Competitiveness of Latvia's exporters

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Abstract

This paper evaluates the competitiveness of Latvia's exporters from various aspects by using detailed trade data from UN Comtrade. Competitiveness represented by the market share of Latvia's products in world trade was on a rising trend, growing almost two times between 1999 and 2010. This 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. Analysis of non-price competitiveness signals that although Latvia's export unit values were increasing faster than those of its main competitors, relative quality and taste for Latvia's products were rising even faster, and, overall, the competitiveness of Latvia's exporters improved.

1. 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 others not mentioned here. As a result, the number of ways a researcher can evaluate the competitiveness of a country is vast. This paper is restricted to only a few approaches, which can be applied to highly disaggregated trade data. Thus we are narrowing the definition of competitiveness to the one given by the OECD: "Competitiveness is a measure of a country's advantage or disadvantage in selling its products in international markets"[3], and concentrate on the performance of Latvia's exporters.

The motivation for focusing on export activities is obvious: Latvia is a very open and 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 the competitiveness of Latvia's exports. However, some empirical papers are already outdated and observe years before accession to the EU (e.g. Dulleck et al., 2005, or Fabrizio et al., 2007), some relate competitiveness issues mostly to effective exchange rates (e.g. Purfield and Rosenberg, 2010), some do not cover all Latvia's exports (Benkovskis and Wörz, 2012). Therefore, the need arises to update the assessment of competitiveness and to broaden the set of available indicators.

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[3] See OECD Glossary of Statistical Terms: http://stats.oecd.org/glossary/detail.asp?ID=399

Are Latvia's products gaining export market shares? Are exporters doing it by expanding in new markets or are they intensifying their presence in traditional markets? Who are the main competitors for 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 UN Comtrade allow us not to restrict analysis to some specific geographical area or subset of products, while disaggregation enables tracking the performance of separate sectors and to take into account structural differences. The important contribution to existing empirical literature is the decomposition of changes in export market shares into intensive and extensive margins. This paper modifies the methodology of Hummels and Klenow (2005) for dynamic analysis. We also evaluate non-price competitiveness of Latvia's total exports using UN Comtrade data. This analysis is performed using methodology recently developed by Benkovskis and Wörz (2012).

The next section illustrates the data, which are extracted from UN Comtrade. Section 3 then focuses on value data, decomposing market share changes into extensive and intensive margins as well as presenting a geographical breakdown of Latvia's main competitors. Section 4 uses 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.

2. Description of database

For empirical analysis we use trade data from UN Comtrade. The main reason for this choice of data source is its almost full country coverage. Although the data in UN Comtrade have a lower level of disaggregation and a longer publication lag in comparison with Eurostat Comext, the world-wide coverage of the UN database is a significant advantage, for a view on Latvia's exports would not be complete without such important trade partners as Russia or Belarus. Moreover, despite the current low shares of such countries as China, India and Brazil in Latvia's exports, 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 UN Comtrade can give information on the product and partner structure of non-EU markets.

UN 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 Eurostat (more than 10 000 products) but is still reasonably high to calculate unit values.

Notwithstanding our final goal to evaluate the competitiveness of Latvia's exports, this paper achieves this 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 evaluation of price and non-price competitiveness. The methodology used in section 4 is based on the consumer's utility maximisation problem. Import data are clearly preferable in this case, as imports are reported in CIF (cost, insurance, freight) prices and include transportation costs to the importer's border; therefore, import data provide a better comparison of prices from the consumer's point of view. On the other hand, use of import

data implies some drawbacks. Obviously, 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 measurement of trade in goods within the EU relies on VAT reports. This creates a greater incentive for reporting export activities, which are subject to VAT returns.[4] For that reason we still use Latvia's export data where possible, namely when 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.

The import dataset contains annual data on imports of 75 countries at the six-digit HS level between 1999 and 2010.[5] The list of reporters (importers) can be found in the Appendix, Table A1. By collecting data on imports of the 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 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 Table A1 (note that the list of exporters does not fully coincide 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 a proxy for import prices and trade volumes (in kg) as a 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 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, coverage is usually worse for the first half of the sample period. This problem makes 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 to the database relates to structural changes within 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 this problem is the large price level differences within a product code. Consequently, all observations with outlying unit value indices were excluded from the database.[6]

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[4] An extreme case of this 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).

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

[6] An observation is treated as an outlier if the absolute difference between the unit value and the median unit value of the product category in the particular year exceeds four median absolute deviations. The exclusion of outliers does not significantly reduce the coverage of the database. In the majority of cases only less than 2% of total import value was treated as an outlier.

As to Latvia's export dataset, which is mainly used for analysis of extensive and intensive margins, this contains annual data on exports to the 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 the export dataset we restrict ourselves only to 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 a detailed analysis of Latvia's competitiveness. At the beginning, analysis is restricted to value data for calculating extensive and intensive margins as well as for a description of Latvia's main competitors, while later we will use also volume and unit value data.

3. Market shares and competitors
3.1. 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) and assume an unchanged set of export products and destinations stress the intensive margin or exported quantity on a single market. The only way to increase exports in this 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 the one developed by Krugman, 1979, 1980), allow for changes in the number of exported varieties. These models put emphasis on the role of extensive margin and state that exports can be enlarged by accessing new markets (in a 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 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 enables an answer to the question whether growth of export market shares and competitiveness was mainly driven by increasing diversification of export products and/or destinations or whether 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. see Dennis and Shepherd, 2007). This measure is simple, 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	8959	9550	10055	11035	11686	13412	18968	20472	20827	21033	22593	24905
Products	2638	2674	2747	2817	2854	3065	3377	3490	3416	3462	3562	3610
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

Source: *UN Comtrade*, author's calculations.

