by almost 15%) and at the same time to enhance their presence at the traditional markets. A similar development, although not as rapid, was observed for base metals. A different strategy was used by wood and chemical exporters. The wood sector is the only important export sector with almost unchanged diversification over the last 12 years. The lack of geographical and product expansion was compensated by a more intensive presence of Latvia in traditional markets for wood products. The same strategy was used by exporters of chemical products: changes in the extensive margin were small (albeit positive), while competitiveness was improved by growing presence in traditional markets.

2.2 Main competitors of Latvia's exporters

The previous subsection gives some preliminary information about the performance of Latvia's exporters in external markets, evaluates competitiveness using the extensive and intensive margins. However, when we speak about competitiveness and competition, it is useful to know also the competitors, and in this section, the countries from which the most important rivals of Latvia's producers originate are specified.

Finding out the countries of origin of the main competitors is not a trivial task. If one wants to take into account both bilateral trade links and third-market competition, it is necessary to use a system of double weighting (e.g. Durand (1986)). The method must take into account the relative importance of all competitors in each market, and the importance of each market for an exporter. Ideally, one needs to have also information on domestic producers in every market, which, however, is not possible due to data restrictions. In order to capture the importance of competitors from different countries for Latvia's exporters, we define the double weights (W_c^{comp}):

$$W_c^{comp} = \sum_{i \in I} \sum_{g \in G} (W_{igc}^M \cdot W_{ig}^X) = \sum_{i \in I} \sum_{g \in G} \left(\frac{M_{igc}}{\sum_{c \in C} M_{igc}} \frac{X_{ig}}{\sum_{i \in I} \sum_{g \in G} X_{ig}} \right) \quad (7)$$

where W_{igc}^M represents the share of imports from country c in total imports of good g by country i , while W_{ig}^X shows the share of exports of good g to country i in Latvia's total exports. Therefore, double weights are calculated as a share of competitors in all 379 786 markets and weighted by the importance of those markets in Latvia's exports.

Table 3
Double weights of Latvia's competitors in 1999, 2004 and 2010

	1999	2004	2010
Germany	7.1	9.6	11.6
China	2.1	3.9	5.7
Poland	3.4	3.9	5.4
Russia	5.0	6.0	4.8
Sweden	8.7	6.1	4.5
France	2.9	3.5	4.3
Finland	7.4	5.4	3.8
Netherlands	2.3	2.9	3.6
Italy	3.5	3.4	3.6
UK	2.7	2.2	3.6
US	3.2	2.3	2.6
Estonia	3.4	2.9	2.5
Lithuania	2.2	2.1	2.4
Belgium	1.7	1.9	2.1
Denmark	2.2	2.2	2.1

Sources: Comtrade and author's calculations.

Note: Calculated using equation (7); %.

Table 3 reports the top-15 countries whose firms were the most significant rivals of Latvia's producers in 2010. It also shows how the weights of competitors evolved over time. According to our calculations for 2010, Latvia's exporters face the most severe competition from Germany. This is a rather expected outcome, as Germany is the third largest world exporter and the largest exporter in Europe. The exporters coming from the biggest world exporter China form the second largest group of rivals for Latvia's producers, but we can expect more competition from this region in the future taking into account the rapid increase of China's weight in comparison with

1999. The growing importance of China is naturally explained by its rocketing export performance during the last ten years, while the higher rivalry with German firms is driven by the expansion of Latvia's exports of machinery, vehicles, and chemical products. The third and fourth largest competitor groups for Latvia are coming from Poland and Russia, which can primarily be explained by geographical closeness and, to a lesser extent, by some similarities in export structure. Overall, the top-15 list of exporters is dominated by European countries, especially those from North Europe, again mainly on account of the geographical factor. A significant decline in importance is observed for rivals from Sweden (Latvia's largest competitor back in 1999) mainly due to diminishing share of wood products in Latvia's exports and decreasing presence of Sweden's producers in the wood products market.

Double weights of competitors in individual product sectors are evaluated in Table 4. These results approve our previous conclusion that the German producers are Latvia's main rivals in machinery, vehicles, and chemical products. Therefore, the importance of German competitors is increasing as Latvia is getting more similar to Germany in terms of export structure. It should be noted that the competition from German firms is also significant in other major export areas of Latvia. Competition from China mainly focuses in machinery and mechanical appliances (not to forget textiles, where the share of competitors from China is almost 25%). The share of firms from Russia in machinery is negligible, while the presence of Russia's competitors is very significant in wood products. Apart from Russia, significant competition in the wood product sector is coming from Latvia's northern neighbours Sweden, Finland and Estonia. Finally, in the market of food products Latvia's producers are competing with firms from France, the UK and, to a lesser extent, also Poland.

Table 4
Double weights of Latvia's competitors by main product sector in 2010

	Wood and articles of wood	Base metals and articles thereof	Machinery and mechanical appliances	Prepared foodstuffs	Chemical products	Vehicles and other transport equipment
Share in Latvia's exports	18.3	13.5	12.6	7.4	7.1	6.0
Germany	6.5	12.9	12.9	6.0	16.9	22.4
China	2.6	3.6	13.3	0.7	2.5	2.1
Poland	4.5	5.1	5.0	6.5	6.4	3.8
Russia	11.8	4.1	1.1	1.9	1.7	1.2
Sweden	9.3	3.0	3.8	3.1	2.5	3.3
France	1.3	3.6	2.6	12.8	7.8	8.0
Finland	6.9	2.2	4.5	2.3	2.7	2.0
Netherlands	1.5	2.8	3.5	4.1	5.1	2.6
Italy	0.9	5.2	4.5	5.3	3.7	4.8
UK	1.6	3.8	3.1	10.6	3.3	5.3
US	1.9	2.2	2.8	2.1	4.5	4.9
Estonia	5.6	1.0	0.8	1.5	1.6	1.4
Lithuania	2.3	2.5	0.9	2.9	1.3	0.7
Belgium	1.9	2.2	0.9	1.3	5.4	3.4
Denmark	1.5	1.3	1.5	1.8	1.9	3.4

Sources: Comtrade and author's calculations.

Note: Six largest product sectors are chosen using 2010 export data of Latvia (they cover 64.9% of Latvia's exports in our database); calculated using equation (7); %.

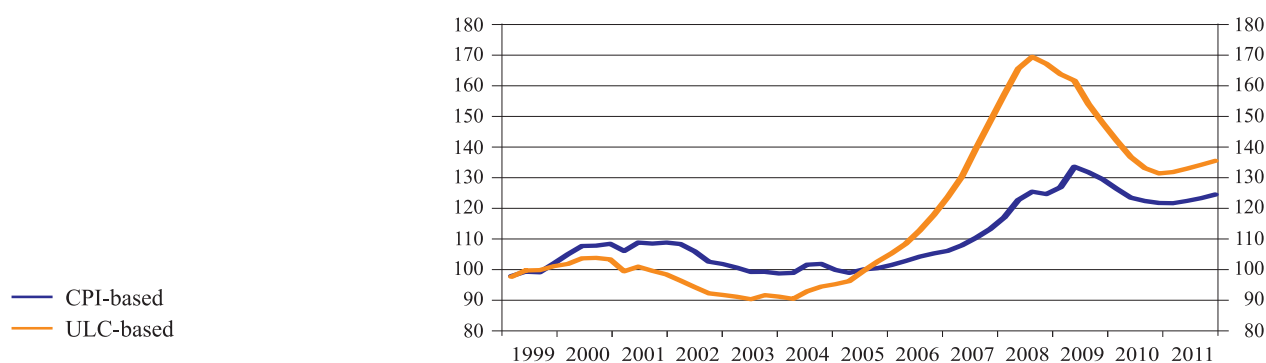
Last, but not least, we should remember about the absence of information on domestic producers in every market, which definitely leads to biased estimations of weights. The results herein somewhat underestimate the competition coming from Lithuania, Estonia, Russia, Germany (to a smaller extent), Sweden and Poland, as these are the main importers of Latvia's products, and the domestic producers obviously have strong positions in these markets.

