Export and productivity in global value chains: comparative evidence from Latvia and Estonia

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Abstract This paper investigates the effect of exporting on productivity, often referred to as "learning by exporting", in the context of global value chains (GVCs). Exports have long been considered as the channel of knowledge transfer from technologically advanced foreign buyers. Although the rise of GVCs raised hope that it would facilitate such knowledge transfer, empirical evidence on its role in learning by exporting is scant. We use data of Latvian and Estonian firms to observe how learning by exporting differs across types of exports that are associated with different kinds of participation in GVCs. We find that while exporting results in significant productivity gains, these are larger for specific types of exports, such as exports of knowledge-intensive services, intermediate goods and re-exports that correspond to activities that generate high value added within GVCs. Our findings suggest that interactions with global buyers and exporters' room for technology catch-up define the extent of learning by exporting in GVCs. These also yield some implications for policies to boost productivity through better integration in GVCs.

Keywords productivity, knowledge transfer, global value chain, exports, Latvia, Estonia

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1 Introduction

International trade has long been considered a channel of knowledge transfer (Bayoumi et al. 1999; Saggi 2002). In particular, firms that start exporting may improve productivity by absorbing new knowledge from foreign buyers. Yet, empirical evidence on such productivity gains associated with export entry, referred to as "learning by exporting" (LBE), is mixed at best (for example, Keller 2004; Wagner 2007). Furthermore, empirical evidence suggests that LBE is far from a general phenomenon, but is conditional on several factors. For instance, supportive evidence is often found among firms in developing countries with larger room for technological catch-up (Blalock and Gertler 2004; van Biesebroeck 2005), when exports are directed to advanced economies (De Loecker 2007) or when multiple goods are exported to multiple destinations (Masso and Vahter 2015). This paper explores how different types of exports, each associated with participation in different segments of global value chains (GVCs), shape the extent of LBE.

Over the past three decades, the decline in trade, transportation and communication costs allowed firms to fragment production processes and tasks globally, giving rise to global value chains and magnified trade volume (Baldwin 2012; Amador and Cabral 2016). Intermediate goods and services incorporated at various stages of the production process comprise more than 60 per cent of global trade (World Bank 2019). Yet, empirical analysis on the implication of GVCs to LBE is so far scant.

Studies on GVCs have documented that GVC participation offers firms in emerging economies opportunities to absorb knowledge transfer through stronger interaction with global buyers like multinational enterprises (MNEs) (Gereffi 1999; Giuliani et al. 2005; Simona and Axèle 2012; Atkin et al. 2017). Such notion of "learning by supplying" (Alcacer and Oxley 2014) is close to the concept of LBE. Exporters supplying highly original or relation-specific goods or services to GVCs may enjoy particularly closer interaction and knowledge transfer from global buyers. As the result, they may realise larger productivity gains than exporters of more generic goods or services. GVC studies have also highlighted uneven distribution of value added generated by participants within a GVC (Gereffi 1999; Kaplinsky 2000; Dedrick et al. 2010). For instance, firms that supply knowledge-intensive inputs such as core components or research and development services often create disproportionally larger value added than those supplying generic goods or services, such as assembly services. GVC participants that supply unique, sophisticated inputs exert significantly stronger bargaining power over suppliers of standardised, substitutable inputs, thus enjoying larger profit margins (Jacobides et al. 2006). Such observation suggests that exporters of knowledge-intensive goods or services may enjoy larger productivity gains.

We use matched firm-level dataset of Estonian and Latvian firms to test the above hypotheses. We examine whether LBE is stronger for some types of exports that involve stronger interactions with global buyers and are associated with activities that generate high value added within GVCs. We indeed find that exports of non-transport services and re-exports result in significantly larger productivity gains than exports of final goods. It is often considered that knowledge intensive activities that generate high value added are found in upstream or far downstream segments of GVCs (for example, Baldwin 2012). Yet, we find that exporters from upstream or far downstream industries characterised by a high or very low level of the index of upstreamness (Antràs et al. 2012; Fally 2011) do not enjoy larger productivity gains. In fact, largest productivity gains are enjoyed by exporters in industries with mid-range levels of the upstreamness index, such as manufacture of electronics equipment or wholesale and retail. Our findings suggest that LBE in GVCs is primarily defined by the knowledge intensity of goods or services and not by the positioning of an industry within GVCs.

