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**Article**

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## Evaluation of Latvia's re-exports using firm-level trade data

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### ABSTRACT

We use an anonymized firm-level trade database provided by the Central Statistical Bureau of Latvia to evaluate Latvia's re-exports. By solving a linear maximization problem for each firm-product pair, we obtain estimates of re-export flows and corresponding re-export mark-ups. We find that the share of re-export flows in the total merchandise exports and imports is significant and follows an increasing trend. The share of re-exports is especially large in such product groups as transport vehicles, plastics, mineral products, and machinery and electrical equipments. The majority of re-export flows are directed to closest neighbours – Lithuania and Estonia – suggesting that Latvia serves as a sort of a regional transport hub. We also find that average re-export mark-ups are sizeable and re-export operations may provide an important contribution to Latvia's GDP.

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Firm-level data; Latvia; re-exports; simplex

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## 1. Introduction

The world economy is getting more and more globalized and Latvia is becoming steadily more integrated within it. This makes the analysis of external trade increasingly complicated since the production chains become longer and incorporate many intermediate stages that can be situated in different countries. For example, Amador, Cappariello, and Stehrer (2015) report that the share of foreign value added in Euro Area's exports increased from 16.4% in 2000 to 21.2% in 2011. The share of foreign value added in gross exports can be even higher for individual countries, for example, 42% for gross exports of Slovakia in 2011, 46% for Belgium, and even more than 60% for Luxembourg. Therefore, exports can no longer be viewed as something mostly produced domestically.

Re-exports represents the most extreme case of decoupling between exports and domestic production. According to the IMF (2009), 're-exports are foreign goods (goods produced in other economies and previously imported) that are exported with no substantial transformation from the state in which they were previously imported' (Chapter 10, p. 157, paragraph 10.37). The domestic value added contribution to re-exports is small. In this particular case, the increase in exports is mirrored by similar increase in imports, thus leaving GDP almost unchanged. This calls for distinguishing

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between re-exports and domestically produced exports for deeper and more precise analysis of external trade.

The reasons behind re-export activities (also called *entrepôt* trade) are numerous. One of them is related to transport hubs, which is especially pronounced in the presence of big harbours. For example, according to Mellens, Noordman, and Verbruggen (2007), the share of re-exports in total goods exports in the Netherlands exceeds 50%. Hong Kong is an even more striking example with 53% of Chinese exports shipped through Hong Kong in 1988–1998 (see Feenstra & Hanson, 2004). However, logistics is not the only reason for re-exports. Feenstra and Hanson (2004) argue that information costs, which arise if counterparts are informed imperfectly about the other side, could be another incentive. For example, Hong Kong traders provide a range of services in matching foreign buyers with Chinese supplies. Feenstra and Hanson (2004) and Fishman, Moustakerski, and Wei (2008) also stress the role of tax and tariff evasion for the phenomenon of indirect trade.

Although the domestic contribution to re-exports is small, as compared to the rest of exports, it does not equal zero. Feenstra and Hanson (2004) report that the average mark-up on Hong Kong re-exports of Chinese goods was 24% during 1988–1998. Moreover, re-export mark-ups provided a significant contribution to Hong Kong's GDP. Although Hong Kong is quite a special case, this example suggests that one should not only quantify the share of re-exports in total exports, but also track the level of re-export mark-ups.

Unfortunately, there is no official statistics on re-export activities in Latvia (unlike in Hong Kong, as used by Feenstra & Hanson, 2004, and Fishman et al., 2008, or in Lithuania, see Lietuvos Bankas, 2014). Thus, an indirect estimation needs to be carried out. The first attempt to evaluate re-exports in Latvia was done by Bērziņa (2013), using anonymized annual data on the value of enterprises' exports and imports by very detailed product categories. Her approach is simple and intuitive: if a particular enterprise exports and imports the same product within a given year, re-exports are defined as the smallest of the two trade flows. In a way, this approach is similar to the one used by Mellens et al. (2007). According to Bērziņa (2013), the share of re-exports in total Latvia's exports equalled 27% in 2012. Moreover, the importance of re-export flows differed significantly across product categories: the share of re-exports was almost 50% for mineral products, transport equipment, as well as machinery and electrical equipment, while it was below 5% for wood product exports.

In this paper the authors follow the approach of Bērziņa (2013) in spirit, although taking the advantage of an even more detailed anonymized firm-level trade database provided by Central Statistical Bureau of Latvia (CSB). This allows to assess the level of Latvia's re-exports by product groups, origin and destination countries, also leading to useful conclusions about domestically produced exports. Moreover, we improve the approach of Bērziņa (2013) in two ways. First, monthly frequency data are used to control that a firm imports a product prior to exports. Second, re-exports are evaluated based on volumes rather than values, which improves the preciseness of the calculations. Furthermore, we are able to estimate the mark-ups of re-export operations, indicating that, despite low domestic content, re-export activity may provide a significant contribution to Latvia's GDP.

The rest of the paper is organized as follows. Section 2 briefly describes the anonymized firm-level trade database. Section 3 describes the methodology and stresses the improvements over the previous approach by Bērziņa (2013). Section 4 describes Latvia's re-export

activities by products and countries. Section 5 checks the robustness of results. Section 6 focuses on re-export mark-ups, while the last section concludes.

## 2. Description of the firm-level external trade database

In this paper we make use of the anonymized firm-level external trade database provided by the CSB. This dataset contains the following information: an anonymized identification number of the enterprise, indication of the flow (exports/imports), product number according to the eight-digit Combined Nomenclature (CN8) classification, statistical value of transaction (in f.o.b. prices for exports and c.i.f. prices for imports), net weight of traded product in kilograms, as well as product volume in supplementary measures (if available), country of destination (for export flows) or origin (for import flows), and time period of the trade flow (year and month). The source of the database is twofold, since information on Latvia's trade with EU countries comes from Intrastat surveys, while information on trade with other countries comes from custom declarations. The above-mentioned dataset provides the most detailed information on Latvia's external trade: the database contains information on all recorded external transactions between 2005 and 2013.