3. PRICE AND NON-PRICE COMPETITIVENESS

3.1 Traditional real effective exchange rate indices

The real effective exchange rate is one of the most widely used tools in the analysis of a country's competitiveness. It proxies relative changes in prices of a country's exports by changes in nominal exchange rates and inflation differentials, which can be captured in various ways, leading in turn to different measures of real exchange rate. The most popular indicator is based on inflation differentials as measured by the CPI due to data availability and comparability. Other popular definitions are PPI-based and ULC-based real effective exchange rates. Figure 3 reports CPI-based and ULC-based real effective exchange rates of Latvia. Both indicators show similar pictures with moderate changes in real effective exchange rate before 2005, a sharp increase in relative prices during boom years of 2006-2008, and regaining of competitiveness after the financial crisis. At the end of the observed period, the real effective exchange rate is higher by 25%–35% compared with 1999, which might be interpreted as a loss of price competitiveness. Such a simple interpretation of these indices, however, can be quite misleading for various reasons.

Figure 3
Real effective exchange rates of Latvia



Source: Eurostat.

Note: 36 trading partners; 1999 = 100.

The traditional real effective exchange rates have several drawbacks related to approximation of export prices. The CPI-based index captures the dynamics of relative consumer prices. Domestic and export prices are faced by different demand and supply conditions and can therefore differ greatly. Further, the CPI-based index includes changes in indirect taxes, which do not affect export activities directly. Although the PPI-based index is closer to the production side of the economy, it still includes production for the domestic market (data on export-oriented PPI are usually very scarce). The ULC-based index has a similar drawback. Moreover, it usually

refers to the total economy, including also the services sector. In addition, the ULC refers only to a part of production costs and ignores such important factors as profit margins. A solution to these shortcomings is to use the relative export price index, i.e. an indicator that is often used in macroeconomic models when explaining the dynamics of real exports. However, an aggregate export deflator still ignores one serious problem: the structure of exports differs across countries. Therefore, the need arises to conduct the analysis at the most disaggregated level to ensure that similar export products are compared for different countries.

In addition, the real effective exchange rate indices measure only the price competitiveness while ignoring non-price factors that affect the performance of exports. One such non-price factor, emphasised by Flam and Helpman (1987), is related to vertical differentiation or quality of exported products. Another non-price factor is changes in consumer tastes, which can be driven by such objective and subjective factors as image or branding. Finally, as emphasised particularly in recent empirical trade literature, consumers gain additional utility from increased product variety through international trade. Therefore, changes in the set of rivals can affect competitiveness of exporters (larger numbers of rivals exporting the same product to one particular market mean increasing variety for consumers). Although several price measures (CPI and PPI) are adjusted for changes in product quality, they do not ensure any possibility to incorporate changes in consumer tastes or product variety.

3.2 Disaggregated approach to measure price and non-price competitiveness

In this section, we will apply the disaggregated approach proposed by Beňkovskis and Wörz (2012) to measure price and non-price competitiveness of Latvia's exports. This approach is based on the methodology developed by Feenstra (1994) and Broda and Weinstein (2006), while the evaluation of unobserved quality or taste parameter is based on the work by Hummels and Klenow (2005). The main idea is that consumers are not focused just on physical quantities but they also value variety (a set of exporters as we are sticking to Armington's (1969) assumption. Moreover, consumers' utility also depends on the quality and taste parameter of a product. By solving consumers' maximisation problem, it is possible to introduce the abovementioned non-price factors into the relative export price measure (for technical derivations see Sections A1–A4 in Appendix).

According to Beňkovskis and Wörz (2012), the changes in the relative export price of good g exported to a country i are defined in the following way:

$$RXP_{ig,t} = \prod_{c \in C_{ig}^{-LV}} \left(\frac{p_{igLV,t}}{p_{igc,t}} \frac{p_{igc,t-1}}{p_{igLV,t-1}} \right)^{w_{igc,t}^{-LV}} \left(\frac{\lambda_{ig,t}^{-LV}}{\lambda_{ig,t-1}^{-LV}} \right)^{\frac{1}{1-\sigma_{ig}}} \prod_{c \in C_{ig}^{-LV}} \left(\frac{d_{igLV,t}}{d_{igc,t}} \frac{d_{igc,t-1}}{d_{igLV,t-1}} \right)^{\frac{w_{igc,t}^{-LV}}{1-\sigma_{ig}}} \quad (8)$$

where LV denotes imports from Latvia, $p_{igc,t}$ is the price of good g imported by country i from country c , $d_{igc,t}$ is the unobservable quality and taste parameter of a product, C_{ig}^{-LV} is the set of countries exporting particular product in both periods (excluding Latvia), $w_{igc,t}^{-LV}$ represents the shares of Latvia's rivals in a particular market, and $\lambda_{ig,t}^{-LV}$ shows the share of new/disappearing exporters (excluding Latvia).

The index of adjusted relative export price in equation (8) can be divided into three parts.

- The first term gives the traditional definition of changes in relative export prices, which are driven by changes in relative export unit values weighted by the importance of competitors in a given market (represented by $w_{igc,t}^{-LV}$). An increase in relative export unit values is interpreted as a loss of price competitiveness.
- The second term represents Feenstra's (1994) ratio capturing changes in varieties (i.e. the set of exporters of this product in our case). This term is calculated with exports coming from Latvia excluded. It can be interpreted as the effect from a changing set of competitors: more competitors for the same product give higher utility and lower minimum unit-costs for consumers while at the same time lowering the market power of Latvia's producers. Therefore, more competitors imply a positive contribution to the adjusted relative export price index and are associated with a loss in non-price competitiveness.
- The third term is simply the change in relative quality and taste of exports. If the quality and taste of Latvia's exports is rising faster than that of its rivals, the contribution to the adjusted relative export price index is negative, thus signalling improvements in non-price competitiveness. Although relative quality and taste are unobservable, it is possible to evaluate them using information on relative unit values and real market shares (see Section A3 in Appendix).

Finally, we need to design an aggregate relative export price, as index in equation (8) describes relative export prices only for one specific product g exported to one particular country i . The aggregate adjusted relative export price index can be defined as a weighted average of specific market indices where weights are given by the shares of those markets in Latvia's exports.