The number of markets where 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 do not shed light on the role of the intensive margin and do not allow comparison with the contribution of the extensive margin. Several papers propose ways to decompose growth in trade (see e.g. Felbermayr and Kohler, 2006, or Besedes and Prusa, 2011). Our goal, however, is export competitiveness which is usually associated with 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,[7] while we are interested in a dynamic analysis of Latvia's competitiveness.

This paper proposes disaggregation of 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 demand structure may also affect changes in market share. The reasoning for this decomposition is twofold. First, as changes in 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 behaviour of exporting firms, shifts in the demand structure are exogenous with respect to exporters at least in the medium term. Changes in market share can be expressed as

$$\frac{MS_t}{MS_{t-1}} = \frac{\sum\limits_{i \in I}\sum\limits_{g \in G} X_{ig,t}}{\sum\limits_{i \in I}\sum\limits_{g \in G} M_{ig,t}} \frac{\sum\limits_{i \in I}\sum\limits_{g \in G} M_{ig,t-1}}{\sum\limits_{i \in I}\sum\limits_{g \in G} X_{ig,t-1}} = \frac{IM_t}{IM_{t-1}} \frac{EM_t}{EM_{t-1}} \frac{DS_t}{DS_{t-1}} \tag{1}$$

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, G is the set of products in world trade.

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

A crucial point of the analysis is the decision on distinction between intensive and extensive margins. The analysis can be done at the product level (as in Amiti and Freund, 2010), country level (as in Felbermayr and Kohler, 2006) or country-product level (as in Besedes and Prusa, 2011). We follow the latter approach and define distinctions at the product-country level, which means that exporting 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 classification, obviously leads to a higher contribution of extensive margin to exports in comparison with alternative definitions.

Another important issue is the time dimension in 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 in 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 in period t; all cases where Latvia's exports are present in both periods are classified as an intensive margin. This definition will clearly decrease the contribution of the extensive margin, which should be kept in mind when interpreting the results.

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

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

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 these 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:

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

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 decreases 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:

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

Equation (4) represents 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 this effect as either an extensive or an intensive margin.

The extensive margin of exports in equation (3) can increase for 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}).

$$\frac{EM_t}{EM_{t-1}} = \frac{EM_t^{prod}}{EM_{t-1}^{prod}} \frac{EM_t^{imp}}{EM_{t-1}^{imp}} \tag{5}$$

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

where $G_{t,t-1}$ is the set of products exported by Latvia in periods $t-1$ and t. The product dimension of the extensive margin is again 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 new exported products. The remaining part of the extensive margin is attributed to the importer dimension and includes establishing new geographical links by exporting 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 (see e.g. Richardson, 1971). The share of Latvia's traditional markets in world imports can shift either due to changing demand for products or due to shifts in importer's relative demand.

$$\frac{DS_t}{DS_{t-1}} = \frac{DS_t^{prod}}{DS_{t-1}^{prod}} \frac{DS_t^{imp}}{DS_{t-1}^{imp}} \tag{6}$$

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

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 decomposing the intensive margin further into price and volume effect, 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 this information is potentially useful, analysis of price and volume data is left for the next section. This is determined by the abovementioned problem concerning 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.[8] It shows that competitiveness, as indicated by the total world market share of Latvia's exporters was rapidly enhancing during the observation period. Except for two periods of marginal decrease (in 2000 and 2006), changes in market share were always positive and competitiveness almost doubled in ten years. As to the contribution of margins, growth in competitiveness was largely determined by the increasing intensive margin, although we also observe growing extensive margin of Latvia's exports. 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 old 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 margin of Latvia's exports
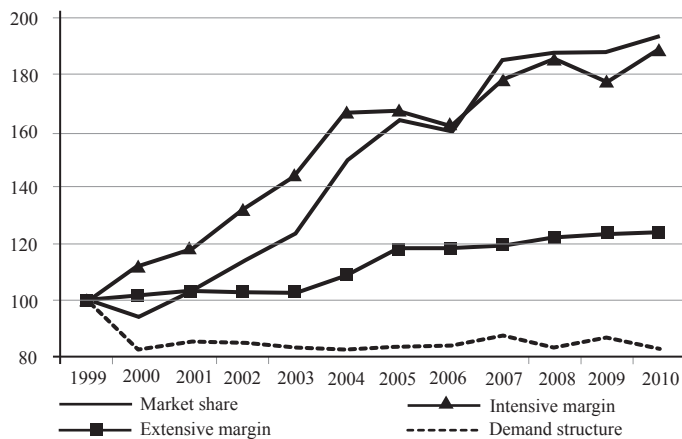
Source: *UN Comtrade*, author's calculations.
Notes: Calculated using equations (1)-(4); 1999=100.

Now we explore the way an increase in 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 the major part of growing diversification is due to Latvia's producers selling exist-

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

ing 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 EU accession and, to some extent, by changes in statistical methodology.[9]

Figure 2. Product and importer dimension

a. extensive margin
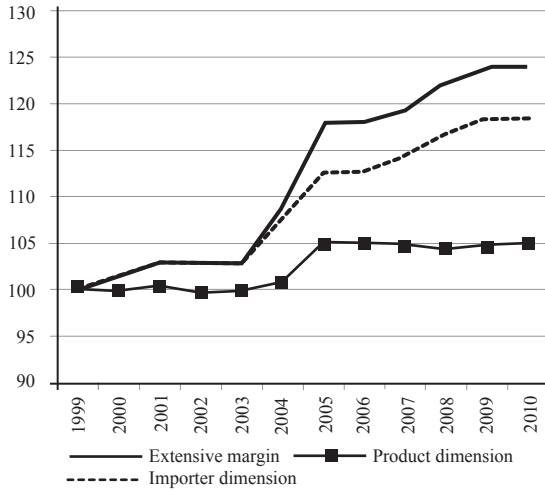
b. demand structure
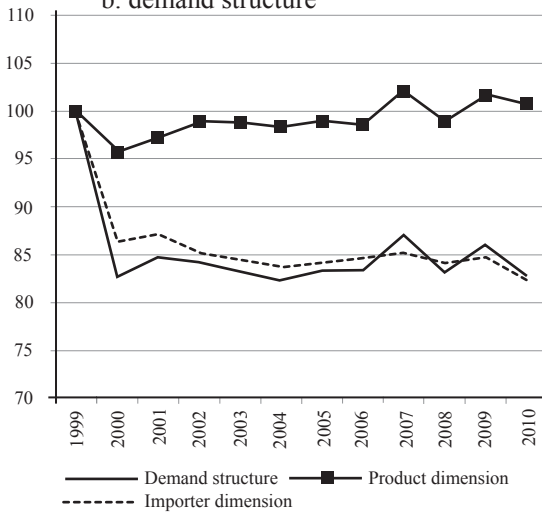
Source: *UN Comtrade*, author's calculations.
Notes: Calculated using equations (3)-(6); 1999=100.