Table 1 reports the main characteristics of the firm-level external trade database. It represents the aggregate external trade flows in Latvia well, since the sum of all firm-level transactions covers more than 90% of total merchandise exports and almost 90% of total merchandise imports. There are approximately 5000 exporting firms and 9000

**Table 1.** Main characteristics of the anonymized firm-level external trade database.

Year	Aggregate exports/ imports (mill. of EUR)	Coverage of firm- level data (%)	Number of firms	Flow per firm (th. of EUR)	Number of transactions	Flow per transactions (th. of EUR)
<b>(a) Exports</b>						
2005	3870.3	94.2	2871	1348.1	187,279	20.7
2006	4382.0	93.5	3160	1386.7	211,961	20.7
2007	5336.7	92.8	3274	1630.0	230,675	23.1
2008	5832.2	92.5	3628	1607.6	237,844	24.5
2009	4737.3	92.4	3902	1214.1	252,588	18.8
2010	6202.2	92.8	4406	1407.7	311,231	19.9
2011	7830.2	91.7	4810	1627.9	353,001	22.2
2012	8910.7	90.3	4697	1897.1	370,923	24.0
2013	9304.9	92.9	5082	1830.9	421,562	22.1
<b>(b) Imports</b>						
2005	6578.5	95.0	7081	929.0	884,847	7.4
2006	8545.8	94.2	8311	1028.3	1,007,360	8.5
2007	10,356.1	93.5	8878	1166.5	1,097,289	9.4
2008	9842.7	91.9	8638	1139.5	1,056,575	9.3
2009	5877.2	87.7	6841	859.1	872,940	6.7
2010	7342.6	87.3	7024	1045.4	977,891	7.5
2011	9477.6	86.3	8144	1163.7	1,124,043	8.4
2012	10,606.1	84.8	7915	1340.0	1,193,045	8.9
2013	11,291.1	89.4	9068	1245.2	1,316,824	8.6

Source: CSB of Latvia, authors' calculations.

Note: Aggregate exports/imports column contains the sum of all database entries for the respective year. Coverage column reports the ratio of the sum in the previous column to the aggregate exports/imports reported by the CSB. The difference is due to a mathematical adjustment to Intrastat firm-level data that accounts for non-response and for those enterprises that are not subject to Intrastat reporting due to the small size of trade volume.

importing firms in the dataset, while the total number of recorded transactions exceeds 1.7 millions in 2013 (0.4 for exports and 1.3 for imports).

The use of the most detailed CN8 classification has one significant drawback that may affect our results – the Combined Nomenclature is regularly revised. Each year a significant number of CN8 codes are subject to reclassification: some product codes are relabelled and moved between sections while others are split or merged. Pierces and Schott (2009) analysed the reclassifications in the 10-digit US Harmonized System and illustrated the importance of tracking these changes when conducting empirical research; therefore we cannot ignore this issue. The most problematic cases are splits or merges of product codes. The feasible solution is to merge values and volumes of respective categories. Although this leads to a broadening of several categories and related problems, it helps to retain the consistency of analysis over time.

### 3. Methodology to evaluate re-exports

Access to firm-level external trade data provides information that enables the evaluation of re-export flows. The approach used by Bērziņa (2013) is based on the idea that if a single firm both imports and exports a specific product in a particular year, this product is likely not to have been processed domestically, and exports (or at least a part of it) should be treated as re-exports rather than domestically produced exports. This is in line with the IMF (2009), which claims that ‘... goods that were previously imported and retain the same HS code, but have suffered wear and tear, could in most cases be included in re-exports ...’ (Chapter 10, p. 157, paragraph 10.38).

Bērziņa (2013) uses anonymized annual data on the value of enterprises’ exports and imports by CN8 product categories. If a particular enterprise exports and imports the same CN8 product category within a given year, enterprise’s re-exports are defined as the smallest of the two trade flows. Namely, if the imports of a CN8 product category exceed exports, re-exports equal the firms’ exports. In this case, it is assumed that some part of imports is consumed domestically. If the imports of a CN8 product category are smaller than exports, re-exports equal imports.

Although the above-mentioned approach is straightforward and simple, it has several serious drawbacks that may bias the estimates of re-exports. The first drawback is related to the use of value data. Bērziņa (2013) acknowledges that nominal exports can exceed nominal imports of the same product if the price of exports is higher than the price of imports (in other words, re-export mark-up is positive). In this case, the size of re-exports would be underestimated. The findings of Feenstra and Hanson (2004) on re-export mark-ups in Hong Kong suggest that this bias could be quite sizeable, thus the evaluation of re-exports based on volume data is imperative.

Second, the use of annual data can bias the estimate in either direction. If a firm imports a product in December of the current year and exports it in January of the next year, this approach will not identify the activity as re-exports. On the other hand, if a firm exports in January and imports in February of the same year, this activity will be erroneously classified as re-exports, despite the fact that for re-exporting to take place, exports should occur after imports.

The third significant drawback is related to the fact that firm-level data on external trade does not contain any product-level information on domestic transactions of the firm. Thus,

if a domestic firm A imports a particular product and sells (without any substantial transformation) this product to a domestic firm B that performs an export operation, we are unable to detect re-export activity.

In this paper we suggest to modify the approach used by Bērziņa (2013) in order to overcome at least some of aforementioned shortcomings. The dataset at hand contains both, value and volume data on trade flows. Most of the volume data are in kilograms, although for some products supplementary measures are also available (e.g. number of items, m<sup>3</sup>, etc.). This allows us to overcome the first drawback, mentioned above, and provides useful information about the level of re-export mark-ups. In addition, we use monthly firm-level external trade data which, by the virtue of being of the highest frequency available, go a long way to addressing the second drawback.

However, monthly frequency of the data calls for a different, more complicated mechanism of re-exports evaluation, since now we cannot assume that imports and exports should occur in the same period of time. Instead we have a limitation that import activity should happen prior to export activity. We solve the following maximization problem for each firm-product pair (note that firm and product subscripts are omitted for simplicity):

$$\sum_{\tau} \sum_t \beta^{t-\tau} R_{\tau,t} \xrightarrow{R_{\tau,t}} \max, \quad (1)$$

$$\tau \leq t, \quad (2)$$

$$\tau + h > t, \quad (3)$$

$$\sum_t R_{\tau,t} \leq M_{\tau}, \quad (4)$$

$$\sum_{\tau} R_{\tau,t} \leq X_t, \quad (5)$$

$$R_{\tau,t} \geq 0, \quad (6)$$

where  $R_{\tau,t}$  is re-export flow (in volume terms) that was imported in period  $\tau$  and further exported in period  $t$ ,  $M_{\tau}$  is imports (in volume terms) in period  $\tau$ ,  $X_t$  is exports (in volume terms) in period  $t$ ,  $h$  is maximal re-exporting lag, and  $0 < \beta < 1$  is the discount parameter.