This study adds several novel perspectives to the existing research on learning by exporting. First, it is a first attempt to capture LBE in the context of GVCs by exploring the heterogeneity of LBE that stems from the difference in exporters' role within GVCs. Second, it employs the estimation method by De Loecker (2013) that allows export status to affect a firm's total factor productivity (TFP) endogenously, in contrast to most of the previous studies on LBE that assume that TFP levels are determined exogenously from exporting.[6] Third, the inclusion of service exporters relates this paper to a relatively small range of studies that uses service trade firm-level data (such as Breinlich and Criscuolo 2011; Malchow-Moller et al. 2015).

Latvia and Estonia are suitable countries for studying the effect of exports and GVC participation on productivity, not least for their considerable room for productivity catch-up against the most advanced OECD economies (OECD 2018; 2019). Due to the small size of their economies, access to foreign markets is essential for their firms to take advantage of economies of scale and to make major qualitative changes such as upgrading technologies or improving skills. Past studies have indeed found supportive evidence of LBE for both countries (Masso and Vahter 2015). Also, higher productivity is particularly important for the competitiveness of these economies, as labour shortages due to international outward migration and population ageing fuel strong upward pressure in wage growth (OECD 2018; 2019).

The rest of the paper is structured as follows. Section 2 formulates several hypotheses on LBE in the context of GVCs through a brief review of GVC literature. Section 3 describes data and methodology employed to estimate total factor productivity. Section 4 provides some snapshots of productivity premia among Latvian and Estonian GVC participants and explores the determinants of export entry by estimating the probability of export entry as a function of firms' characteristics. Section 5 estimates the impact of entry to different types of exports on firm productivity by applying the propensity score matching (PSM). Section 6 concludes.

2 Learning by exporting in global value chains

This section reviews literature on global value chains (GVCs) and other relevant studies to deduce hypotheses on how different types of exports result in different extent of "learning by exporting" (LBE). It attributes particular attention on how each type of exports differs in the extent of knowledge transfer from global buyers and in its role within GVCs.

GVCs are globalised networks of interlinked manufacturing and service activities that take place in different segments of value chains (Baldwin 2012). There are numerous direct and indirect evidence of knowledge transfer within GVCs through interactions between global buyers and local suppliers (Gereffi 1999; Javorcik 2004; Giuliani et al. 2005; Simona and Axèle 2012). For instance, an involvement of global buyers into suppliers' innovation and technology upgrading improves suppliers' productivity (Pietrobelli and Saliola 2008; Alcacer and Oxley 2014), although it seems to benefit mostly suppliers with sufficiently high technological capabilities (Alcacer and Oxley 2014; Brancati et al. 2017). The importance of direct buyer-seller interactions in knowledge transfer is also corroborated by observations that firms exporting directly to foreign buyers are found to outperform those exporting indirectly through intermediaries (Davies and Jeppesen 2015).

Exports of intermediate goods and services are likely to involve stronger buyer-seller interactions and thus knowledge transfer than exports of final goods. For instance, Gereffi et al (2005) argue that when the specifications of product or services are complex and cannot be codified, which is often the case of manufacture of sophisticated parts and components, global buyers seek to exchange tacit knowledge through face-to-face interactions and a high level of coordination. Furthermore, because consumption and production of services often occur simultaneously, closer buyer-seller interactions are needed to ensure that the seller delivers services that match buyers' demand (Love and Ganotakis 2013).

Exports of intermediate goods or services are also one way to participate in activities within GVCs that generate high value added. Studies on GVCs have documented very uneven distribution of value added generated by GVCs among the participants (Gereffi 1999; Kaplinsky 2000; Dedrick et al. 2010; Rungi and Del Prete 2018). In general, value added is concentrated to GVC participants supplying unique inputs that define competitiveness of final goods or services. These participants exercise strong bargaining power over other suppliers providing more generic inputs and appropriate a lion's share of the total value added

[6] To the best of our knowledge De Loecker (2013) and Manjon et al. (2013) are the only other studies employing a similar approach to infer LBE.

generated by GVCs (Jacobides et al. 2006; Dedrick et al. 2010). This is the case of providers of knowledge-intensive services that increasingly define competitiveness of manufacturing as they add higher value to final products (Miroudot and Cadestin 2017). Conversely, those supplying well-standardised and often labour-intensive goods or services (such as base materials or mass production of final goods using imported components) generate relatively low value added, as they face fierce competition that drives down their profit margins (Kaplinsky 2000).

Service exporters may enjoy larger productivity gains than final goods exporters also due to the intangibility of services (La et al. 2005; Gallouj 2002; Love and Ganotakis 2013). Since services are by nature intangible, their production involves less of physical capital than goods production and relies more on knowledge-based capital that does not depreciate with production scale (Gallouj 2002; Miles 2005). This allows service exporters to scale up or replicate their services with little additional costs, thereby enjoying large economies of scale and delivering their products faster than goods exporters. This, combined with the stronger interactions with global buyers due to inseparability of consumption and production of services, can result in a more significant improvement in productivity due to faster learning and knowledge transfer from global buyers (Contractor et al. 2007; Love and Ganotakis 2013). These observations yield our first hypothesis:

H1: Exporters of intermediate goods and services enjoy larger productivity gains than exporters of final goods.