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[9] Before May 1, 2004, foreign trade data were collected from customs declarations. Afterwards, data on trade with 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.

The small role of new products in increasing competitiveness contradicts the results presented in Table 1 and differs from the conclusions of Funke and Ruhwedel (2005), and Benkovskis and Rimgailaite (2011) who report a significant increase in product variety of Latvia's exports. In the case of Funke and Ruhwedel (2005), this is most likely determined by a different sample period (between 1993 and 2000 when the process of expanding the set of products should have been more intensive), and a different benchmark as well (product variety of Latvia's exports compared with 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 while the importance of new products in total exports was not taken into account. 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 the relatively lower disaggregation level of UN Comtrade, which leads to an underestimate of product set expansion.

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 of base metal	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

Source: *UN Comtrade*, author's calculations.
Notes: Calculated using equation (1); the six largest product sectors are chosen using 2010 export data for Latvia (cover 64.9% of Latvia' exports in our database); 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 the UK did not increase their imports as rapidly as the 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 product sectors; this is done in Table 2. A disaggregated view of export market shares and margins uncovers some interesting details. During the period observed, market shares increased for all major product sectors. The market share 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. Analysis of extensive and intensive margins by sector of production (see Table A2 in Appendix) confirms dominance of the intensive margin in 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.

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 in 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 on 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. A 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.

3.2. Main competitors of Latvia's exporters

The previous subsection gives some preliminary information about the performance of Latvia's exporters in external markets and evaluates competitiveness using the extensive and intensive margins. However, when we speak about competitiveness and competition, it is also useful to know the competitors so this section specifies countries from which the most important competitors for Latvia's producers originate. Identifying 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 (see 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 also needs to have information on domestic producers in every market. This, 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}):

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

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 the share of competitors in all 379 786 markets and weighted by the importance of those markets in Latvia's exports.

Table 3 reports the top 15 countries whose firms were the most significant competitors for 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. Exporters coming from the biggest world exporter, China, form the second largest group of competitors 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 higher competi-
tion 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 come 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 Northern Europe, again mainly
on account of the geographical factor. A significant decline in importance is observed for
competitors from Sweden (Latvia's largest competitor back in 1999) mainly due to the dimin-
ishing share of wood products in Latvia's exports and the decreasing presence of Sweden's
producers in the wood products market.

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

Source: *UN Comtrade*, author's calculations.
Notes: Calculated using equation (7); %.

Double weights of competitors in individual product sectors are evaluated in Table 4. These
results corroborate our previous conclusion that German producers are Latvia's main com-
petitors 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 competition from German firms is also significant in Latvia's other
major export areas. Competition from China mainly focuses on machinery and mechani-
cal appliances (not to forget textile products, where the share of competitors from China is
almost 25%). The share of firms from Russia in machinery is negligible, while the presence
of Russian competitors is very significant in wood products. Apart from Russia, significant
competition in the wood product sector comes from Latvia's northern neighbours Sweden,
Finland and Estonia. Finally, in the food products market 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 sectors in 2010

	Wood and articles of wood	Base metals and articles of base metal	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

**Source:** *UN Comtrade*, author's calculations.
Notes: The six largest product sectors are chosen using 2010 export data for Latvia (cover 64.9% of Latvia's exports in our database); calculated using equation (7); %.

Last, but not least, we should remember the absence of information on domestic producers in every market, which definitely leads to biased estimations of weights. The results here 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 domestic producers obviously have strong positions in these markets.

4. Price and non-price competitiveness
4.1. Traditional real effective exchange rate indices
The real effective exchange rate is one of the most widely used tools in 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 real exchange rate measures. 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 for Latvia. Both indicators show similar pictures with moderate changes in real effective exchange rate before 2005, a sharp increase in relative prices during the boom years of 2006-2008, and regaining of competitiveness after the financial crisis. At the end of the period observed, the real effective exchange rate is 25-35% higher *vis-à-vis* 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 for Latvia
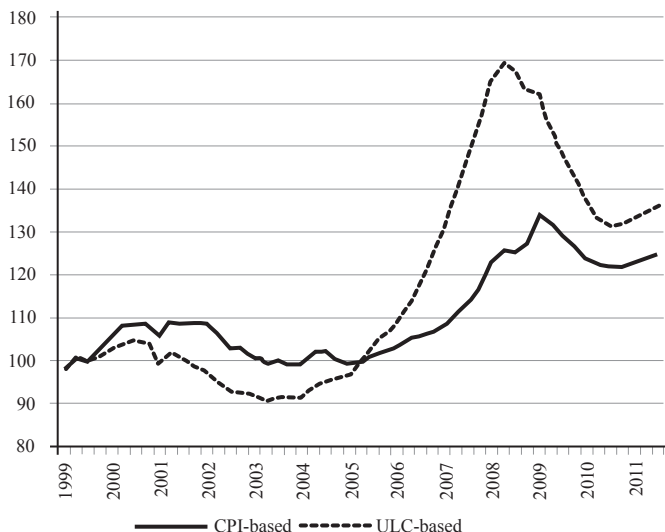
Note: 36 trading partners; 1999=100.