Equations (2)–(6) contain a set of restrictions. Equation (2) provides a natural limitation that a firm should import a product at the same month or before selling it abroad. Moreover, we add another limitation in Equation (3) telling that the time period between importing and exporting activity cannot exceed  $h$ , which is assumed to be 12 months. Thus,  $\tau \in (t - h, t)$ ; namely, the import operation happens within a 12-months-period before exports. Also, according to Equation (4), the sum of products imported in period  $\tau$  and re-exported afterwards at any time cannot exceed the total amount of imports in period  $\tau$ . Analogically, Equation (5) states that the sum of all re-exports of a product at time  $t$  cannot exceed total exports of that product at time  $t$ . Finally, all re-export flows should be non-negative.

By maximizing the sum of all re-export activities for a particular firm-product pair in Equation (1), we search for the best possible match between export and import data, subject to the restrictions above. This is similar to the approach by Bērziņa (2013), who

maximized the size of re-exports for a given firm-product pair within a given year. We also introduce a discount parameter  $\beta$  that prioritizes a smaller lag between exports and imports. In other words, if we have two alternative solutions when a firm imports 50 kilograms of a product both in January and February, and exports 50 kilograms of the same product in March, our approach will assume that the product was imported in February and re-exported in March.

The system of Equations (1)–(6) is a linear programming problem and can be efficiently solved with simplex algorithm. In case a firm exports or imports a product to/from various countries in the same month, we assume that the ratio of re-exports to exports or imports is the same for all destinations/origins.

As discussed above, the use of volume data (mostly in kilograms, although supplementary measures were preferred for some products) enables the calculation of re-export mark-ups as the difference between the price of exports and the weighted price of imports for each re-export flow:

$$\mu_{\tau,t} = \ln P_t^X - \sum_{\tau} \frac{R_{\tau,t}}{\sum_{\tau} R_{\tau,t}} \ln P_{\tau}^M \quad (7)$$

where  $\mu_{\tau,t}$  is the mark-up of the re-export flow that was imported in period  $\tau$  and further exported in period  $t$ ,  $P_t^X$  denotes the unit value of export flow in period  $t$ , while  $P_{\tau}^M$  – the unit value of import flow in period  $\tau$ .

Evaluated re-export mark-ups provide useful information for the analysis (see Section 6.1) and also improve the accuracy of re-export evaluation. Although the use of the most detailed CN8 classification drills down to the individual products in most cases, it is still possible that we analyse two very similar, but still different products. Very large (positive and negative) mark-ups will flag those cases that cannot be attributed to re-exports. We proceed as follows. First, we evaluate re-export flows solving the maximization problem in Equations (1)–(6) and calculate re-export mark-ups using Equation (7). Then we detect outlier cases with too high or too low mark-ups. The limits were set to  $-0.5$  and  $1.0$  that correspond to mark-ups of  $-39.3\%$  and  $171.8\%$ , respectively. Afterwards, we solve the maximization problem (1)–(6) once again excluding re-export flows with extreme mark-ups. Robustness check in Section 5 shows that exclusion of outliers with extreme mark-ups does not change the estimates of re-exports significantly.

Finally, one more adjustment should be made. CSB of Latvia makes a mathematical adjustment to Intrastat firm-level data for non-response and for those enterprises that are not subject to Intrastat reporting due to the small size of trade volume. In aggregate figures reported below we assume that the share of re-export activities to total exports is the same for missing enterprises (accounting for the country of destination and product group).

## 4. Results

We solve the maximization problem (1)–(6) for the period between January 2005 and December 2013. The total number of unique firm-product pairs is 99,206 (5855 unique firms and 7047 unique CN8 products categories, taking into account reclassification

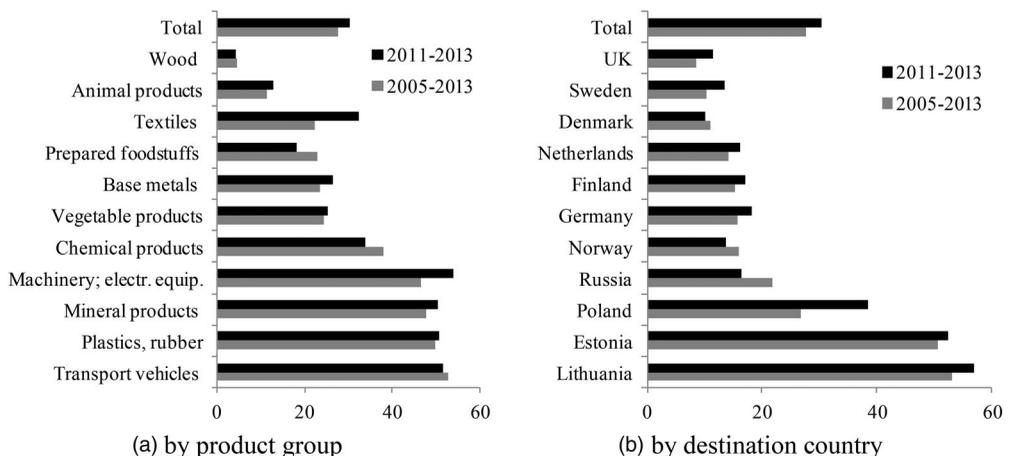
issues). We report the main results of our analysis below. Section 4.1 describes the share of re-exports in total exports for different product groups and partner countries, while the next section reports the structure of re-exports. Section 4.3 shows how the share of re-exports in aggregate exports changed over time in Latvia. Finally, Section 4.4 briefly touches the issue of re-exported imports.

#### 4.1. Share of re-exports in gross exports

According to our estimates, the share of re-exports in the total merchandise exports was 27.6% on average during the period between 2005 and 2013, while the share of re-exports increased to 30.4% in 2011–2013 (see Figure 1). Our estimate of the re-exports' share in total exports is rather high, but not exceptional. The previously mentioned example of Netherlands by Mellens et al. (2007) (with more than 50% of exports) can be supplemented by Lietuvos Bankas (2014) analysis: it reports that Lithuania's re-exports equalled 48% of total exports in 2013. This suggests that our findings for Latvia are in line with international results for small and seacoast countries. In addition, one should not forget about the possible downward bias in our estimates due to absence of information on domestic transactions.