Some types of services, such as telecommunications, energy and transportation services require large physical infrastructure. Exports of these services would then necessitate sizable upfront investments, thus creating entry barriers and limiting a quick scaling up of service production to serve foreign markets. This motivates us to formulate the second hypothesis on LBE associated with different types of service exports, namely exports of transport services, comprising a significant weight in Latvian and, to a lesser extent, Estonian exports, and exports of other services, mostly knowledge-intensive services. Transport services and knowledge-intensive services are also likely to differ substantially in terms of value added they generate within GVCs, given their very different roles in value chains.

H2: Exporters of knowledge-intensive services enjoy larger productivity gains than exporters of infrastructure-based services, such as transport services.

Re-exports comprise an important share in Baltic states' (particularly, Latvian) trade. They accounted for 28% of Latvian merchandise exports over the period between 2005 and 2013 (Benkovskis et al. 2016). Re-exports, defined as simultaneous exports and imports of similar goods within a narrow time window (Damijan et al. 2013; Benkovskis et al. 2016), can be interpreted in two ways. First, these can be activities that involve an intensive use of imported inputs. Firms that both import and export are more productive than firms that either only export or import (Muûls and Pisu 2009; Castellani et al. 2010; Smeets and Warzynski 2013; Bernard et al. 2018). This may be due to the self-selection of most productive firms into such trade involving sunk costs for both exporting and importing, but can also be because learning effects are stronger, given that importing on its own increases productivity (Halpern et al. 2015). For example, Damijan et al. (2013) reported that 70% of Slovenian exporters engage in exports and imports of products from the same 8-digit Combined Nomenclature product category, and these exporters enjoy larger improvement in productivity and profitability compared to other exporters. Second, re-exports can be a trade intermediation service that joins parties with large information asymmetries (Feenstra and Hanson 2004). In this case, re-exporters may generate substantial value added by providing knowledge-intensive services that interlink participants within GVCs. Indeed, Latvia’s re-exports have been associated with non-negligible profit margins (Benkovskis et al. 2016). These observations motivate our third hypothesis:

H3: Re-exporters, or firms that export and import same goods, enjoy larger productivity gains than other goods exporters.

The extent of LBE is also shaped by several characteristics of exporters, namely, their technological capabilities that define their ability to absorb external knowledge and thus room for learning. Exporters with initially high productivity level are likely to have higher technological capabilities, which would allow them to absorb more external knowledge acquired through interactions with global buyers (Cohen and Levinthal 1989; 1990). This hypothesis is supported by studies such as Dai and Yu (2013), Albornoz and Ercolani (2007) or Liu and Buck (2007) that document that larger R&D expenditure is associated with higher impacts of exporting on productivity. On the other hand, exporters with initially lower productivity levels have more to gain from exposure to foreign knowledge sources due to the larger gap in technology and productivity against the frontier. This "technology gap" effect is the firm-level equivalent to the idea that one can expect faster convergence to the productivity frontier and larger technology transfer from abroad in the case of more backward regions or countries (e.g., as argued in Findlay (1978), building on Veblen (1915) and Gerschenkron (1952)). Indeed, Salomon and Jin (2008) reported that Spanish firms from technologically lagging industries enjoy larger improvements in productivity from exporting than those from technologically advanced industries. Also, Love and Ganotakis (2013) find that British SMEs with relatively low innovation intensity tend to gain more from exporting. It is therefore not clear a priori whether the absorptive capacity or this technology gap effect is more important for LBE. We however expect that LBE is shaped by the initial productivity level of exporters in one way or another:

H4: Productivity gains from exporting are dependent on exporters' initial productivity levels.

3 Data, descriptive statistics and production function estimation

3.1. Data

This paper uses administrative firm-level data on financial statements and international trade of Latvian firms over the period from 2006 to 2015 and Estonian firms from 1995 to 2014 (see Appendix for more details). Data processing between the Latvian and Estonian datasets was harmonised to the largest possible extent to allow comparison between these two countries. Establishments in financial and insurance, public administration, education, health care, arts and entertainment sectors are excluded from this study. In addition, in order to avoid observations with extreme values influencing the estimation results, those were identified and dropped (see Appendix for details). As the result, for Latvia we obtain a sample of around 50,000 to 80,000 firms for each year and up to around 100,000 firms in the most recent year and for Estonia – a sample of around 90,000 firms in the most recent year.