3.3 Results of disaggregated approach for Latvia's exports

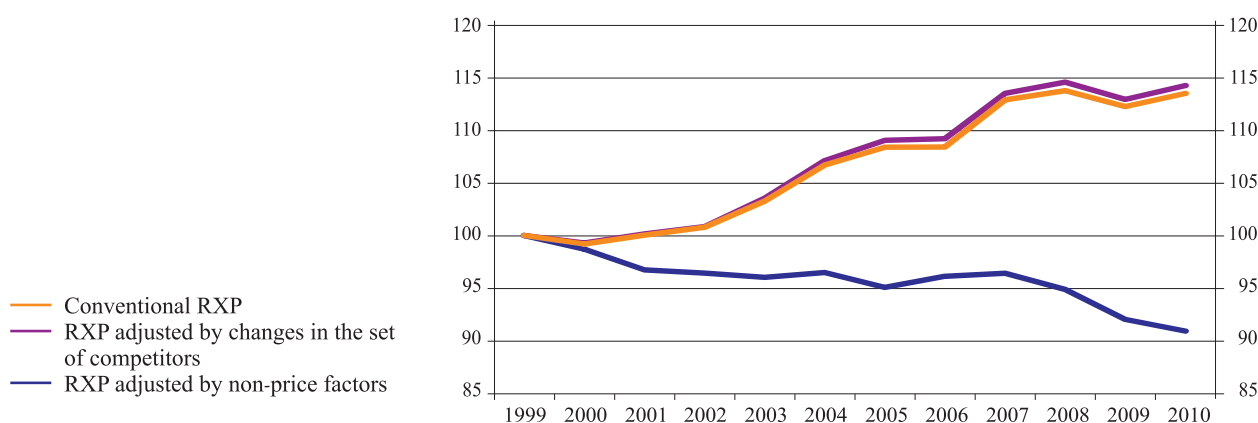
Now we can calculate the relative export price index for Latvia, which will take into account the non-price factors like quality, taste and changes etc. in the set of rivals. This is done using equations (8) and (A9), while the unobserved relative quality is evaluated by equation (A10). Figure 4 shows three different relative export price indices for every country. The first one is the traditional or conventional relative export price index (RXP), which does not take into account changes in the quality and set of rivals and is calculated using the first term in equation (8). This index can serve as a benchmark denoting pure price competitiveness of Latvia's exports. The second index also takes into account changes in the composition of competitors in the market. It is calculated using the first two terms in equation (8). A comparison with the conventional index indicates the contribution of changes in the set of rivals to competitiveness. Finally, the relative export price index adjusted to non-price factors is calculated using all three terms of equation (8). This index includes all non-price competitiveness factors analysed in this paper. By comparing it with the conventional RXP, we can highlight the role of non-price factors in Latvia's export competitiveness.

Before analysing the role of non-price factors for export competitiveness, we shall contrast the relative export price index based on trade data to the more frequently

used real effective exchange rates reported in Figure 3. As both real effective exchange rates mostly describe price competitiveness, we must compare them with the conventional relative export price index. Although all indicators are signalling overall losses of price competitiveness between 1999 and 2010 for Latvia's exporters, the magnitude of losses and the dynamics over years differ.

Figure 4

Latvia's relative export prices



Sources: Comtrade and author's calculations.

Note: Relative export prices are calculated by cumulating RXP changes from equations (8), (A9) and (A10); 1999 = 100.

Both real effective exchange rates calculated from the aggregate price indices show a more pronounced real appreciation. At the peak, they point to around 70% appreciation (ULC-based) and around 35% appreciation (CPI-based) in comparison with the level of 1999. Price competitiveness improved significantly during and after the crisis; however, the level of real exchange rate is still significantly higher than in 1999 (by around 35% for ULC-based and around 25% for CPI-based rates). By contrast, the relative export price index calculated on the basis of highly disaggregated trade data shows much more moderate loss of price competitiveness of Latvia's exporters, with the highest point observed in 2008 (losses of almost 15% compared with 1999). Second, there is a difference in time pattern of the changes in price competitiveness. All indices show the weakest point of competitiveness in 2008–2009 (for CPI-based index late peak is due to an increase in VAT and excise tax rates in Latvia), although in the case of aggregated indices, price competitiveness is rather stable until 2006, while the disaggregated index shows a gradual loss of price competitiveness until 2008. These differences could be driven by various reasons, including differences between the CPI, ULC and export prices (unit values). In contrast to the ULC, export prices include profit margins, which declined during the boom years, thus partly compensating the rapid growth in labour costs. After the crisis, however, profit margins gradually returned to their initial level. Another crucial factor is structural differences between Latvia and its rivals, which are not captured by aggregated indices. A slower increase of disaggregated relative export price might show that losses of price competitiveness were much less pronounced in the main exporting sectors of Latvia.

The comparison of RXP adjusted to changes in the set of competitors with the conventional RXP shows no material effect from changes in the set of rivals. In

other words, a rising or falling number of rivals is not an important driver of Latvia's export competitiveness. However, when we look at the RXP adjusted by non-price factors, we observe a rather strong impact of changes in quality and taste on Latvia's export competitiveness. Figure 4 shows that this index decreases, indicating that Latvia was gaining non-price competitiveness. Although Latvia's export unit values were increasing relative to those of the main rivals, the relative quality of Latvia's exports (or taste for Latvian products) was rising even faster, compensating the price effect and leading to the improvement in overall competitiveness. Unfortunately, our methodology does not allow for disentangling tangible and intangible components of non-price competitiveness, therefore we cannot calculate the contribution of the changes in physical quality of exports. Most probably Latvia managed to improve both physical quality of products and their image, branding and market placement.

Table 5
Cumulated contribution of non-price factors to competitiveness of Latvia's exports by main sector and market

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Sectors												
Wood and articles of wood	100.0	101.8	103.6	106.8	112.1	111.2	110.6	108.0	123.0	121.9	119.0	126.5
Base metals and articles thereof	100.0	96.3	102.6	89.8	94.5	95.3	100.8	102.8	99.7	105.0	98.7	103.0
Machinery and mechanical appliances	100.0	102.2	101.1	106.9	107.1	123.4	134.5	132.3	128.3	147.9	150.6	162.7
Prepared foodstuffs	100.0	111.9	159.5	191.1	220.1	252.7	271.4	290.3	289.4	294.7	305.4	312.6
Chemical products	100.0	93.4	74.2	74.6	69.6	69.0	79.7	83.9	94.4	101.3	115.2	129.8
Vehicles and other transport equipment	100.0	85.1	87.9	77.3	79.0	78.8	76.5	77.0	78.6	79.9	84.5	84.1
Importers												
Lithuania	100.0	97.6	96.1	98.0	93.7	107.8	107.7	108.1	106.1	110.5	117.0	119.1
Estonia	100.0	93.6	72.2	72.1	72.7	71.3	87.7	89.5	96.8	107.9	113.3	122.5
Russia	100.0	115.4	134.5	159.7	187.9	197.3	180.7	191.2	185.4	201.6	195.2	204.3
Germany	100.0	101.5	104.7	94.9	94.9	92.1	95.0	92.1	92.3	94.8	96.5	96.6
Sweden	100.0	98.2	100.8	104.1	106.3	105.1	104.3	102.7	114.5	105.6	110.4	121.8
Poland	100.0	102.6	103.6	101.7	99.6	104.1	105.2	70.6	76.5	77.6	73.3	85.9

Sources: Comtrade and author's calculations.

Notes: Six largest product sectors are chosen using 2010 export data of Latvia (they cover 64.9% of Latvia' exports, six largest importers – 62.8%). Calculated using equations (8), (A9) and (A10); 1999 = 100.