Figure 1(a) shows that the following product groups contain a large (more than 40%) share of re-exports within the particular product group: transport vehicles (53% during 2005–2013), plastics (50%), mineral products (48%), machinery and electrical equipment (47%). At the same time, one of the largest product groups in Latvia's export – wood products – contains the lowest share of re-exports: around 5%.

Macro-data already suggest that the exports of a number of product groups are likely to contain significant amounts of re-exports since, for example, Latvia exports, but does not produce either passenger cars or oil. Furthermore, among the 25 largest exporting companies in Latvia one can find such non-manufacturers as LG Electronics Latvia, Samsung Electronics Baltics, Rimi Latvia, Moller Baltic Import, MMD Serviss, Gulfstream Oil, Kurzemes Degviela and Elko Grupa.<sup>1</sup>



**Figure 1.** The share of re-exports in total exports (%).  
Source: CSB of Latvia, authors' calculations.

There are some cases though where anecdotal evidence overwhelmingly suggests a presence of re-export activity while firm-level trade data do not confirm this. For example, less than 10% of export of wine of fresh grapes is identified as re-exports in the post-crisis period, while it is known that Latvian companies do not produce either *Bordeaux* or *Mosel*. The most likely cause for this underestimation is the previously described drawback in the methodology: firm-level data on external trade do not identify re-exports if transactions between companies have been carried out domestically after importing and prior to exporting the product.

Comparing our results with figures reported by Lietuvos Bankas (2014) we can observe some similar patterns. Namely, the share of re-exports is high in transport vehicles and machinery product groups in Lithuania (exceeding 70% in 2011–2013), while the share of re-exports in wood and wood products is relatively low (slightly above 20% in 2011–2013).

Analysis of re-export by destination shows that the countries with the largest share of re-exports in total exports are our neighbouring countries – Lithuania and Estonia – to both of which re-exports constitute more than 50% of the total export activity (see Figure 1(b)). This is not surprising and is consistent with the existence and development of logistics chains that, given the small size of the countries, treat the Baltics as one region. Firms often operate warehouses serving more than one of the Baltic States (which corresponds to one of the intermediation theories that Feenstra & Hanson, 2004 use to explain entrepôt trade – taking advantage of hubbing in international shipping). Re-exports also account for a significant part of total exports to Poland and Russia. This finding was previously suggested by the macro-level evidence: for example, one of the key export products to Poland is heavy gas oils, which are not produced in Latvia. The list of the main re-export destinations is similar to those reported by Lietuvos Bankas (2014) for Lithuania. Main destinations in 2011–2013 were Lithuania's closest neighbours: Russia (around 45% of total re-exports), Belarus, Latvia and Estonia.

Overall in the past few years the weight of re-exports in total exports from Latvia has increased, pointing to a further expansion of globalization. The increase in the weight of re-exports during post-crisis years has been the largest in exports to Poland, driven by a sharp increase in the re-exports of mineral products. On the other hand, re-exports as a percentage of total exports to Russia, Norway and Denmark have decreased. When it comes to Russia, the explanation can at least partly be linked to methodological problems that were pointed out earlier. The development in the main product groups shows that the share of re-exports in the total exports of prepared foodstuffs and beverages to Russia has decreased markedly since 2010, reaching only 7% in 2013. Given the fact that the share of exports of wine in the total prepared foodstuffs and beverages that same year was almost 11%, and as previously mentioned, Latvia does not produce wine in such quantities, the weight of re-exports is likely to have been underestimated in this particular case.

In terms of product groups, the highest increase in the share of re-exports during the post-crisis period (2011–2013) in comparison with the whole period of 2005–2013 was in textiles as well as machinery and electrical equipment. The strongest decline in the share or re-exports is observed in prepared foodstuffs and chemical products.

The increase in re-exports should not be regarded as a negative tendency, since re-exports also contribute to domestic economic activity by creating jobs and incomes,

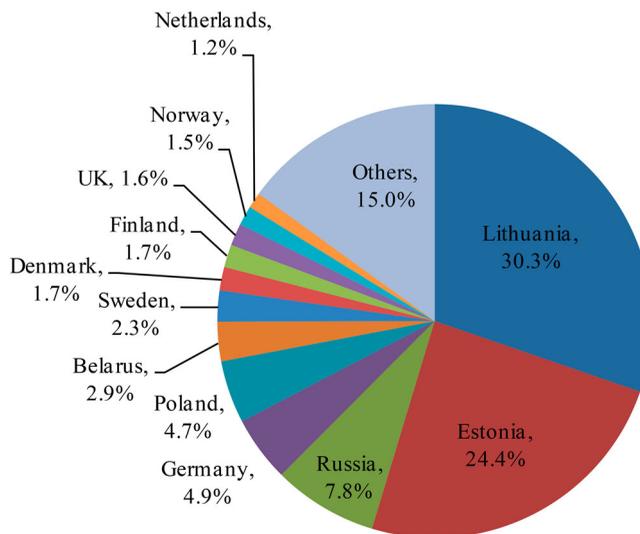
ensuring growth of logistics and transportation activities (we will come back to this issue in Section 6). However, domestic production is likely to add a larger value to GDP, resulting in a more sustainable economic growth in the medium and long term.

#### 4.2. Structure of re-exports

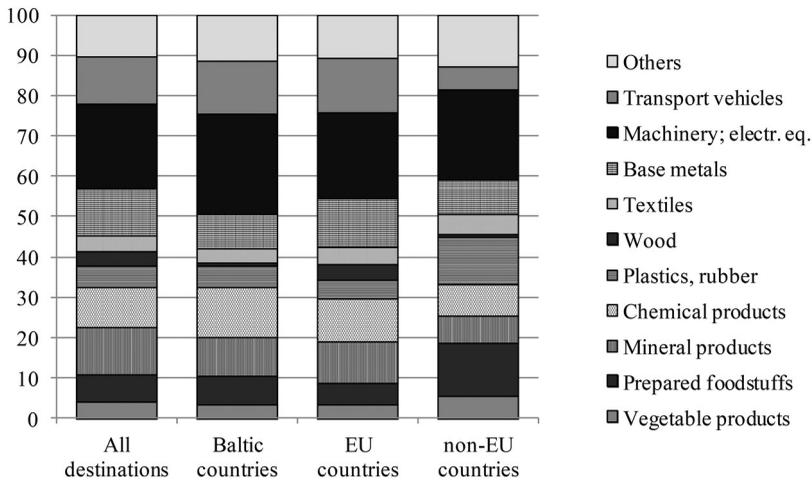
Now we briefly describe the structure of Latvia's re-exports both, by country and by product group. The largest destination countries, in terms of re-exports of goods, are largely similar to our largest total merchandise export partners – namely, Lithuania, Estonia, Poland, Russia and Germany (see Figure 2). Overall, EU countries serve as a main destination of Latvia's re-exports (almost 80% of total re-exports), while the only important destination countries outside EU are Russia and Belarus. The leading role of the EU is mostly determined by Lithuania and Estonia that account for more than a half of Latvia's re-exports. The dominating role of our closest neighbours – Estonia and Lithuania – in re-export flows suggests that Latvia serves as a sort of a regional transport hub.