3.2. Types of exporters and measures of upstreamness

We define intermediate and final goods exporters as firms exporting products categorised as intermediate and final goods respectively in the OECD BTDIxE end-use classification, which is used to construct the OECD-WTO Trade in Value Added (TiVA) database. This allows a comparison of our findings with recent GVC studies that employ TiVA database (for example, Amador and Cabral 2016). Following Benkovskis et al. (2016), we define re-exporters as firms exporting and importing goods that belong to the same 8-digit Combined Nomenclature (CN code) within the period of 12 months. As regards service exports, we distinguish transport service exporters from other service exporters, given the considerable share of transport services in service exports, particularly in Latvia, and their dependence on physical transportation infrastructure, which may result in different pattern of LBE as compared to other service exports (see above). Non-transport service exports include exports of knowledge-intensive services such as ICT and professional services, that comprise important shares in service exports in both countries (OECD 2018; 2019).

In the most recent year, about 4-5% of Latvian and Estonian firms exported either goods or services. Latvian exporters are mainly goods exporters while there are almost as many Estonian firms exporting services as those exporting goods (Table 1). While these shares are not mutually exclusive, as some firms export both goods and services, such firms only comprise small shares (2.7% and 10.7% of the total number of Latvian and Estonian exporters over 2006-2014, respectively). In Latvia, about 2% of firms are intermediate goods exporters while about the same share of firms are final goods exporters. In Estonia, the share of firms exporting intermediate goods (1.3%) is higher than the share of final goods exporters (0.7%). The share of re-exporters is somewhat higher in Latvia than in Estonia. Furthermore, more than half of

Latvian service exporters are exporting transport services, while almost all of Estonian service exporters are exporting non-transport services.

Table 1 The share of exporters in the total number of firms, employment and turnover in the most recent year, %

Type of exports	Latvia			Estonia		
	Number of firms	Employment	Turnover	Number of firms	Employment	Turnover
All exporters (goods and services)	4.6	30.7	51.7	4.1	41.4	57.9
Goods exporters	4.2	24.3	43.2	2.1	26.5	42.8
Exporters of intermediate inputs	2.3	12.1	19.8	1.3	18.4	29.5
Exporters of final goods	2.1	11.9	19.5	0.7	10.3	11.3
Re-exporters	1.8	14.2	31.0	0.7	20.2	33.9
Service exporters	0.4	8.1	12.1	2.4	23.9	32.5
Transport service exporters	0.3	4.7	6.2	0.0	2.2	1.7
Non-transport service exporters	0.2	3.6	6.4	2.4	22.2	31.6

Note: the most recent available year for Latvia is 2015 and for Estonia – 2014.

It is often considered that activities that generate high value added within GVCs are located in the upstream of far downstream of GVCs (Baldwin 2012; Ye et al. 2015). These include new product design, research and development, manufacture of key parts and components, marketing and branding as well as postproduction services, e.g. leasing (Baldwin 2012; Ye et al. 2015). In order to infer whether a firm's positioning in upstream or far downstream segments in GVCs is important for LBE, we employ two indicators to capture the position of firms within GVCs. The first is an industry-level index of the upstreamness proposed by Antràs et al. (2012) and Fally (2011), which measures the average distance between an industry's production and the final demand for its product. [7] A high value implies that an industry is located in upstream segments of GVCs. The second is a firm-level indicator, proposed by Kee and Tang (2016) that captures the share of intermediate input in a firm's output. A lower share indicates that a firm is participating in upstream segments of GVCs, as such firm would require less intermediate inputs than firms in more downstream segments that for example assemble imported parts into final goods. We also observe the share of imported inputs in total intermediate inputs: the higher share of foreign intermediate inputs indicates larger involvement in the GVCs.

Table 2 shows that exporters in both countries belong to industries that are rather similar in terms of their positioning within production chains, as the average levels of upstreamness index are fairly similar across export types. However, as expected, exporters of final goods exhibit somewhat lower index, implying that they are located in more downstream segments than exporters of intermediate goods or re-exporters. Regarding the intensity of intermediate input use in production, the provision of non-transport services seems to require a relatively smaller share of intermediate input. Interestingly, in Latvia this share is dominated by foreign intermediate input that accounts for as much as 70%, whereas in Estonia it is almost exclusively domestic.