This finding is mostly corroborated by earlier literature on quality performance in CEEC. Dulleck et al. (2005) find an overall evidence for quality increases in CEEC exports between 1995 and 2000, although they report serious cross-country differences. For instance, the authors conclude that quality was, to some extent, a concern for the Baltic States. Also Fabrizio, Igan and Mody (2007) state that the gains in market shares of CEEC, despite the pronounced appreciation trend of their currencies, can be ascribed to a shift in the quality of their exports. The performance of Latvia in terms of quality was positive between 1994 and 2004, albeit worse

compared with several Central European countries. Some divergence in the results might be explained by different time periods for analysis, as Figure 3 suggests a pronounced improvement in non-price competitiveness starting only from 2002. Finally, Beņkovskis and Wörz (2012) use the same methodology and evaluate non-price competitiveness of ten CESEE countries, including Latvia, in the EU market (based on data from Comext). The main conclusions are similar: although the relative export prices increased more strongly in Latvia in comparison with their competitors, the average quality and taste for Latvia's goods increased even faster, thus fully compensating for the rise in prices.

The analysis by product sector shows significant improvements in non-price competitiveness for all major export goods, excluding vehicles and other transport equipment (see Table 5). The most rapid improvement in quality or shift in consumer tastes is observed for food products and machinery. The role of non-price factors for wood and chemical products is positive, although less significant, while quality or taste for Latvia's exports of base metals remained unchanged. The analysis of non-price competitiveness at different geographical destinations states, that the highest contribution of non-price factors to Latvia's competitiveness is observed in Russia (the most important destination outside the EU). Non-price competitiveness in Lithuania, Sweden and Estonia is improving, although at a lower speed in comparison with the results obtained by Beņkovskis and Wörz (2012) on the basis of the Comext database. Moreover, Table 5 reports negative changes in quality or consumer tastes for Latvia's products in German market, which contradicts the results in Beņkovskis and Wörz (2012). Taking into account the similarity of applied methodology, the only plausible explanation for this inconsistency is the difference in input data. It is possible that the disaggregation level, which is approximately 2 times smaller in Comtrade, and the problems with volume and price data referred to above produce bias in this paper's results. Taking into account that the disaggregation level of Comext database is higher and, hence, the estimates of unit values are more accurate, we can argue that evaluations of Latvia's competitiveness in EU markets are more precise in Beņkovskis and Wörz (2012). It follows that our results have tendency to underestimate the effect of non-price competitiveness due to the data limitation problem. However, broader coverage of importing countries leads to an important conclusion: the improvement of quality and taste for Latvia's products in Russia's markets in comparison with the EU markets was even more pronounced.

CONCLUSIONS

This paper makes an attempt to assess Latvia's competitiveness in external markets. Acknowledging that the topic of competitiveness is far too broad for one research, we restrict ourselves to only few approaches, which can be applied to highly disaggregated trade data. Thus, the analysis made in this paper still remains in the macro area, albeit at a detailed level. For empirical analysis, trade data from Comtrade at the six-digit level of the HS are used. The dataset contains annual data on imports of 75 reporter countries from 75 partner countries as well as annual data on Latvia's exports to 75 countries between 1999 and 2010.

One of the questions the paper addresses is about Latvia's rivals. From which countries are the main competitor producers coming? According to our results, the Latvian exporters face most severe competition from the German producers. Enterprises from China are the second largest rival group for the Latvian producers, but we can expect more competition from this region in the future taking into account a rapid increase in China's weight. The third and fourth largest group of competitors are coming from Poland and Russia. As to sectoral composition of rivals, the most significant competition in wood products markets is staged by Russia, Sweden, Finland and Estonia. Germany and China are by far the two main rivals of Latvia's machinery exporters. The presence of German firms is also very significant in the vehicles, chemical products and base metals sectors.

A very quick and intuitive way to assess competitiveness of a country is to calculate its export market share. The analysis at a very detailed level allows for extracting contributions of extensive and intensive margins, thus more information about drivers of competitiveness is obtained. Overall, competitiveness represented by the total market share of Latvia's products in world market was rapidly enhancing during the observed period. The upward trend in competitiveness is driven by increasing presence of Latvia's producers in already conquered markets, while the diminishing share of Latvia's traditional markets in world trade is compensated by the expansion of Latvia's exporters into new markets. The growing extensive margin is dominated by geographical dimension, as producers start to export the existing products to new destination countries. These results are not uniform across product sectors, however. Some, like vehicles, machinery and food, performed well both in new geographical destination countries and traditional markets; producers of other goods like wood and chemical products, focused on a more intensive presence in traditional markets.

The real effective exchange rate is by far the most popular way of measuring cost competitiveness. However, these traditional aggregate indicators have a rather long list of drawbacks, including poor proxying for exporting activities, ignoring structural differences of competitors, and focusing solely on price competitiveness. Indeed, the real effective exchange rates are based on price dynamics and almost ignore the changes in product volumes. The abovementioned drawbacks can be resolved, at least partly, by using price and volume trade data on disaggregated level. Therefore, we use the relative export price index developed by Benkovskis and Wörz (2012), which takes into account structural differences and allows for disentangling the impact of changes in relative quality and taste from changes in price competitiveness. The results show that Latvia experienced a loss of pure price competitiveness over sample period, although our index signals that losses of price

competitiveness were much smaller than suggested by traditional REER measures. This could be driven by various factors, including changes in indirect tax rates, counter-cyclical behaviour of profit margins, differences in export structures, and more rapid productivity improvements in export-oriented sectors of Latvia.

When looking at the relative export price adjusted by non-price factors, we observe a rather strong impact of changes in quality and taste on Latvia's export competitiveness. Although Latvia's export unit values were increasing relative to those of its main rivals, the relative quality of Latvia's exports (or taste for Latvia's products) was rising even faster, fully compensating for the price effect and improving overall competitiveness. The analysis by product sector shows significant gains in non-price competitiveness for all major export goods, excluding vehicles and other transport equipment. The analysis of non-price competitiveness in main geographical destinations shows that the highest contribution of non-price factors to Latvia's competitiveness was observed in Russia's market (the most important destination outside the EU). Contributions of non-price competitiveness in the EU market are positive, although smaller when compared with the recent results by Beņkovskis and Wörz (2012). Taking into account the similarity of applied methodology, the only plausible explanation for this discrepancy is the choice of a different database. It is most likely that the disaggregation level, which is relatively smaller in Comtrade, produces a downward bias in the evaluation of Latvia's non-price competitiveness.

Finally, it should be stressed that this paper by no means can fully describe the issue of Latvia's competitiveness and even cannot be regarded as a complete analysis of the subject from the international trade perspective. There is a clear need for further research on microeconomic and institutional determinants of Latvia's competitiveness.