The product groups with the largest share in total re-exports are machinery and electrical equipment, mineral products, base metals and vehicles (see Figure 3). The importance of those product groups is even more pronounced for re-export flows directed towards Baltic countries and the EU. Also we want to stress the larger share of machinery and electrical equipment, chemical and food products in intra-Baltic re-exports.

The structure of re-exports to non-EU countries is somewhat similar: machinery and electrical equipment is still the largest product group; also base metals and chemical products are important. However, Latvia's re-exports to non-EU countries consists of more food products and plastics, while the share of mineral products and transport vehicles is smaller.



**Figure 2.** Re-export structure by destination country (average in 2005–2013, %). Source: CSB of Latvia, authors' calculations.

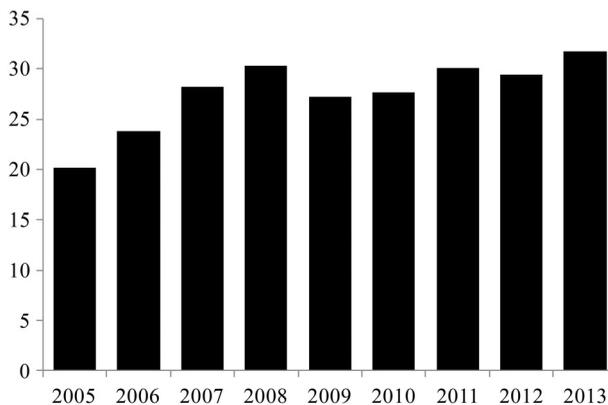


**Figure 3.** Re-export structure by product group (average in 2005–2013, %). Source: CSB of Latvia, authors’ calculations.

#### 4.3. The share of re-exports in total exports over time

The share of Latvia’s re-exports in total exports was not stable over time. In 2005, right after the accession to the EU, only around 20% of gross exports were related to re-export activities. Following a steady rise during the boom years, the share of re-exports saw a slight decline during the crisis (around 27% during 2009–2010). This decline to some extent goes in line with the findings of Los, Timmer, and de Vries (2015), who suggest that the global crisis caused a temporary hiccup in the tendency of increasing international fragmentation of production. Re-exports, being one of the fragmentation forms, followed similar pattern. Indeed, the post-crisis period is again characterized by an upward trend in the share of re-exports, reaching its highest point (32%) in 2013 (Figure 4) .

Such a rapid increase is in line with results obtained by Lietuvos Bankas (2014): the share of Lithuania’s re-exports in total exports grew from 26% in 2004 to 48% in 2013.



**Figure 4.** Share of re-exports in total merchandise exports (%). Source: CSB of Latvia, authors’ calculations.

Thus, increasing involvement into international logistic and production chains can be viewed as a Baltic-wide phenomenon.

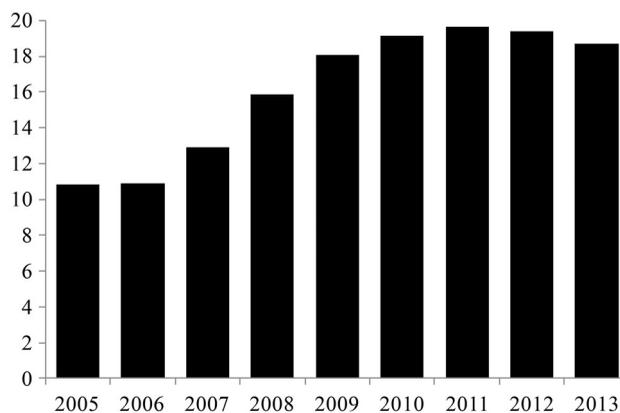
#### 4.4. Re-exported imports

The share of re-exported imports in total imports has on average been 16.2% during 2005–2013 (see Figure 5). This share had a tendency to increase until 2011; however, in the last two years of our sample period, the share of re-exported imports slightly declined. To some extent, the decline in re-exported imports share in 2013 is related to the estimation methodology. Some goods were imported at the end of 2013 and re-exported in 2014. These flows were not marked as re-exports by the algorithm, since our dataset ends at December 2013. We argue that this does not lead to a significant downward bias in re-exported imports estimates for 2013, since the majority of re-export operations occur at the same month or with a one month lag. However, one needs to take this caveat into account.

The rates of growth for re-exported imports were above those recorded for imports intended for domestic use or processing. The fall in re-exported imports during crisis was less pronounced than that of imports for domestic use; for example, if imports for domestic use fell by 39% in 2009, those for re-exports fell only by 29%. It is only in the final two years of the sample that the growth of re-exported imports lags behind the growth of imports for domestic use.

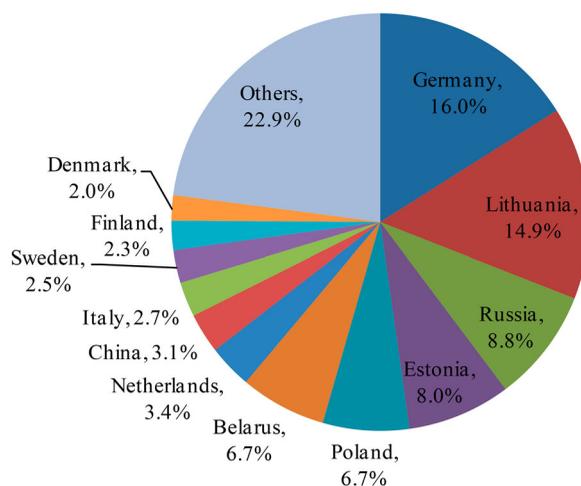
While analysing re-exports it is also important to look at the source of these flows of products. The structure of imports of re-exported goods by country is very similar to Latvia's total import structure (see Figure 6). The largest import (and re-exported import) origins during 2005–2013 were Lithuania, Germany, Russia, Poland and Estonia. The biggest differences have to do with Belarus and Finland. Belarus is much more important in the imports of further re-exported goods than in total imports; while it is the opposite case for Finland.