Table 2 Summary of upstreamness measures

Type of exports	Latvia			Estonia		
	Upstreamness index	Intermediate input share	Foreign share	Upstreamness index	Intermediate input share	Foreign share

[7] We follow Antràs et al. (2012) and Fally (2011) to measure upstreamness as $U = [I - \Delta]^{-1}1$, where U is the vector of upstreamness measures by industries ($U \geq 1$, larger values correspond to higher levels of upsteamness), Δ denotes the square matrix containing the shares of sector i's total output that is purchased by industry j, and $\mathbf{1}$ is a column vector of ones. The upstreamness of Latvian and Estonian industries between 2000 and 2014 was calculated using data from the World Input-Output dataset (WIOD, www.wiod.org) and is available upon request.

All exporters (goods and services)	2.72	0.65	0.34	2.75	0.60	0.16
Goods exporters	2.71	0.65	0.33	2.70	0.71	0.30
Exporters of intermediate inputs	2.83	0.68	0.27	2.76	0.71	0.32
Exporters of final goods	2.53	0.65	0.31	2.56	0.69	0.39
Re-exporters	2.69	0.59	0.65	2.69	0.71	0.51
Service exporters	2.81	0.57	0.45	2.79	0.54	0.08
Transport service exporters	2.82	0.64	0.29	2.04	0.63	0.53
Non-transport service exporters	2.78	0.45	0.71	2.80	0.54	0.07

3.3. Total factor productivity

The paper employs total factor productivity (TFP) as a measure of firm-level productivity. TFP is not observable from the data and thus is estimated based on the production function approach.[8]

We assume that a firm's production function takes the following Cobb-Douglas form:

$$q_{it} = \beta_0 + \beta_k k_{it} + \beta_l l_{it} + \omega_{it} + \epsilon_{it}, \tag{1}$$

where q_{it} is the natural log of value added of a firm *i* at time *t*, k_{it} is the natural log of capital, l_{it} is the natural log of labour, ω_{it} is unobserved productivity level, ϵ_{it} is a standard i.i.d. error term. Because a firm's decision on how much capital, labour and materials to employ responds to the productivity shock, the OLS estimation of the equation (1) yields biased coefficients (Ackerberg et al. 2015). In order to correct for these biases Olley and Pakes (1996) and Levinsohn and Petrin (2003) proposed methods where capital investment or demand for intermediate inputs are assumed to be a function of unobserved productivity. We follow Ackerberg et al. (2006) and De Loecker (2013) by further allowing labour input (l_{it}) and a firm's export status (X_{it-1}) to impact its demand for intermediate goods m_{it}:

$$m_{it} = h(k_{it}, l_{it}, \omega_{it}, X_{it-1}) \tag{2}$$

Since demand for intermediate inputs *(h(..))* is considered to be a monotonic function of productivity it can be inverted to obtain the inverse relationship for productivity:

$$\omega_{it} = h^{-1}(k_{it}, l_{it}, m_{it}, X_{it-1}) \tag{3}$$

Unobserved productivity is therefore a function of export status. Note that export status is lagged by one period in order to control for the self-selection of more productive firms into exporting (Manjon et al. 2013).

By substituting equation (3) into the production function (1), the latter can be written as follows:

$$q_{it} = \beta_0 + \beta_k k_{it} + \beta_l l_{it} + h^{-1}(k_{it}, m_{it}, l_{it}, X_{it-1}) \ + \epsilon_{it} \tag{4}$$

where h^{-1} is proxied by the third degree polynomial of capital, labour and intermediate inputs while also accounting for export status and interactions of export status with capital, labour and intermediate inputs. In addition to a firm's export status, we allow its export strategies reflected in its export intensity and extent of export diversification to influence productivity. This is done by including the share of exports in turnover, as well as the number of exported products and export destinations in the inverse function $h^{-1}(\cdot)$. Finally, time fixed effects are controlled for.

Following De Loecker (2013) and Ackerberg et al. (2006), we employ the two-step estimation procedure. In the first step, we estimate the extended production function (4) using OLS to eliminate the measurement error. Expected value added ($\hat{q}_{it}$) is then used to obtain the predicted value of unobserved productivity ($\widehat{\omega}_{it}$):

$$\widehat{\omega_{it}} = \widehat{q_{it}} - \widetilde{\beta_0} + \widetilde{\beta_k} k_{it} + \widetilde{\beta_l} l_{it} \tag{5}$$

where $\widetilde{\beta_0}, \widetilde{\beta_k}\ and\ \widetilde{\beta_l}$ are initial values of the production function coefficients.

[8] Labour productivity, computed from the data as value added per employee, is used as an alternative measure in the robustness analysis.