APPENDIX

Table A1

Share in world imports of 75 exporters and 75 importers from the database in 2010

Importers (reporters)	Share in world imports (%)	Exporters (partners)	Share in world imports (%)
United States	13.51	China	12.71
China	9.59	United States	8.18
Germany	7.33	Germany	8.03
Japan	4.76	Japan	5.15
France	4.12	France	3.56
United Kingdom	3.86	Korea	2.98
Italy	3.35	Netherlands	2.88
Hong Kong	3.03	Italy	2.87
Netherlands	3.02	Russia	2.69
Korea	2.92	Canada	2.64
Canada	2.69	United Kingdom	2.63
Belgium	2.68	Mexico	2.15
India	2.40	Belgium	2.07
Spain	2.17	Malaysia	1.70
Singapore	2.14	Switzerland	1.62
Mexico	2.07	Spain	1.61
Russia	1.71	Saudi Arabia	1.57
Australia	1.30	India	1.47
Turkey	1.27	Brazil	1.41
Thailand	1.25	Singapore	1.41
Brazil	1.24	Australia	1.39
Switzerland	1.21	Thailand	1.34
Poland	1.20	Indonesia	1.16
Malaysia	1.13	Ireland	1.06
Austria	1.03	United Arab Emirates	1.06
Sweden	1.02	Sweden	1.02
Indonesia	0.93	Poland	0.98
Czech Republic	0.86	Austria	0.96
Saudi Arabia	0.73	Norway	0.92
Hungary	0.60	Czech Republic	0.82
Denmark	0.58	Turkey	0.70
South Africa	0.55	South Africa	0.64
Norway	0.53	Denmark	0.60
Portugal	0.52	Hungary	0.60
Finland	0.47	Nigeria	0.55
Slovakia	0.44	Vietnam	0.51
Greece	0.44	Finland	0.49
Romania	0.43	Philippines	0.48
Ukraine	0.42	Chile	0.47
Ireland	0.42	Hong Kong	0.46
Israel	0.41	Argentina	0.45
Philippines	0.40	Qatar	0.45
Argentina	0.39	Venezuela	0.42
Chile	0.39	Kuwait	0.42

C O M P E T I T I V E N E S S O F L A T V I A ' S E X P O R T E R S

Importers (reporters)	Share in world imports (%)	Exporters (partners)	Share in world imports (%)
Nigeria	0.30	Algeria	0.40
Algeria	0.28	Slovakia	0.40
Colombia	0.28	Israel	0.38
Pakistan	0.26	Ukraine	0.37
Morocco	0.24	Kazakhstan	0.33
Belarus	0.24	Romania	0.32
Venezuela	0.22	Portugal	0.30
New Zealand	0.21	Colombia	0.28
Peru	0.21	Peru	0.22
Slovenia	0.18	Oman	0.21
Bulgaria	0.17	New Zealand	0.20
Lithuania	0.16	Costa Rica	0.18
Tunisia	0.15	Egypt	0.17
Ecuador	0.14	Slovenia	0.16
Luxembourg	0.14	Greece	0.15
Croatia	0.14	Azerbaijan	0.15
Oman	0.14	Pakistan	0.14
Lebanon	0.12	Belarus	0.13
Panama	0.11	Ecuador	0.13
Serbia	0.11	Bulgaria	0.13
Jordan	0.10	Morocco	0.13
Dominican	0.10	Luxembourg	0.12
Costa Rica	0.10	Lithuania	0.11
Guatemala	0.10	Tunisia	0.11
Estonia	0.09	Trinidad and Tobago	0.10
Sri Lanka	0.08	Sudan	0.07
Kenya	0.08	Estonia	0.07
Latvia	0.08	Croatia	0.07
Bahrain	0.07	Cote d'Ivoire	0.06
Bosnia Herzegovina	0.06	Latvia	0.06
Ethiopia	0.06	Panama	0.05
Total	96.25	Total	93.01

Sources: Comtrade and author's calculations.

Note: The share of exporters and the share of importers are calculated relative to total world imports.

Table A2

Extensive and intensive margins of Latvia's exports by main product sector

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Intensive margin												
Wood and articles of wood	100.0	110.0	113.1	121.3	143.9	138.8	135.0	128.6	158.6	145.6	147.4	171.7
Base metals and articles thereof	100.0	110.9	100.7	124.4	133.2	181.8	159.5	156.2	158.7	181.0	150.4	154.4
Machinery and mechanical appliances	100.0	100.8	139.4	166.5	203.5	240.1	282.7	305.0	403.7	510.5	525.9	503.6
Prepared foodstuffs	100.0	101.9	168.5	204.8	169.8	226.3	249.9	265.4	317.1	339.8	294.1	326.8
Chemical products	100.0	98.9	88.5	86.0	91.6	100.1	101.7	119.4	153.8	173.9	157.4	156.2
Vehicles and other transport equipment	100.0	111.3	110.3	125.2	132.4	177.3	245.5	357.2	463.8	549.6	554.6	576.1
Extensive margin (total)												
Wood and articles of wood	100.0	99.9	99.4	99.5	99.7	100.1	100.3	100.5	101.1	101.8	102.3	102.0
Base metals and articles thereof	100.0	106.5	113.8	111.7	108.2	109.1	120.1	110.9	111.6	118.0	123.0	127.0
Machinery and mechanical appliances	100.0	106.4	99.6	101.3	100.3	111.4	117.1	114.9	109.5	110.6	115.4	113.5
Prepared foodstuffs	100.0	99.5	100.0	101.9	105.9	116.0	120.5	124.3	123.6	124.3	126.0	124.9
Chemical products	100.0	101.8	104.6	96.2	98.7	103.1	105.3	106.2	105.9	112.9	105.9	107.8
Vehicles and other transport equipment	100.0	109.5	145.4	139.8	152.4	187.5	213.5	216.9	224.4	226.7	238.6	225.4
Extensive margin (products)												
Wood and articles of wood	100.0	100.0	100.0	100.0	100.0	100.1	100.1	100.0	99.9	99.9	99.9	99.9
Base metals and articles thereof	100.0	99.9	101.5	99.6	99.5	99.4	99.6	99.5	99.7	99.9	100.2	103.7
Machinery and mechanical appliances	100.0	100.5	100.0	99.9	100.3	102.8	102.1	101.2	95.7	95.5	95.7	95.1
Prepared foodstuffs	100.0	100.9	100.6	100.3	100.5	106.3	106.3	106.4	106.4	106.4	106.5	105.8
Chemical products	100.0	99.5	99.5	99.9	101.1	102.9	103.4	103.4	104.2	105.1	105.2	105.4
Vehicles and other transport equipment	100.0	104.1	108.1	108.7	115.7	112.9	113.8	115.5	116.7	114.5	114.0	113.6
Extensive margin (importers)												
Wood and articles of wood	100.0	99.9	99.4	99.5	99.7	100.0	100.1	100.5	101.2	101.9	102.3	102.1
Base metals and articles thereof	100.0	106.6	112.1	112.2	108.8	109.8	120.6	111.5	111.9	118.1	122.7	122.5
Machinery and mechanical appliances	100.0	105.9	99.6	101.4	100.0	108.3	114.8	113.6	114.4	115.8	120.6	119.3
Prepared foodstuffs	100.0	98.6	99.4	101.6	105.4	109.1	113.3	116.9	116.2	116.8	118.4	118.1
Chemical products	100.0	102.2	105.1	96.4	97.7	100.2	101.9	102.7	101.6	107.3	100.6	102.3
Vehicles and other transport equipment	100.0	105.2	134.5	128.5	131.7	166.1	187.6	187.8	192.3	197.9	209.3	198.4

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Demand structure												
Wood and articles of wood	100.0	95.5	95.6	95.1	94.3	95.5	95.9	96.1	94.6	93.8	94.5	97.1
Base metals and articles thereof	100.0	93.2	96.9	95.5	92.7	88.2	87.6	91.6	96.3	96.7	101.5	100.9
Machinery and mechanical appliances	100.0	97.3	96.3	94.3	94.5	95.0	95.6	95.4	102.0	99.5	99.7	100.3
Prepared foodstuffs	100.0	100.0	102.6	106.1	106.3	106.5	107.9	108.6	109.2	106.4	104.2	101.2
Chemical products	100.0	94.9	113.3	115.4	114.0	116.3	119.2	125.5	122.7	119.0	125.8	118.3
Vehicles and other transport equipment	100.0	91.5	94.1	94.7	99.9	102.9	105.1	108.6	107.3	106.3	99.5	90.0

Sources: Comtrade and author's calculations.