When looking at the dynamics, even though still among the largest import partners, Germany up to 2013 has been losing its weight in Latvia's structure of imports, and even more so – in re-exported imports. Poland, on the other hand, is increasing its



**Figure 5.** Re-exported imports as a share of total imports (%).

Source: CSB of Latvia, authors' calculations.



**Figure 6.** Structure of re-exported imports by country of origin (2005–2013, %). Source: CSB of Latvia, authors' calculations.

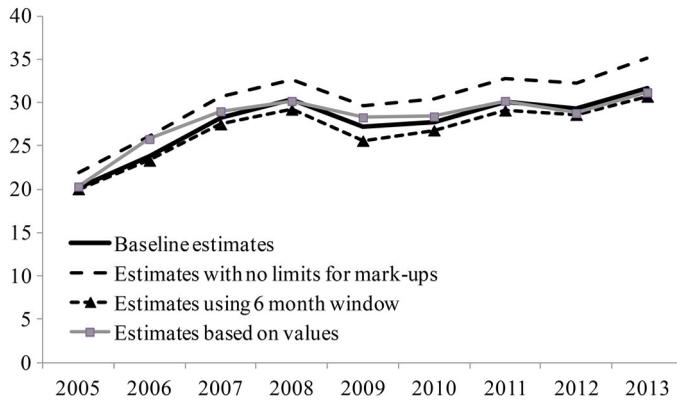
share in imports and re-exported imports of Latvia. This is mostly due to a marked increase of imports of machinery and mechanical appliances from Poland. It is also important to note that China is becoming a more and more prominent import partner (due to rising imports of machinery and mechanical appliances, like Poland), and its share in imports of re-exported products is rising even faster. Overall though, China was still behind such important historic trade partners as Russia and Belarus in 2013.

The structure of source countries for products that are imported for the purpose of re-exporting is more diversified than their re-export destination countries (compare [Figure 2](#) and [6](#)). In terms of product groups, for mineral products the main import partner is Belarus, followed by Lithuania; for base metals – Russia; for vehicles – Germany and for machinery and electrical equipment – Poland followed by China.

## 5. Robustness check

We provide the robustness check of the re-export figures reported above by running three alternative estimations. First, we check the importance of restrictions to the levels of mark-ups by allowing any difference between export and import unit values. Obviously, this should lead to higher estimates of re-exports. Second, we define that re-export operation cannot be performed later than 6 month (instead of 12 month) after importing, thus putting stricter constraints to the linear system. Finally, we apply our algorithm to the values of trade flows.

These alternative calculations do not alter our conclusions, as can be seen in [Figure 7](#). Relaxing the limitations for extreme mark-ups increases the share of re-exports in total exports of goods by 2–3pp, but the pattern of developments remains unchained. The difference of results from other alternative estimates with the benchmark results is even smaller. Decreasing the allowed re-export period to 6 month has a negligible effect, since the majority of operations occur within 1–2 months. As to estimates based on values, these should be compared with estimates with no limits for mark-ups (since the



**Figure 7.** Alternative estimates of the re-exports' share in total merchandise exports (%). Source: CSB of Latvia, authors' calculations.

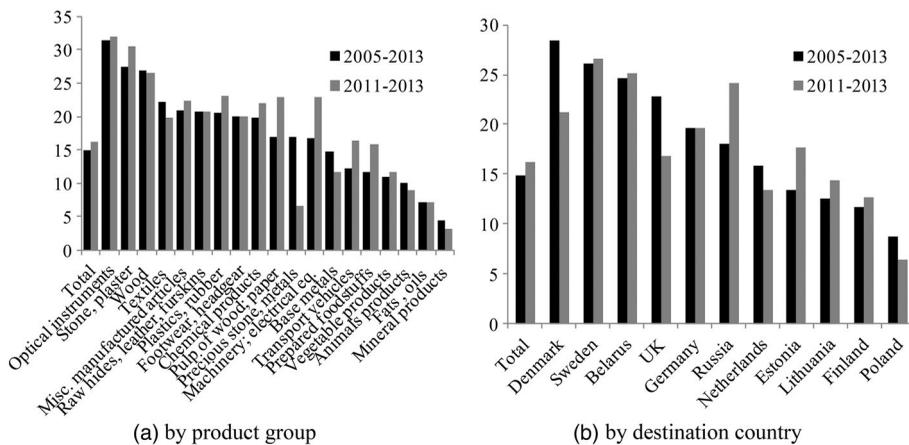
evaluation of mark-ups is not possible in this case). We see that use of values tends to underestimate the importance of re-exports in total exports.

Table 2 also compares the product and destination structure of estimated re-export flows. We can conclude that extreme mark-ups more often appear in the product categories of machinery and electrical equipment, as well as chemical products. However, the above-mentioned changes to the methodology do not affect the composition of re-exported products and list of major destinations significantly, thus confirming the robustness of our results.

## 6. Mark-ups of re-export operations

### 6.1. General results

According to our estimates, average re-export mark-ups (the difference between price of exports and weighted price of imports) were 15% in 2005–2013 (see Figure 8(a)).<sup>2</sup> Among