As in De Loecker (2013), we assume that the law of motion for productivity ω_{it} evolves according to an endogenous Markov process in which previous export status and strategies (proxied by the lagged number of exported products Xnr_{it-1}, the number of export destinations $Xdest_{it-1}$ and export intensity $Xintens_{it-1}$) can exert an additional influence on ω_{it}:[9]

$$\omega_{it} = \alpha_0 + \alpha_1\omega_{it-1} + \alpha_2 X_{t-1} + \alpha_3 Xnr_{t-1} + \alpha_4 Xdest_{t-1} + \alpha_5 Xintens_{t-1} + \alpha_6 X_{t-1} * \omega_{it-1} + \alpha_7 Xnr_{t-1} * \omega_{it-1} + \alpha_8 Xdest_{t-1} * \omega_{it-1} + \alpha_9 Xintens_{t-1} * \omega_{it-1} + \xi_{it} \quad (6)$$

We estimate (6) using predicted values of productivity ($\widehat{\omega_{it}}$) and setting moment conditions that estimated productivity innovations $\hat{\xi}_{it}$ are orthogonal to the lagged values of labour and the current levels of capital stock (the latter are predetermined in t–1 and should not be included in the lagged form):

$E[\hat{\xi}_{it}, k_{it}]$=0 and $E[\hat{\xi}_{it}, l_{it-1}]$=0

We iterate the estimation of coefficients of the equation (6) until the moment conditions are satisfied. TFP is then calculated for each firm as residuals given the estimated sector-specific capital and labour input coefficients:

$$TFP_{it} = \tilde{q}_{it} - \hat{\beta}_0 - \hat{\beta}_k k_{it} - \hat{\beta}_l l_{it} \quad (7)$$

where $\hat{\beta}_0$, $\hat{\beta}_k$ and $\hat{\beta}_l$ correspond to the values of production function coefficients satisfying the moment conditions above.

We estimate the production function for each two-digit NACE sector. In case the number of observations in any two-digit sector is not sufficient (less than 500), we use the coefficients estimated for the corresponding aggregated economic sector.[10] All nominal variables are deflated by sector specific deflators.

4 Characteristics of exporters and determinants of GVC participation

4.1 Exporter premia

This section starts by observing whether exporters differ from non-exporters in terms of productivity and other measures of firm performance. In order to identify the exporter premium, we estimate simple regression equations using OLS:

$$\ln Y_{ijt} = \alpha + \beta * X_{ijt} + Z_{ijt} + \eta_j + \mu_t + \varepsilon_{ijt}, \quad (8)$$

where Y_{ijt} is a firm performance indicator, such as productivity, employment and average wage (subscripts indicate specific firm *i* in industry *j* at time *t*), X_{ijt} denotes a dummy variable indicating export status, Z_{ijt} stands for other control factors such as firm size, firm age, or foreign ownership, η_j and μ_t are industry and year dummies, respectively. Exporter premium is captured by the coefficient β. We observe how β differs across various types of exports and different firm indicators.

Table A1 in the Appendix summarises the estimation results of equation (8). Exporter premia are positive and mostly statistically significant at 1% level for both countries. In both Latvia and Estonia, exporters exhibit higher productivity, hire more employees, pay higher wages and use more capital per worker than non-exporters after controlling for firms' age, liquidity and foreign ownership. These exporter premia are more pronounced in Latvia. For instance, exporters in Latvia have in general 53% higher total factor productivity (TFP) and 112% higher labour productivity levels than non-exporters, while in Estonia such

[9] In the robustness section we employ TFP estimated from a simpler, more parsimonious model, where endogenous Markov process only accounts for export status and does not include terms related to export strategies.

[10] We classify 2-digit NACE industries into the following twelve broad macroeconomic sectors: agriculture (NACE 01-03), mining and quarrying (05-10), manufacturing (10-33), energy and water supply (35-39), construction (41-43), wholesale and retail trade (45-47), transportation and storage (49-53), accommodation and food service (55-56), information and communication (58-63), real estate activities (68), professional, scientific and technical activities (69-75, 95), administrative and support service activities (77-82).

advantages are 47% and 76%, respectively.[11] Exporter premia in employment size also appear larger in Latvia than in Estonia.

Furthermore, exporter premia differ substantially across types of exports: exporters of non-transport services have particularly larger premia than other exporters. This is consistent with the observation that knowledge-intensive activities are better remunerated. Interestingly, re-exporters also have significantly larger labour productivity premia than other goods exporters, suggesting that re-exports involve knowledge-intensive activities that generate information rent by intermediating trade between parties with large information asymmetries (Feenstra and Hanson 2004). Alternatively, the larger premia can be due to larger entry costs associated with these types of exports.