Notes: Six largest product sectors are chosen using 2010 export data of Latvia (they cover 64.9% of Latvia's exports in our database). Calculated using equations (2)–(6); 1999 = 100.

A1. Import price index

We define a nested constant elasticity of substitution (CES), the utility function of a representative household in country i , which consists of three nests. At the upper level, a composite import good and a domestic good are consumed:

$$U_{i,t} = \left(D_{i,t}^{\kappa_i} + M_{i,t}^{\kappa_i} \right)^{\frac{\kappa_i}{\kappa_i-1}} ; \quad \kappa_i > 1 \quad (A1)$$

where $D_{i,t}$ is the domestic good, $M_{i,t}$ is composite imports, and κ_i is the elasticity of substitution between domestic and foreign good. At the second level of utility function, composite imported good consists of individual imported products:

$$M_{i,t} = \left(\sum_{g \in G} M_{ig,t}^{\gamma_i} \right)^{\frac{\gamma_i}{\gamma_i-1}} ; \quad \gamma_i > 1 \quad (A2)$$

where $M_{ig,t}$ is the subutility from consumption of imported good g , γ_i is elasticity of substitution between different import goods, while G denotes the set of imported goods. The third level utility function is the place where variety and quality are introduced into the model. Each imported good consists of various varieties (is imported from different countries of origins, therefore product variety is indicating the set of competitors on the particular market). The taste and quality parameter denotes the subjective or objective quality that consumers attach to the product. $M_{ig,t}$ is defined by a non-symmetric CES function:

$$M_{ig,t} = \left(\sum_{c \in C} d_{igc,t}^{\sigma_{ig}} m_{igc,t}^{\sigma_{ig}} \right)^{\frac{\sigma_{ig}}{\sigma_{ig}-1}} ; \quad \sigma_{ig} > 1 \quad \forall \quad g \in G \quad (A3)$$

where $m_{igc,t}$ denotes quantity of imports of good g from country c , C is the set of all partner countries, $d_{igc,t}$ is the taste and quality parameter, and σ_{ig} is elasticity of substitution among varieties of good g .

After solving the utility maximisation problem subject to the budget constraint, the minimum unit cost function of import good g is represented by:

$$\phi_{ig,t} = \left(\sum_{c \in C} d_{igc,t} p_{igc,t}^{1-\sigma_{ig}} \right)^{\frac{1}{1-\sigma_{ig}}} \quad (A4)$$

where $\phi_{ig,t}$ denotes the minimum unit cost of import good g , and $p_{igc,t}$ is the price of good g imported from country c .

The price indices for good g could be defined as a ratio of minimum unit costs in the current period to minimum unit costs in the previous period ($P_{ig} = \phi_{ig,t} / \phi_{ig,t-1}$). The conventional assumption is that quality and taste parameters are constant over time for all imported varieties and products, ($d_{igc,t} = d_{igc,t-1}$), and the price index is calculated over the set of product varieties $C_{ig} = C_{ig,t} \cap C_{ig,t-1}$ available in both periods t and $t-1$, where $C_{igt} \subset C$ is the subset of all varieties of goods consumed in period t . Sato (1976) and Vartia (1976) proved that for a CES function the exact price index will be given by the log-change price index

$$P_{ig}^{conv} = \prod_{c \in C_{ig}} \left(\frac{p_{igc,t}}{p_{igc,t-1}} \right)^{w_{igc,t}} \quad (A5)$$

where weights $w_{igc,t}$ are computed using cost shares $s_{igc,t}$ in the two periods as follows:

$$w_{igc,t} = \frac{(s_{igc,t} - s_{igc,t-1}) / (\ln s_{igc,t} - \ln s_{igc,t-1})}{\sum_{c \in C_{ig}} ((s_{igc,t} - s_{igc,t-1}) / (\ln s_{igc,t} - \ln s_{igc,t-1}))};$$

$$s_{igc,t} = \frac{p_{igc,t} m_{igc,t}}{\sum_{c \in C_{ig}} p_{igc,t} m_{igc,t}}.$$

The import price index in equation (A5) ignores possible changes in quality and variety (set of partner countries). The underlying assumption that variety is constant was relaxed by Broda and Weinstein (2006). According to them, if $d_{igc,t} = d_{igc,t-1}$ for $c \in C_{ig} = (C_{ig,t} \cap C_{ig,t-1})$, $C_{ig} \neq \emptyset$, then the exact price index for good g is given by:

$$P_{ig}^{bw} = \prod_{c \in C_{ig}} \left(\frac{p_{igc,t}}{p_{igc,t-1}} \right)^{w_{igc,t}} \left(\frac{\lambda_{ig,t}}{\lambda_{ig,t-1}} \right)^{\frac{1}{\sigma_{ig}-1}} = P_{ig}^{conv} \left(\frac{\lambda_{ig,t}}{\lambda_{ig,t-1}} \right)^{\frac{1}{\sigma_{ig}-1}} \quad (A6)$$

$$\text{where } \lambda_{ig,t} = \frac{\sum_{c \in C_{ig}} p_{igc,t} m_{igc,t}}{\sum_{c \in C_{ig,t}} p_{igc,t} m_{igc,t}} \text{ and } \lambda_{ig,t-1} = \frac{\sum_{c \in C_{ig}} p_{igc,t-1} m_{igc,t-1}}{\sum_{c \in C_{ig,t-1}} p_{igc,t-1} m_{igc,t-1}}.$$

Therefore, the price index derived in equation (A5) is multiplied by an additional term, which captures the role of new and disappearing varieties.

Broda and Weinstein (2006) assume that taste and quality parameters are unchanged for all varieties of all goods ($d_{igc,t} = d_{igc,t-1}$), i.e. vertical product differentiation is ignored. Benkovskis and Wörz (2011) introduced an import price index that allows also for changes in taste and quality:

$$\begin{aligned} P_{ig}^q &= \left(\frac{\sum_{c \in C_{ig,t}} d_{igc,t} p_{igc,t}^{1-\sigma_{ig}}}{\sum_{c \in C_{ig,t-1}} d_{igc,t-1} p_{igc,t-1}^{1-\sigma_{ig}}} \right)^{\frac{1}{1-\sigma_{ig}}} = \\ &= \prod_{c \in C_{ig}} \left(\frac{p_{igc,t}}{p_{igc,t-1}} \left(\frac{d_{igc,t}}{d_{igc,t-1}} \right)^{\frac{1}{1-\sigma_{ig}}} \right)^{w_{igc,t}} \left(\frac{\lambda_{ig,t}}{\lambda_{ig,t-1}} \right)^{\frac{1}{\sigma_{ig}-1}} = P_{ig}^{conv} \left(\frac{\lambda_{ig,t}}{\lambda_{ig,t-1}} \right)^{\frac{1}{\sigma_{ig}-1}} \prod_{c \in C_{ig}} \left(\frac{d_{igc,t}}{d_{igc,t-1}} \right)^{\frac{w_{igc,t}}{1-\sigma_{ig}}} \end{aligned} \quad (A7).$$

Equation (A7) can be taken as a modified version of equation (A6) where the additional term captures the changes in quality and taste parameter.