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 face 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, also including 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, real effective exchange rate indices measure only 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 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 competitors can affect the competitiveness of exporters (larger numbers of competitors exporting the same product

to one particular market means 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.

4.2. Disaggregated approach to measure price and non-price competitiveness

In this section, we will apply the disaggregated approach proposed by Benkovskis 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 evaluation of the unobserved quality or taste parameter is based on 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, consumer utility also depends on the quality and taste parameter of a product. By solving the consumer maximisation problem, it is possible to introduce the abovementioned non-price factors into the relative export price measure.

4.2.1. Import price index

We define a nested constant elasticity of substitution (CES) 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:

$$U_{i,t} = \left(D_{i,t}^{\frac{\kappa_i-1}{\kappa_i}} + M_{i,t}^{\frac{\kappa_i-1}{\kappa_i}} \right)^{\frac{\kappa_i}{\kappa_i-1}} ; \quad \kappa_i > 1 \tag{8}$$

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

$$M_{i,t} = \left(\sum_{g \in G} M_{ig,t}^{\frac{\gamma_i-1}{\gamma_i}} \right)^{\frac{\gamma_i}{\gamma_i-1}} ; \quad \gamma_i > 1 \tag{9}$$

where $M_{ig,t}$ is 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 origin, therefore product variety indicates 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:

$$M_{ig,t} = \left(\sum_{c \in C} d_{igc,t}^{\frac{1}{\sigma_{ig}}} m_{igc,t}^{\frac{\sigma_{ig}-1}{\sigma_{ig}}} \right)^{\frac{\sigma_{ig}}{\sigma_{ig}-1}} ; \quad \sigma_{ig} > 1 \quad \forall \quad g \in G \tag{10}$$

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 maximization problem subject to the budget constraint, the minimum unit cost function of import good g is represented by:

$$\phi_{ig,t} = \left(\sum_{c \in C} d_{igc,t} p_{igc,t}^{1-\sigma_{ig}} \right)^{\frac{1}{1-\sigma_{ig}}} \tag{11}$$

where $\phi_{ig,t}$ denotes the minimum unit cost of import good g, $p_{igc,t}$ 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

$$P_{ig}^{conv} = \prod_{c \in C_{ig}} \left(\frac{p_{igc,t}}{p_{igc,t-1}} \right)^{w_{igc,t}} \tag{12}$$

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

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

The import price index in equation (12) 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 $c \in C_{ig} = \left(C_{ig,t} \cap C_{ig,t-1} \right)$, $C_{ig} \neq \emptyset$, then the exact price index for good g is given by:

$$P_{ig}^{bw} = \prod_{c \in C_{ig}} \left(\frac{p_{igc,t}}{p_{igc,t-1}} \right)^{w_{igc,t}} \left(\frac{\lambda_{ig,t}}{\lambda_{ig,t-1}} \right)^{\frac{1}{\sigma_{ig}-1}} = P_{ig}^{conv} \left(\frac{\lambda_{ig,t}}{\lambda_{ig,t-1}} \right)^{\frac{1}{\sigma_{ig}-1}} \tag{13}$$

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

Therefore, the price index derived in equation (12) is multiplied by an additional term, which captures the role of new and disappearing variety.

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 also allows for changes in taste and quality:

$$P_{ig}^q = \left(\frac{\sum_{c \in C_{ig,t}} d_{igc,t} p_{igc,t}^{1-\sigma_{ig}}}{\sum_{c \in C_{g,t-1}} d_{gc,t-1} p_{gc,t-1}^{1-\sigma_g}} \right)^{\frac{1}{1-\sigma_{ig}}} = P_{ig}^{conv} \left(\frac{\lambda_{ig,t}}{\lambda_{ig,t-1}} \right)^{\frac{1}{\sigma_{ig}-1}} \prod_{c \in C_{ig}} \left(\frac{d_{igc,t}}{d_{igc,t-1}} \right)^{\frac{w_{igc,t}}{1-\sigma_{ig}}} \tag{14}$$

Equation (14) can be taken as a modified version of equation (13) where the additional term captures changes in the quality and taste parameter.

4.2.2. Relative export price index
Equation (14) gives us a formula for a variety- and quality-adjusted import price index. However, we can easily interpret $m_{igc,t}$, which is imports by country i of product g originating from country c, as exports from country c 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 (14) 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:

$$RXP_{ig,t} = \frac{\phi_{ig,t}^{LV} / \phi_{ig,t-1}^{LV}}{\phi_{ig,t}^{-LV} / \phi_{ig,t-1}^{-LV}} = \frac{\left(p_{igLV,t} / p_{igLV,t-1} \right)\left(d_{igLV,t} / d_{igLV,t-1} \right)^{\frac{1}{1-\sigma_{ig}}}}{\phi_{ig,t}^{-LV} / \phi_{ig,t-1}^{-LV}} \tag{15}$$

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 (14) and (15) we obtain:

$$RXP_{ig,t} = \prod_{c \in C_{ig}^{-LV}} \left(\frac{p_{igLV,t}}{p_{igc,t}} \frac{p_{igc,t-1}}{p_{igLV,t-1}} \right)^{w_{igc,t}^{-LV}} \left(\frac{\lambda_{ig,t}^{-LV}}{\lambda_{ig,t-1}^{-LV}} \right)^{\frac{1}{1-\sigma_{ig}}} \prod_{c \in C_{ig}^{-LV}} \left(\frac{d_{igLV,t}}{d_{igc,t}} \frac{d_{igc,t-1}}{d_{igLV,t-1}} \right)^{\frac{w_{igc,t}^{-LV}}{1-\sigma_{ig}}} \tag{16}$$

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).