**Figure 8.** Re-export mark-ups (%). Source: CSB of Latvia, authors' calculations.

**Table 2.** Structure of re-exports for alternative estimates (average in 2005–2013, %).

	Baseline	Alternative estimates		
		No limits for mark-ups	6 month window	Based on values
(a) By product groups				
Machinery; electrical equipment	21.0	22.9	22.3	22.1
Mineral products	11.8	11.2	12.3	12.2
Base metals	11.7	11.0	11.4	11.0
Transport vehicles	11.6	10.7	11.2	10.8
Chemical products	10.0	11.1	9.4	10.9
Prepared foodstuffs	6.5	5.9	6.2	6.4
Plastics, rubber	5.4	5.2	5.3	5.1
Textiles	4.0	4.3	4.1	4.2
Vegetable products	4.0	3.9	4.2	4.2
Wood and wood products	3.4	3.0	3.0	2.6
Animal products	1.6	1.6	1.7	1.7
Other products	9.0	9.2	8.8	8.8
(b) By destination countries				
Lithuania	30.3	29.2	31.0	31.5
Estonia	24.4	23.1	24.2	24.8
Russia	7.8	8.4	7.3	7.4
Germany	4.9	5.0	4.8	4.7
Poland	4.7	5.5	5.7	5.4
Sweden	2.3	2.4	2.4	2.1
Denmark	1.7	1.8	1.6	1.6
UK	1.6	1.6	1.4	1.3
Finland	1.7	1.5	1.6	1.6
Norway	1.5	1.4	1.4	1.4
Netherlands	1.2	1.2	1.2	1.2
Belarus	2.9	3.0	2.8	2.8
Other countries	15.0	15.9	14.5	14.1

Source: CSB of Latvia, authors' calculations.

three groups with the largest mark-ups one can observe two very small product groups within the total export structure: optical instruments, apparatus, clocks and musical instruments (with a 32% mark-up in 2005–2013) and stone, plaster, cement, glassware and ceramic products (28% mark-up). The third product group with the largest mark-ups is wood and articles of wood (27%); however, the re-export share in this groups is very small (see Section 4.2). This suggests that larger mark-ups can be attributed to specific products re-exported in small amounts. Among the most important product groups in total export one of the smallest mark-up (3%) has been identified for mineral products – a group that includes a large share (and a large amount) of re-exports. Small mark-ups for re-exports of mineral products are in line with Feenstra and Hanson (2004), who report that mark-ups tend to be lower for standardized products.

Denmark and Sweden are the countries with the highest mark-ups among our key trading partners (on average above 25% during 2005–2013, see Figure 8(b)). The smallest mark-ups for re-exported goods are observed for destination countries like Poland (9%), Finland, Lithuania (both around 12%), and Estonia (13%). One of the explanations for the smaller mark-ups of re-exports to Lithuania and Poland might be the fact that Latvian transport sector businesses consider their counterparts in these countries to be their most important competitors, which is likely to drive down mark-ups for exports to those destinations.

Post-crisis (2011–2013 on average) mark-ups were 1.3pp higher comparing with overall sample period (2005–2013). The strongest increase in mark-ups can be observed for such

product groups as machinery and electrical equipment, as well transport vehicles that also have a high share of re-exports in total exports. At the same time a similar increase in mark-ups is evident for prepared foodstuffs and pulp of wood and paper that are not groups with a particularly pronounced presence of re-exports.

The largest increase in mark-ups in the post-crisis period was for re-exports to Russia, which could be related to a structural change in the composition of re-exports to this country related to the above-mentioned methodological problems. Namely, the weight in re-exports of processed food and beverages (a product group with lower-than-average mark-ups) decreased considerably after the crisis. Mark-ups for re-exports to Estonia have also increased considerably following the crisis. This could partly be explained by increased weight in re-exports to Estonia of machinery and equipment in the second half of the sample (one of the product groups whose mark-ups are higher than the average for Estonia and increased the most in the post-crisis period).

The sharpest decrease in mark-ups post-crisis has been to such countries as the UK (–6pp) and Denmark (–7pp). These three post-crisis years had seen an important increase in the weight of metals in the re-exports to the UK (from minuscule to around 25%) – a product group that has mark-ups significantly lower than the average mark-ups for products exported to the UK.

According to our estimates, the ratio of total re-export mark-ups to GDP was 2.1% in 2012.<sup>3</sup> This number shows the importance of re-export flows in Latvia and indicates that the input of re-export operations into Latvia's economy is non-negligible. One should note, however, that it does not mean that all mark-ups contribute to the domestic value added. A large share of re-export mark-ups (i.e. difference between import and export prices) could be due to transportation, storage and relabelling, which was performed by Latvia's firms. These operations also require foreign intermediate inputs that can be rather sizeable in case of transportation (fuel costs). Moreover, import prices (in c.i.f.) do not include import duties, therefore mark-ups are overestimated for several products imported from non-EU countries (e.g. China, Russia, Belarus). Thus, the true contribution of re-export operations to Latvia's domestic value added and GDP is below 2.1%. Nevertheless, our findings prove that re-exports should not be viewed as a negative phenomenon.

## **6.2. Regression analysis**

In order to obtain more insights about Latvia's re-export mark-ups, we perform a simple regression analysis. Since we only have the firm-level external trade database, the set of potential explanatory variables is scarce. In addition to the mark-ups of re-export flows evaluated by Equation (7), we know the commodity, countries of origin and destination, anonymized (artificial) firm's identification number, and time period. Moreover, we also know the value and the volume (in kilograms) of respective re-export flow. Thus, we simply model re-export mark-ups by the panel regression with various fixed effects (reflecting commodity, origin, destination, firm, year). We do not use value (or volume) of re-export flows due to potential endogeneity problem. Instead, we create a new variable that describes value per kilogram of each transaction. The rationale behind this variable is simple: value per kilogram may reflect some characteristics of the product (e.g. quality)

**Table 3.** Re-export mark-ups regressions (2006–2013).

	Model specifications					
	1	2	3	4	5	6
Value per kilogram	9.61e-5**	1.50e-4**	1.98e-4**	1.98e-4**	1.94e-4**	1.94e-4**
Value per kilogram, square	-5.67e-10**	-8.18e-10**	-1.01e-9**	-1.01e-9**	-9.92e-10**	-9.95e-10**
Year fixed effects:						
2006 (benchmark)	-	-	-	-	-	-
2007	-	-	-	0.0110*	0.0113*	0.0101
2008	-	-	-	0.0220**	0.0234**	0.0252**
2009	-	-	-	0.000402	0.00226	0.00708
2010	-	-	-	0.00854	0.0101*	0.0162**
2011	-	-	-	0.0118**	0.0139**	0.0186**
2012	-	-	-	0.0157**	0.0168**	0.0194**
2013	-	-	-	0.0215**	0.0211**	0.0230**
Destination fixed effects:						
Lithuania (benchmark)	-	-	-	-	-	-
Estonia	-	-	-	-	0.00944**	0.0122**
Russia	-	-	-	-	0.0165**	0.0170**
Germany	-	-	-	-	0.0691**	0.0668**
Poland	-	-	-	-	-0.0254**	-0.0407**
Belarus	-	-	-	-	0.0144**	0.0123*
Sweden	-	-	-	-	0.0333**	0.0365**
Denmark	-	-	-	-	0.0827**	0.0858**
Finland	-	-	-	-	0.0453**	0.0513**
Origin fixed effects:						
Germany	-	-	-	-	-	-0.0569**
Lithuania (benchmark)	-	-	-	-	-	-
Russia	-	-	-	-	-	0.0515**
Estonia	-	-	-	-	-	-0.0341**
Poland	-	-	-	-	-	0.0190**
Belarus	-	-	-	-	-	0.0605**
Netherlands	-	-	-	-	-	-0.0698**
China	-	-	-	-	-	0.0850**
Italy	-	-	-	-	-	-0.0639**
Sweden	-	-	-	-	-	-0.0805**