A2. Relative export price index

Equation (A7) gives us a formula for a variety- and quality-adjusted import price index. However, we can easily interpret $m_{igc,t}$, which is country's i imports of product g originating from country c , as country's c exports of product g to country i . Another problem arises from the need to compare the performance of one particular country relative to its competitors, while equation (A7) gives the aggregate import price from all suppliers. According to Benkovskis and Wörz (2012), changes in the relative export price of good g exported by Latvia to country i could be defined in the following way:

$$RXP_{ig,t} = \frac{\phi_{ig,t}^{LV} / \phi_{ig,t-1}^{LV}}{\phi_{ig,t}^{-LV} / \phi_{ig,t-1}^{-LV}} = \frac{(p_{igLV,t} / p_{igLV,t-1}) (d_{igLV,t} / d_{igLV,t-1})^{\frac{1}{1-\sigma_{ig}}}}{\phi_{ig,t}^{-LV} / \phi_{ig,t-1}^{-LV}} \quad (A8)$$

where $\phi_{ig,t}^{LV}$ denotes the minimum unit cost of good g when exported by (imported from) Latvia, while $\phi_{ig,t}^{-LV}$ is the minimum unit cost of good g when exported by (imported from) all countries, except Latvia. After combining equations (A7) and (A8), we obtain:

$$RXP_{ig,t} = \prod_{c \in C_{ig}^{LV}} \left(\frac{p_{igLV,t}}{p_{igc,t}} \frac{p_{igc,t-1}}{p_{igLV,t-1}} \right)^{w_{igc,t}} \left(\frac{\lambda_{ig,t}^{-LV}}{\lambda_{ig,t-1}^{-LV}} \right)^{\frac{1}{1-\sigma_{ig}}} \prod_{c \in C_{ig}^{LV}} \left(\frac{d_{igLV,t}}{d_{igc,t}} \frac{d_{igc,t-1}}{d_{igLV,t-1}} \right)^{\frac{w_{igc,t}}{1-\sigma_{ig}}} \quad (8)$$

where C_{ig}^{-LV} is the set of product varieties available in both periods, excluding varieties coming from Latvia, $w_{igc,t}^{-LV}$ and $\lambda_{ig,t}^{-LV}$ are calculated similar to $w_{igc,t}$ and $\lambda_{ig,t}$, again excluding Latvia from the set of exporters (varieties).

Finally, one needs to design an aggregate relative export price, as the index in equation (8) describes relative export prices only for one specific product g , which is exported to one particular market i . We calculate the aggregated adjusted relative export price index (RXP_t) as a weighted average of market-specific indices. Weighting is done on the basis of Latvia's export data, as this source of information is preferable for determination of country's export structure. If we denote the export price and volume of product g exported by Latvia to country i as $p_{igLV,t}^x$ and $x_{igLV,t}$ accordingly, the aggregate adjusted relative export price index can be defined as

$$RXP_t = \prod_{i \in I} \prod_{g \in G} RXP_{ig,t}^{W_{ig,t}} \tag{A9}$$

where
$$W_{ig,t} = \frac{(S_{ig,t} - S_{ig,t-1}) / (\ln S_{ig,t} - \ln S_{ig,t-1})}{\sum_{i \in I} \sum_{g \in G} ((S_{ig,t} - S_{ig,t-1}) / (\ln S_{ig,t} - \ln S_{ig,t-1}))};$$

$$S_{ig,t} = \frac{p_{igLV,t}^x x_{igLV,t}}{\sum_{i \in I} \sum_{g \in G} p_{igLV,t}^x x_{igLV,t}}.$$

Equation (A9) shows that the aggregate index is just another Sato (1976) and Vartia (1976) log-change index, with its weights computed using the share of product g exports to country i in Latvia's total exports.

A3. Evaluation of relative quality and taste

The calculation of the adjusted relative export price index in equation (8) is a challenging task due to the fact that relative quality and taste are unobservable. As in Hummels and Klenow (2005), we evaluate unobservable quality and taste from utility optimisation problem in the following way: after taking first order conditions and the transformation into log-ratios, we can express relative quality and taste in terms of relative prices, volumes and elasticity of substitution between varieties:

$$\ln \left(\frac{d_{igc,t}}{d_{igk,t}} \right) = \sigma_{ig} \ln \left(\frac{p_{igc,t}}{p_{igk,t}} \right) + \ln \left(\frac{m_{igc,t}}{m_{igk,t}} \right) \tag{A10}$$

where k denotes a benchmark country (any country can be chosen).

A4. Estimation of elasticities

To derive the elasticity of substitution, one needs to specify demand and supply equations. The demand equation is defined by re-arranging the minimum unit cost function in terms of market shares, taking first differences and ratios to a reference country:

$$\frac{\Delta \ln s_{igc,t}}{\Delta \ln s_{igk,t}} = -(\sigma_{ig} - 1) \frac{\Delta \ln p_{igc,t}}{\Delta \ln p_{igk,t}} + \varepsilon_{igc,t} \quad (\text{A11})$$

where $\varepsilon_{igc,t} = \Delta \ln d_{igc,t}$, therefore we assume that the log of quality and taste is a random walk process. The export supply equation relative to country k is given by:

$$\frac{\Delta \ln p_{igc,t}}{\Delta \ln p_{igk,t}} = \frac{\omega_{ig}}{1 + \omega_{ig}} \frac{\Delta \ln s_{igc,t}}{\Delta \ln s_{igk,t}} + \delta_{igc,t} \quad (\text{A12})$$

where $\omega_{ig} \geq 0$ is the inverse supply elasticity assumed to be the same across partner countries. The unpleasant feature of the system of equations (A11) and (A12) is the absence of exogenous variables, which would be needed to identify and estimate elasticities. To get these estimates, one needs to transform the system of two equations into a single equation by exploiting Leamer's (1981) insight and independence of errors $\varepsilon_{igc,t}$ and $\delta_{igc,t}$. This is done by multiplying both sides of equations. After such transformations, the following equation is obtained:

$$\left(\frac{\Delta \ln p_{igc,t}}{\Delta \ln p_{igk,t}} \right)^2 = \theta_1 \left(\frac{\Delta \ln s_{igc,t}}{\Delta \ln s_{igk,t}} \right)^2 + \theta_2 \left(\frac{\Delta \ln p_{igc,t}}{\Delta \ln p_{igk,t}} \right) \left(\frac{\Delta \ln s_{igc,t}}{\Delta \ln s_{igk,t}} \right) + u_{igc,t} \quad (\text{A13})$$

where

$$\theta_1 = \frac{\omega_{ig}}{(1 + \omega_{ig})(\sigma_{ig} - 1)}; \quad \theta_2 = \frac{1 - \omega_{ig}(\sigma_{ig} - 2)}{(1 + \omega_{ig})(\sigma_{ig} - 1)};$$

$$u_{igc,t} = \varepsilon_{igc,t} \delta_{igc,t}.$$

Broda and Weinstein (2006) argue that one needs to define a set of moment conditions for each good g by using independence of unobserved demand and supply disturbances for each country over time:

$$G(\beta_{ig}) = E_t(u_{igc,t}(\beta_{ig})) = 0 \quad \forall c$$

where $\beta_{ig} = (\sigma_{ig}, \omega_{ig})$ represents the vector of estimated elasticities. For each good g imported by country i the following GMM estimator is obtained:

$$\hat{\beta}_{ig} = \arg \min_{\beta \in B} G^*(\beta_{ig})' W G^*(\beta_{ig}) \quad (\text{A14})$$

where $G^*(\beta_{ig})$ is the sample analogue of $G(\beta_{ig})$ and B is the set of economically feasible values of β ($\sigma_{ig} > 1$ and $\omega_{ig} \geq 0$). W is a positive definite weighting matrix, which weights the data so that the variance depends more on large shipments and becomes less sensitive to measurement errors.