The index of adjusted relative export price in equation (16) 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 competitors, 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 4.2.3). Finally, one needs to design an aggregate relative export price, as the index in equation (16) 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 a country's export structure. If we denote the export price and volume of product g exported by Latvia to country i as $p^x_{igLV,t}$ and $x_{igLV,t}$ accordingly, the aggregate adjusted relative export price index can be defined as

$$RXP_t = \prod_{i \in I} \prod_{g \in G} RXP_{ig,t}^{W_{ig,t}} \tag{17}$$

where $W_{ig,t} = \dfrac{\left(S_{ig,t} - S_{ig,t-1}\right) / \left(\ln S_{ig,t} - \ln S_{ig,t-1}\right)}{\displaystyle\sum_{i \in I} \sum_{g \in G} \left(\left(S_{ig,t} - S_{ig,t-1}\right) / \left(\ln S_{ig,t} - \ln S_{ig,t-1}\right)\right)}$; $S_{ig,t} = \dfrac{p^x_{igLV,t} x_{igLV,t}}{\displaystyle\sum_{i \in I} \sum_{g \in G} p^x_{igLV,t} x_{igLV,t}}$.

Equation (17) shows that the aggregated 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 out of Latvia's total exports.

4.2.3. Evaluation of relative quality and taste
Calculation of the adjusted relative export price index in equation (16) is a challenging task due to the fact that relative quality and taste are unobservable. As in Hummels and Klenow (2005), we evaluate unobserved quality and taste from the utility optimisation problem in the following way: after taking first order conditions and transformation into log-ratios, we can express relative quality and taste in terms of relative prices, volumes and elasticity of substitution between varieties:

$$\ln\left(\frac{d_{igc,t}}{d_{igk,t}}\right) = \sigma_{ig} \ln\left(\frac{p_{igc,t}}{p_{igk,t}}\right) + \ln\left(\frac{m_{igc,t}}{m_{igk,t}}\right) \tag{18}$$

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

4.2.4. Estimation of elasticities

To derive 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:

$$\frac{\Delta \ln s_{igc,t}}{\Delta \ln s_{igk,t}} = -\left(\sigma_{ig} - 1\right)\frac{\Delta \ln p_{igc,t}}{\Delta \ln p_{igk,t}} + \varepsilon_{igc,t} \tag{19}$$

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:

$$\frac{\Delta \ln p_{igc,t}}{\Delta \ln p_{igk,t}} = \frac{\omega_{ig}}{1 + \omega_{ig}}\frac{\Delta \ln s_{igc,t}}{\Delta \ln s_{igk,t}} + \delta_{igc,t} \tag{20}$$

where $\omega_{ig} \geq 0$ is inverse supply elasticity assumed to be the same across partner countries. The unpleasant feature of the system of equations (19) and (20) 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 the independence of errors $\varepsilon_{igc,t}$ and $\delta_{igc,t}$. This is done by multiplying both sides of the equations. After these transformations, the following equation is obtained:

$$\left(\frac{\Delta \ln p_{igc,t}}{\Delta \ln p_{igk,t}}\right)^2 = \theta_1\left(\frac{\Delta \ln s_{igc,t}}{\Delta \ln s_{igk,t}}\right)^2 + \theta_2\left(\frac{\Delta \ln p_{igc,t}}{\Delta \ln p_{igk,t}}\right)\left(\frac{\Delta \ln s_{igc,t}}{\Delta \ln s_{igk,t}}\right) + u_{igc,t} \tag{21}$$

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

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

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

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

where $u_{igc,t} = \varepsilon_{igc,t}\delta_{igc,t}$ represents the vector of estimated elasticities. For each good g imported by country i the following GMM estimator is obtained:

$$\hat{\beta}_{ig} = \arg\min_{\beta \in B} G^*\left(\beta_{ig}\right)' W G^*\left(\beta_{ig}\right) \tag{22}$$

where $G^*\left(\beta_{ig}\right)$ is the sample analog of $G\left(\beta_{ig}\right)$ 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 such that variance depends more on large shipments and becomes less sensitive to measurement error. Elasticity of substitution between varieties is estimated using equation (22) for all products

where data on at least 3 countries of origin were available. Table A3 in the Appendix displays the main characteristics of estimated elasticities of substitution between varieties. For easier interpretation one can calculate the median mark-up, which equals $\sigma_{ig}/(\sigma_{ig}-1)$.

4.3. Results of disaggregated approach for Latvia's exports

Now we can calculate the relative export price index for Latvia, which will take into account non-price factors like quality, taste and changes in the set of competitors. This is done using equations (16) and (17), while unobserved relative quality is evaluated by equation (18). Figure 4 shows three different relative export price indices for every country. The first is the traditional or conventional relative export price index (RXP), which does not take into account changes in quality and set of competitors and is calculated using the first term in equation (16). 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. This is calculated using the first two terms in equation (16). A comparison with the conventional index indicates the contribution of changes in the set of countries to competitiveness. Finally, the relative export price index adjusted to non-price factors is calculated using all three terms of equation (16). 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.

Figure 4. Latvia's relative export prices
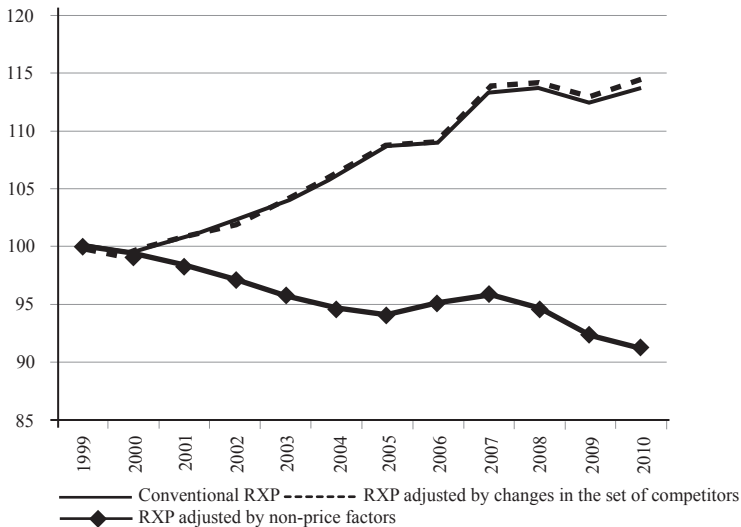
Source: *UN Comtrade*, author's calculations.
Notes: Relative export prices are calculated by cumulating RXP changes from equations (16)-(18); 1999 = 100.