Fixed effects:

Firm (4528 categories)	No	Yes	Yes	Yes	Yes	Yes
Product (7914 categories)	No	No	Yes	Yes	Yes	Yes
Year (8 categories)	No	No	No	Yes	Yes	Yes
Destination country (203 categories)	No	No	No	No	Yes	Yes
Origin country (146 categories)	No	No	No	No	No	Yes
Number of observations	495,674	495,674	495,674	495,674	495,674	495,674
$R^2$	0.008	0.012	0.041	0.041	0.047	0.062

Source: CSB of Latvia, authors' calculations.

Note: The dependent variable is re-export mark-up, evaluated using Equation (7). We exclude 2005 from the analysis due to possible underestimation of re-exports at the beginning of the sample.

\* $p$ -value <.05.

\*\* $p$ -value <.01.

that affect the size of the mark-ups. The model of re-export mark-ups is the following:

$$\mu_{ijkmt} = \beta_0 + \beta_1 V_{ijkmt} + \beta_2 V_{ijkmt}^2 + \alpha_i + \gamma_j + \delta_k + \eta_m + \lambda_t + u_{ijkmt}, \quad (8)$$

where  $\mu_{ijkmt}$  denotes firm  $i$ 's mark-ups for re-exports of commodity  $j$  from origin country  $k$  to destination country  $m$  in period (year)  $t$ ,  $V_{ijkmt}$  represents value per kilogram of respective flow,  $\alpha_i$  corresponds to firm fixed effect,  $\gamma_j$  – product fixed effect,  $\delta_k$  – origin fixed effect,  $\eta_m$  – destination fixed effect, and  $\lambda_t$  – time fixed effect.

Table 3 contains six different specifications of the model (starting from pooled ordinary least squares to the model with five different fixed effects). First, we see that the higher value of product per kilogram is associated with larger mark-ups (negative coefficient before the square of value per kilogram reflects decreasing marginal effect). This result remains qualitatively unchanged even after controlling for individual commodity effects (Models 3–6). Possibly, firms charge higher mark-ups while re-exporting more qualitative commodities.

Year fixed effects, showed in Table 3, capture an upward trend in re-export mark-ups. After a temporary decline in 2009–2010, mark-ups continued to increase: keeping other factors unchanged, mark-ups were expected to be higher by 2.1–2.3pp in 2013 comparing with 2006.

Finally, we report country fixed effects for 10 most important destination and origin countries (in both cases Lithuania was used as a benchmark). Several interesting findings can be mentioned here. For instance, Lithuania can be viewed as a ‘cheap’ destination, since re-export mark-ups tend to be higher for other important destination countries. Expected mark-ups of re-exports to Estonia (second largest destination country) are exceeding mark-ups of re-exports to Lithuania by 0.9–1.2pp, while mark-ups are expected to be by 6.7–6.9pp higher when re-exports flows are directed to Germany instead of Lithuania. Only re-exports to Poland have lower mark-ups comparing with re-exports to Lithuania. Thus, the lowest mark-ups are observed for flows directed towards Latvia’s closest EU neighbours, which could reflect the importance of logistics as a determinant of Latvia’s re-exports.

Regarding the origin of re-export flows, the highest mark-ups are observed for re-exports coming from non-EU countries (Russia, Belarus and China). First, this could be related to import tariffs that are not included into c.i.f. prices. Second, higher mark-ups may also reflect specific knowledge of Latvia’s entrepreneurs about markets of Russia and Belarus.

Despite the large number of fixed effects included, the explanatory power of the models is low. This requires further investigations regarding the determinants of re-export mark-ups, including firm-specific characteristics, geographical factors and tax rate differences. However, we leave this task for the future study.

## Conclusions

We used the anonymized firm-level trade database provided by the CSB to evaluate re-export flows in Latvia. We followed the approach by Bērziņa (2013) in spirit, although taking advantage of a more detailed dataset, in particular, using monthly frequency data and evaluating re-exports based on volumes rather than values. After solving the

maximization problem for each firm-product pair, we obtained estimates of re-export flows and calculated the corresponding re-export mark-ups.

According to our estimates, we found that the share of re-export flows in the total merchandise exports and imports is significant and has a tendency to increase, which goes in line with the globalization trend observed in the world economy. The share of re-exports is especially important in such product groups as transport vehicles, plastics, mineral products, and machinery and electrical equipments. The majority of re-export flows is directed to our closest neighbours – Lithuania and Estonia – suggesting that Latvia serves as a sort of a regional transport hub.

We claim that one should take into account the share of domestically produced exports and re-exports while analysing exports by product groups and countries. Changes in total export flows may understate/overstate the real impact of shocks to certain commodities or shocks in specific trade partner countries on the domestic economy. This is because domestically produced products add a higher value to the Latvian economy than re-exported goods, and therefore, changes in exports of the former will have a more pronounced impact on the domestic economy. However, we should not view re-exports as something useless. We found that average re-export mark-ups were sizeable and re-export operations may also provide an important contribution to Latvia's GDP.

This is a first, and, admittedly, a fairly descriptive attempt to assess the re-exports of Latvia. Clearly, more research should be done in future to understand the reasons behind the product composition and direction of re-export flows, as well as the developments in re-export mark-ups.

## Notes

1. Reported by Bērziņa (2013) based on information from CSB of Latvia.
2. These figures were obtained after the exclusion of extreme mark-ups, as mentioned in Section 3.
3. We report figure for 2012 to avoid downward bias in estimates in re-exported imports in 2013, mentioned in Section 3.3.

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## Disclosure statement

No potential conflict of interest was reported by the author.

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