The elasticity of substitution between varieties is estimated using equation (A14) for all products where data on at least 3 countries of origin are available. Table A3 displays the main characteristics of estimated elasticities of substitution between varieties. For easier interpretation, one can calculate the median mark-up, which equals $\sigma_{ig} / (\sigma_{ig} - 1)$.

Table A3
Elasticities of substitution between varieties

	Elasticities estimated	Mean	Standard deviation	Maximum	Minimum	Median	Median mark-up
Algeria	3 261	22.0	125.2	6 492.2	1.05	5.36	23.0
Argentina	2 920	20.6	69.1	2 076.8	1.03	5.49	22.3
Australia	2 833	79.3	480.4	14 517.1	1.02	5.83	20.7
Austria	4 501	23.8	84.8	4 011.7	1.07	5.89	20.5
Bahrain	2 328	19.9	44.1	992.5	1.05	5.01	24.9
Belarus	3 326	22.7	71.7	2 023.7	1.10	5.21	23.7
Belgium	4 856	18.4	44.2	905.8	1.05	5.35	23.0
Bosnia Herzegovina	3 282	22.5	61.7	1 453.2	1.05	5.67	21.4
Brazil	3 946	21.3	82.5	3 745.5	1.03	5.52	22.1
Bulgaria	3 893	19.8	49.1	1 096.7	1.07	4.89	25.7
Canada	3 568	42.1	252.9	8 201.7	1.03	8.26	13.8
Chile	3 525	43.5	210.2	6 564.6	1.01	5.44	22.5
China	4 151	45.4	234.9	7 385.5	1.01	6.71	17.5
Colombia	3 718	19.5	64.3	2 305.4	1.06	5.02	24.9
Costa Rica	3 142	21.9	45.3	931.7	1.02	5.69	21.3
Croatia	4 029	17.7	40.8	979.8	1.04	4.58	27.9
Czech Republic	4 672	18.1	36.0	673.2	1.10	5.50	22.2
Denmark	4 440	19.1	52.2	2 541.8	1.09	5.90	20.4
Dominican	1 053	75.8	482.7	12 091	1.01	10.07	11.0
Ecuador	3 064	20.2	50.8	1 368.1	1.05	4.92	25.5
Estonia	3 464	18.6	39.2	816.2	1.03	5.21	23.8
Ethiopia	1 778	18.5	43.2	1 079.1	1.02	5.68	21.4
Finland	4 209	20.4	78.7	3 478.7	1.04	4.99	25.1
France	4 963	24.2	150.0	10 020.8	1.05	5.54	22.0
Germany	4 732	21.0	49.6	1 695.9	1.02	5.62	21.6
Greece	4 291	18.1	48.7	1 112.0	1.03	4.51	28.5
Guatemala	2 904	22.1	75.4	2 474.5	1.02	5.28	23.4
Hong Kong	3 555	69.0	917	52 025.5	1.01	6.11	19.6
Hungary	4 125	23.8	53.4	1 012.6	1.05	5.56	21.9
India	3 835	63.6	421.5	15 872.1	1.01	6.51	18.1
Indonesia	4 286	19.5	70.1	3 613.6	1.07	5.58	21.8
Ireland	4 171	27.5	234.2	13 318.6	1.02	5.59	21.8
Israel	1 418	137.2	1 090.9	37 958.5	1.02	9.03	12.5
Italy	4 913	19.2	43.5	893.9	1.02	5.05	24.7
Japan	4 349	22.9	90.5	4 472.8	1.02	4.35	29.8
Jordan	2 145	19.7	47.6	714.1	1.05	4.73	26.8
Kenya	2 426	28.2	88.5	2 177.7	1.05	5.45	22.5
Korea	4 499	18.3	52.3	2 650.8	1.01	5.32	23.2
Latvia	3 451	21.0	51.4	1 089.1	1.02	5.13	24.2
Lebanon	3 010	21.7	58.8	1 469.7	1.03	4.90	25.6
Lithuania	3 673	18.5	45.6	1 177.7	1.04	5.13	24.2
Luxembourg	3 598	27.5	112.6	5 751.3	1.01	6.05	19.8
Malaysia	3 969	86.9	541.2	14 903.0	1.01	4.59	27.8
Mexico	3 548	29.0	92.7	3 528.0	1.01	5.60	21.7
Morocco	3 412	21.0	59.3	1 857.2	1.02	4.87	25.9

	Elasticities estimated	Mean	Standard deviation	Maximum	Minimum	Median	Median mark-up
Netherlands	4 193	55.6	329.8	12 309.7	1.01	4.67	27.2
New Zealand	3 949	19.7	49.4	1 058.0	1.05	5.30	23.3
Nigeria	1 559	29.6	123.8	4 373.9	1.03	5.18	23.9
Norway	4 321	17.3	49.9	1 200.1	1.01	4.50	28.6
Oman	2 325	22.6	58.4	1 185.7	1.03	5.12	24.3
Pakistan	2 387	56.4	404.5	12 883.5	1.01	9.95	11.2
Panama	2 503	21.5	59.5	1 661.0	1.00	5.38	22.8
Peru	3 393	17.9	63.7	2 902.9	1.02	5.03	24.8
Philippines	3 592	24.0	82.6	2 832.5	1.03	4.74	26.7
Poland	4 566	18.6	72.5	4 112.3	1.08	5.34	23.0
Portugal	4 338	19.9	51.1	970.9	1.02	4.86	25.9
Romania	4 238	20.5	59.4	2 517.7	1.01	5.56	21.9
Russia	4 285	20.0	65.9	3 443.2	1.08	6.35	18.7
Saudi Arabia	3 937	19.2	43.2	1 270.7	1.01	5.12	24.3
Serbia	3 318	21.7	57.5	1 222.5	1.01	5.81	20.8
Singapore	3 068	76.4	438.7	8 874.8	1.00	5.79	20.9
Slovakia	4 130	21.0	76.5	3 997.3	1.07	5.80	20.9
Slovenia	4 241	19.2	60.0	2 002.4	1.06	5.27	23.4
Southern Africa	4 122	39.5	192.4	6 241.9	1.01	6.49	18.2
Spain	4 872	17.9	43.8	1 142.0	1.04	5.21	23.8
Sri Lanka	2 336	37.8	147.9	2 872.4	1.02	5.75	21.0
Sweden	3 986	24.5	56.0	1 452.2	1.03	6.21	19.2
Switzerland	4 684	20.0	46.3	1 089.3	1.03	5.33	23.1
Thailand	3 754	31.5	207.5	6 240.8	1.02	5.65	21.5
Tunisia	3 380	20.6	59.4	2 001.7	1.03	5.02	24.9
Turkey	4 206	17.4	98.9	5 958.3	1.04	5.05	24.7
UK	4 871	18.0	47.1	1 381.1	1.05	4.37	29.7
Ukraine	3 721	20.9	57.2	2 206.4	1.08	6.36	18.7
US	3 956	68.2	526.5	23 647.6	1.01	4.98	25.1
Venezuela	3 520	23.6	80.6	2 825.9	1.04	5.37	22.9

Sources: Comtrade and author's calculations.

Note: Elasticities of substitution are estimated using equation (A14) for all products where data on at least 3 countries of origin are available.

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