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 signal overall losses of price competitiveness between 1999

and 2010 for Latvia's exporters, the magnitude of losses and the dynamics over years differ. Both real effective exchange rates calculated from 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 1999 level. Price competitiveness improved significantly during and after the crisis; however, the real exchange rate level 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 a 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 for changes in price competitiveness. All indices show the weakest point of competitiveness in 2008-2009 (for the CPI-based index the 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 causes, 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 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 competitors, 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.

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	101.3	103.3	106.8	113.9	113.3	112.5	111.8	126.8	124.7	116.6	124.9
Base metals and articles of base metal	100.0	97.5	96.1	97.5	99.0	104.6	113.0	113.3	110.2	115.3	110.2	112.1
Machinery and mechanical appliances	100.0	100.4	99.0	100.0	102.1	128.3	134.7	129.4	127.2	137.9	149.2	156.7
Prepared foodstuffs	100.0	106.5	142.7	166.0	173.2	180.5	186.1	195.4	201.1	196.5	205.6	206.9
Chemical products	100.0	100.5	87.1	92.0	82.2	89.4	97.5	105.4	117.3	129.1	137.7	148.4
Vehicles and other transport equipment	100.0	92.4	94.4	87.4	88.0	85.4	85.6	85.2	86.1	89.0	99.0	103.6
Importers												
Lithuania	100.0	99.4	99.6	98.9	96.0	112.0	115.8	114.6	111.5	116.2	123.4	126.3
Estonia	100.0	96.7	85.6	87.9	85.2	91.0	97.1	99.2	102.7	110.6	114.6	120.8
Russia	100.0	116.2	136.6	157.4	186.4	196.3	200.2	204.6	200.5	202.3	200.7	206.9
Germany	100.0	99.7	102.4	101.9	102.2	101.1	104.5	102.7	107.7	111.3	112.0	113.1
Sweden	100.0	94.6	94.8	94.7	99.1	97.5	96.4	97.2	105.5	103.2	105.7	123.1
Poland	100.0	102.8	100.7	97.7	95.0	102.2	99.2	83.5	93.8	91.7	88.2	85.8

Source: *UN Comtrade*, author's calculations.
Notes: The six largest product sectors and importers are chosen using 2010 export data for Latvia (the six largest sectors cover 64.9 % of Latvia' exports, the six largest importers – 62.8%); calculated using equations (16)-(18); 1999=100.

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 competitors. In other words, a rising or falling number of competitors 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 competitors, the relative quality of Latvia's exports (or taste for Latvian products) was rising even faster, compensating the price effect and leading to 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 changes in physical quality of exports. Most probably Latvia managed to improve both physical quality of products and their image, branding and market placement.

This finding is mostly corroborated by earlier literature on quality performance in Central and Eastern European countries (CEEC). Dulleck et al. (2005) find 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 et al. (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 periods for analysis, as Figure 4 suggests a pronounced improvement in non-price competitiveness starting only from 2002. Finally, Benkovskis and Wörz (2012) use the same methodology and evaluate non-price competitiveness of ten CEEC countries, including Latvia, in the EU market (based on data from Comext). The main conclusions are similar: although relative export prices increased more strongly in Latvia in comparison with its competitors, the average quality and taste for Latvia's goods increased even faster, thus fully compensating for the rise in prices.

Analysis by product sector shows significant improvements in non-price competitiveness for all major export goods (see Table 5). The most rapid improvement in quality or shift in consumer tastes is observed for food products, machinery and chemicals. The role of non-price factors for wood and base metal products is positive, although less significant, while quality or taste for Latvia's exports of vehicles remained unchanged. 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, Estonia, Sweden and Germany is improving, although at a lower speed in comparison with Russia.

Conclusions

This paper attempts to assess Latvia's competitiveness in external markets. Acknowledging that the topic of competitiveness is far too broad for one research project, we restrict ourselves to only a few approaches which can be applied to highly disaggregated trade data. Thus, the analysis in this paper still remains in the macro area, albeit at a detailed level. For empirical analysis we use trade data from UN Comtrade at the six-digit level of the HS. 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 competitors. From which countries are the main competitor producers coming? According to our results, Latvian exporters face the most severe competition from German producers. Enterprises from China are the second largest competitor group for 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 from Poland and Russia. As to sectoral composition of competitors, the most significant competition in the wood products markets is staged by Russia, Sweden, Finland and Estonia. Germany and China are by far the two main competitors for 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 the competitiveness of a country is to calculate its export market share. Analysis at a very detailed level allows for extracting contributions of extensive and intensive margins, thus more information is obtained about drivers of competitiveness. Overall, competitiveness represented by the total market share of Latvia's products in the world market was rapidly enhancing during the period observed. The upward trend in competitiveness is driven by the increasing presence of Latvia's producers in old 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 the geographical dimension, as producers start to export 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 in traditional markets; producers of other articles like wood and chemicals 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 export activities, ignoring structural differences of competitors, and focusing solely on price competitiveness. Indeed, real effective exchange rates are based on price dynamics and almost ignore changes in product volumes. The abovementioned drawbacks can be resolved, at least partly, by using price and volume trade data on a 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 the 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 competitors, 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. Analysis by product sector shows significant gains in non-price competitiveness for all major export goods. Analysis of non-price competitiveness in the main geographical destinations shows that the highest contribution of non-price factors to Latvia's competitiveness was observed in the Russian market (the most important destination outside the EU). Contributions of non-price competitiveness in the EU market are positive as well.