4.2 Propensity score matching

Having observed large productivity premia by exporters, we now move to a formal causal analysis on the effects of entry into different types of exports on productivity. An adequate definition of export entry is important for our analysis. While the most general definition of export entrant would be firms that did not export at time *t–1* but do so at time *t*, these firms also include intermittent exporters that stop exporting soon after entry. Such firms may not be able to absorb significant knowledge from foreign markets or global buyers.[12] This paper therefore sets two different definitions of export entry. In the baseline, we employ the most general definition of export entrants. However, as a robustness analysis, we define export entrants as firms that did not export in both *t–2* and *t–1* and start to export in period *t* and continue exporting in period *t+1*. We call such firms *persistent* entrants. The numbers of entrants and persistent entrants by each year in the dataset are provided in Table A2 in Appendix.

The causal effect of export entry should be inferred by observing whether firms that started exporting experience larger gains in productivity level compared to a hypothetical case, where these firms did not start exporting. Since such a counterfactual is not available, we proxy it with the change in productivity of non-exporting firms. In order to address the self-selection of firms with originally superior performance (including higher productivity levels) into exporting, we employ the Propensity Score Matching (PSM; Rosenbaum and Rubin 1983) which constructs the sample of non-exporters with very similar ex-ante likelihood of export entry with the actual participants. This approach has been widely employed by previous studies on LBE (Girma et al. 2004; De Loecker 2007).

The first step in this exercise is a Probit estimation of the probability (propensity score) of export entry. The probability for a firm to start exporting is assumed to be a function of its productivity level and other factors that are likely to enable firms to overcome the initial costs of export entry (the vector *Z* on the right hand side). They include firm size, firm age, the liquidity ratio, the return on assets, capital-to-labour ratio, state and foreign ownership – the covariates that were used in earlier studies.

$$Prob(Export\ entry_t) = \Phi(Productivity_{t-1}, Z_{t-1}) \tag{9}$$

The explanatory variables of the Probit model are lagged one period before the export entry to ensure that they are unaffected by the entry itself (i.e. to avoid reverse causality).[13]

The next step is to match each export entrant with non-exporters with the closest propensity score (estimated probability) of export entry. Two nearest neighbours are allocated to each export entrant.[14] Moreover, we ensure that matching occurs within the same year and the same two-digit sector. The standard condition of common support is used when choosing these nearest neighbours. We also test whether the

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[11] The differences between exporters and non-exporters are calculated using estimates of β as 100*($\exp(\beta) - 1$).

[12] Past studies have shown that the share of intermittent export entrants is high. For instance, only 66% of Estonia's new exporters survive until the second year of exporting (Masso and Vahter 2014; ECB CompNet 2014).

[13] One limitation of this standard analysis is that the timing of the decision of entry is unobservable and can in fact occur before the actual year of entry. Another limitation is that this framework cannot capture the export entry by firms that start exporting in the year of their creation. In Latvia, such firms comprise about 15% and in Estonia – 23% of new exporters.

[14] We test the robustness of the estimation results to matching with five nearest non-exporters.

treatment group and the constructed control group share similar levels of productivity and other determinants of export entry prior to the export entry (the balancing property test of propensity score matching).

Table 3 displays the estimation results of the Probit regression for both countries. They give a clear indication of self-selection of more productive firms into export entry, as higher productivity increases the probability of export entry.

Table 3 Probit estimation of the probability of export entry

Variable	Latvia	Estonia
Log(TFP)_{t-1}	0.295***	0.077***
$\text{Log(employment)}_{t-1}$	0.328***	0.365***
$\text{Log(employment)}_{t-1}^2$	-0.024***	-0.031***
Age_{t-1}	-0.024***	-0.030***
Age_{t-1}^2	0.000	0.000
Capital to labour ratio_{t-1}	0.061***	0.083***
Liquidity ratio_{t-1}	-0.174***	0.060
ROA_{t-1}	0.021	0.045*
State ownership dummy_{t-1}	-0.758***	-0.293***
Foreign ownership dummy_{t-1}	0.157***	0.458***
Constant	-2.768***	-3.664***
Number of observations	86857	93914
Log-likelihood	-9742.18	-16253.70
Pseudo R^2	0.171	0.128

Note: *significant at 10%, ** significant at 5%, *** significant at 1%. Source:

The estimated coefficients of the Probit regressions are used to calculate the propensity score of all firms, which is used to create the counterfactual control groups of non-entrants with very close probability of export entry with respect to the actual entrants. The balancing property test of prior differences between the treated (export entrants) and the control group (matched non-entrants) is used to infer the quality of matching. Table A3 reports the results of the balancing property test. All in all, the control group constructed by matching can be regarded as the proper counterfactual for export entrants.