Finally, it should be stressed that this paper can by no means fully describe the issue of Latvia's competitiveness and cannot even 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.

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Appendix

Table A1. Share of 75 exporters and 75 importers from our database in World imports in 2010

Importers (reporters)	Share in World imports, %	Exporters (partners)	Share in World imports, %	Importers (reporters)	Share in World imports, %	Exporters (partners)	Share in World imports, %
United States	13.51	China	12.71	Ukraine	0.42	Chile	0.47
China	9.59	United States	8.18	Ireland	0.42	Hong Kong	0.46
Germany	7.33	Germany	8.03	Israel	0.41	Argentina	0.45
Japan	4.76	Japan	5.15	Philippines	0.40	Qatar	0.45
France	4.12	France	3.56	Argentina	0.39	Venezuela	0.42
United Kingdom	3.86	Korea	2.98	Chile	0.39	Kuwait	0.42
				Nigeria	0.30	Algeria	0.40
Italy	3.35	Netherlands	2.88	Algeria	0.28	Slovakia	0.40
Hong Kong	3.03	Italy	2.87	Colombia	0.28	Israel	0.38
Netherlands	3.02	Russia	2.69	Pakistan	0.26	Ukraine	0.37
Korea	2.92	Canada	2.64	Morocco	0.24	Kazakhstan	0.33
Canada	2.69	United Kingdom	2.63	Belarus	0.24	Romania	0.32
Belgium	2.68	Mexico	2.15	Venezuela	0.22	Portugal	0.30
India	2.40	Belgium	2.07	New Zeeland	0.21	Colombia	0.28
Spain	2.17	Malaysia	1.70	Peru	0.21	Peru	0.22
Singapore	2.14	Switzerland	1.62	Slovenia	0.18	Oman	0.21
Mexico	2.07	Spain	1.61	Bulgaria	0.17	New Zeeland	0.20
Russia	1.71	Saudi Arabia	1.57	Lithuania	0.16	Costa Rica	0.18
Australia	1.30	India	1.47	Tunisia	0.15	Egypt	0.17
Turkey	1.27	Brazil	1.41	Ecuador	0.14	Slovenia	0.16
Thailand	1.25	Singapore	1.41	Luxembourg	0.14	Greece	0.15
Brazil	1.24	Australia	1.39	Croatia	0.14	Azerbaijan	0.15
Switzerland	1.21	Thailand	1.34	Oman	0.14	Pakistan	0.14
Poland	1.20	Indonesia	1.16	Lebanon	0.12	Belarus	0.13
Malaysia	1.13	Ireland	1.06	Panama	0.11	Ecuador	0.13
Austria	1.03	United Arab Emirates	1.06	Serbia	0.11	Bulgaria	0.13
				Jordan	0.10	Morocco	0.13
Sweden	1.02	Sweden	1.02	Dominican	0.10	Luxembourg	0.12
Indonesia	0.93	Poland	0.98	Costa Rica	0.10	Lithuania	0.11
Czech Republic	0.86	Austria	0.96	Guatemala	0.10	Tunisia	0.11
Saudi Arabia	0.73	Norway	0.92	Estonia	0.09	Trinidad and Tobago	0.10
Hungary	0.60	Czech Republic	0.82				
Denmark	0.58	Turkey	0.70	Sri Lanka	0.08	Sudan	0.07
South Africa	0.55	South Africa	0.64	Kenya	0.08	Estonia	0.07
Norway	0.53	Denmark	0.60	Latvia	0.08	Croatia	0.07
Portugal	0.52	Hungary	0.60	Bahrain	0.07	Cote d'Ivoire	0.06
Finland	0.47	Nigeria	0.55	Bosnia Herzegovina	0.06	Latvia	0.06
Slovakia	0.44	Vietnam	0.51				
Greece	0.44	Finland	0.49	Ethiopia	0.06	Panama	0.05
Romania	0.43	Philippines	0.48	Total	96.25	Total	93.01

Source: *UN Comtrade*, author's calculations.
Notes: Share of exporters and share of importers are calculated relative to total World imports.

Table A2. Extensive and intensive margin 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 of base metal	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 of base metal	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 – product dimension												
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 of base metal	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 – importer dimension												
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 article of base metal	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
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 of base metal	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

Source: *UN Comtrade*, author's calculations.

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

Table A3. Elasticities of substitution between varieties

	Elasticities estimated	Mean	Standard Deviation	Maximum	Minimum	**Median**	**Median mark-up**
Algeria	3261	22.0	125.2	6492.2	1.05	**5.36**	**23.0**
Argentina	2920	20.6	69.1	2076.8	1.03	5.49	22.3
Australia	2833	79.3	480.4	14517.1	1.02	**5.83**	**20.7**
Austria	4501	23.8	84.8	4011.7	1.07	**5.89**	**20.5**
Bahrain	2328	19.9	44.1	992.5	1.05	**5.01**	**24.9**
Belarus	3326	22.7	71.7	2023.7	1.10	**5.21**	**23.7**
Belgium	4856	18.4	44.2	905.8	1.05	5.35	23.0
Bosnia Herzegovina	3282	22.5	61.7	1453.2	1.05	**5.67**	**21.4**
Brazil	3946	21.3	82.5	3745.5	1.03	**5.52**	**22.1**
Bulgaria	3893	19.8	49.1	1096.7	1.07	**4.89**	**25.7**
Canada	3568	42.1	252.9	8201.7	1.03	**8.26**	**13.8**
Chile	3525	43.5	210.2	6564.6	1.01	5.44	22.5
China	4151	45.4	234.9	7385.5	1.01	**6.71**	**17.5**
Colombia	3718	19.5	64.3	2305.4	1.06	**5.02**	**24.9**
Costa Rica	3142	21.9	45.3	931.7	1.02	**5.69**	**21.3**
Croatia	4029	17.7	40.8	979.8	1.04	**4.58**	**27.9**
Czech Republic	4672	18.1	36.0	673.2	1.10	**5.50**	**22.2**
Denmark	4440	19.1	52.2	2541.8	1.09	**5.90**	**20.4**
Dominican	1053	75.8	482.7	12091	1.01	**10.07**	**11.0**
Ecuador	3064	20.2	50.8	1368.1	1.05	**4.92**	**25.5**
Estonia	3464	18.6	39.2	816.2	1.03	**5.21**	**23.8**
Ethiopia	1778	18.5	43.2	1079.1	1.02	5.68	21.4
Finland	4209	20.4	78.7	3478.7	1.04	**4.99**	**25.1**
France	4963	24.2	150.0	10020.8	1.05	**5.54**	**22.0**
Germany	4732	21.0	49.6	1695.9	1.02	**5.62**	**21.6**
Greece	4291	18.1	48.7	1112.0	1.03	**4.51**	**28.5**
Guatemala	2904	22.1	75.4	2474.5	1.02	5.28	23.4
Hong Kong	3555	69.0	917	52025.5	1.01	**6.11**	**19.6**
Hungary	4125	23.8	53.4	1012.6	1.05	**5.56**	**21.9**
India	3835	63.6	421.5	15872.1	1.01	**6.51**	**18.1**
Indonesia	4286	19.5	70.1	3613.6	1.07	**5.58**	**21.8**
Ireland	4171	27.5	234.2	13318.6	1.02	5.59	21.8
Israel	1418	137.2	1090.9	37958.5	1.02	**9.03**	**12.5**
Italy	4913	19.2	43.5	893.9	1.02	**5.05**	**24.7**
Japan	4349	22.9	90.5	4472.8	1.02	**4.35**	**29.8**
Jordan	2145	19.7	47.6	714.1	1.05	**4.73**	**26.8**
Kenya	2426	28.2	88.5	2177.7	1.05	5.45	22.5
Korea	4499	18.3	52.3	2650.8	1.01	**5.32**	**23.2**
Latvia	3451	21.0	51.4	1089.1	1.02	**5.13**	**24.2**
Lebanon	3010	21.7	58.8	1469.7	1.03	**4.90**	**25.6**
Lithuania	3673	18.5	45.6	1177.7	1.04	**5.13**	**24.2**
Luxembourg	3598	27.5	112.6	5751.3	1.01	6.05	19.8
Malaysia	3969	86.9	541.2	14903.0	1.01	**4.59**	**27.8**
Mexico	3548	29.0	92.7	3528.0	1.01	**5.60**	**21.7**
Morocco	3412	21.0	59.3	1857.2	1.02	**4.87**	**25.9**
Netherlands	4193	55.6	329.8	12309.7	1.01	**4.67**	**27.2**
New Zeeland	3949	19.7	49.4	1058.0	1.05	5.30	23.3
Nigeria	1559	29.6	123.8	4373.9	1.03	**5.18**	**23.9**
Norway	4321	17.3	49.9	1200.1	1.01	**4.50**	**28.6**
Oman	2325	22.6	58.4	1185.7	1.03	**5.12**	**24.3**
Pakistan	2387	56.4	404.5	12883.5	1.01	**9.95**	**11.2**

Panama	2503	21.5	59.5	1661.0	1.00	5.38	22.8
Peru	3393	17.9	63.7	2902.9	1.02	**5.03**	**24.8**
Philippines	3592	24.0	82.6	2832.5	1.03	**4.74**	**26.7**
Poland	4566	18.6	72.5	4112.3	1.08	**5.34**	**23.0**
Portugal	4338	19.9	51.1	970.9	1.02	**4.86**	**25.9**
Romania	4238	20.5	59.4	2517.7	1.01	5.56	21.9
Russia	4285	20.0	65.9	3443.2	1.08	**6.35**	**18.7**
Saudi Arabia	3937	19.2	43.2	1270.7	1.01	**5.12**	**24.3**
Serbia	3318	21.7	57.5	1222.5	1.01	**5.81**	**20.8**
Singapore	3068	76.4	438.7	8874.8	1.00	**5.79**	**20.9**
Slovakia	4130	21.0	76.5	3997.3	1.07	5.80	20.9
Slovenia	4241	19.2	60.0	2002.4	1.06	**5.27**	**23.4**
Southern Africa	4122	39.5	192.4	6241.9	1.01	**6.49**	**18.2**
Spain	4872	17.9	43.8	1142.0	1.04	**5.21**	**23.8**
Sri Lanka	2336	37.8	147.9	2872.4	1.02	**5.75**	**21.0**
Sweden	3986	24.5	56.0	1452.2	1.03	6.21	19.2
Switzerland	4684	20.0	46.3	1089.3	1.03	**5.33**	**23.1**
Thailand	3754	31.5	207.5	6240.8	1.02	**5.65**	**21.5**
Tunisia	3380	20.6	59.4	2001.7	1.03	**5.02**	**24.9**
Turkey	4206	17.4	98.9	5958.3	1.04	**5.05**	**24.7**
UK	4871	18.0	47.1	1381.1	1.05	4.37	29.7
Ukraine	3721	20.9	57.2	2206.4	1.08	**6.36**	**18.7**
US	3956	68.2	526.5	23647.6	1.01	**4.98**	**25.1**
Venezuela	3520	23.6	80.6	2825.9	1.04	**5.37**	**22.9**

Source: *UN Comtrade*, author's calculations.
Notes: Elasticities of substitutions are estimated using equation (22) for all products where data on at least 3 countries of origin are available.