5 The effect of GVC participation

5.1. Baseline results of the difference-in-difference analysis

In order to identify the ex post productivity gains from exporting, the study applies the following difference-in-difference (DiD) regression framework on the sample of exporters and matched non-exporters:

$$Y_{it+l} = \beta_0 + \beta_1 Z_{it-1} + \beta_2 X_{it} + \textstyle\sum_k \beta_{3k} X_{it} * Z_{kit-1} + \sum_m \beta_4 X_{it} * D_{mit} + \varepsilon_{it} \tag{10}$$

where l is the time period after the export entry in time t. We follow the effect of exports entry until the third year of entry (therefore, l takes the value between 0 and 2). Y_{it+l} is a change in TFP in each period against its initial pre-entry level in $t–1$. X_{it} is a dummy variable that denotes export entry in year t. We allow the effects of export entry to be heterogenous across firms by including interactions between the export entry dummy and their initial characteristics Z_{kit-1}, where β_{3k} is a vector of coefficients for each characteristic k. The difference in the effect of export entry across different types of exports is captured by interacting X_{it} with D_{mit}, dummy variable indicating each type of exports. Specifically, D_{mit} is a vector of dummy variables indicating exports of intermediate goods, transport services, non-transport services as well as re-exports. The base category of exporters is therefore the category of final goods exporters. The hypotheses laid out in the section 2 are tested by observing the coefficient β_4, which identifies additional productivity gains associated with each type of exports.

Before estimating the full model described in equation (10), we estimate a simpler DiD regression that does not include the last two interaction terms and thus identifies the general effect of exporting on productivity. The estimation indicates significant LBE in all three periods that follow export entry (see Table

4). The estimated effect is particularly large in the year of export entry, amounting to around 38.0% higher productivity for Latvia (35.0% for Estonia) compared to the control group.[15] The productivity of export entrants as compared to non-exporters is 21.8% (14.0%) higher in t+1 and 18.2% (11.5%) in the third year of export entry (e.g. *t+2*).

Table 4 The effect of export entry on TFP

Variable	Latvia			Estonia		
	t	t+1	t+2	T	t+1	t+2
Exports entry$_{t-1}$ (X_{t-1})	0.325***	0.197***	0.167***	0.298***	0.131***	0.109***
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	6953	6953	6953	12151	12151	12151
R^2	0.434	0.412	0.400	0.362	0.294	0.306

Notes: * significant at 10%, ** significant at 5%, *** significant at 1%. Dependent variables are all in natural logs. Period t+l denotes l years after the year of export entry. The analysis includes only the sample of export entrants and matched non-exporters. Incumbent exporters, that export for the full sample period, are not taken into account. Total factor productivity is estimated using the method developed by De Loecker (2013).

One possible explanation for large productivity gains in the short run is that learning by exporting occurs quickly because export entrants have very low initial knowledge base.[16] An alternative interpretation is that the productivity gains in the period of export entry are driven partly by an increase in capacity utilisation as firms take advantage of larger demand, which dissipates in the medium run as firms adjust their production capacity to larger demand.

We now differentiate the effect of export entry by types of exports and allow the effect to depend on the prior levels of productivity by including two interactive terms. Table 6 summarises the estimation results. The coefficient on the export entry dummy X_{it} now captures productivity gains by exporters of final goods. The evidence of a long lasting learning effect is scarce among Estonian final goods exporters. While they experience a sizable and significant gain in TFP on the year of export entry, such gain dissipates quickly and becomes statistically insignificant in the third year of export entry. In contrast, Latvian final goods exporters enjoy significant productivity gains throughout the period observed.

Table 5 shows that exporters of intermediate goods enjoy stronger and more persistent productivity gains than exporters of final goods in both countries, thereby supporting our first hypothesis (H1). As for the service exporters, the results differ between exporters of transport services and non-transport services. In both countries, exports of non-transport services, that include knowledge-intensive services, result in the largest productivity gains among the types of exports considered, whereas productivity gains from exports of transport services do not statistically differ from those of final goods exporters. The finding on exporters of non-transport services thus also supports H1 as well as our second hypothesis (H2). For Latvia and to a lesser extent for Estonia, re-exports result in significantly larger productivity gains than exports of final or intermediate goods, confirming our third hypothesis (H3). Productivity gains from re-exports are long lasting, implying significant LBE. As the bulk of Latvian and Estonian re-exporters (70% and 46% in the latest available year respectively) are found in the wholesale and retail sectors, our finding is in line with Malchow-Moller et al. (2015) reporting that the productivity growth in Danish private sector is largely driven by exporters in these industries.

Finally, concerning our last hypothesis (H4) on the role of absorptive capacity and technology gap in LBE, Latvian firms with initially lower productivity levels enjoy larger productivity gains from exporting. It is therefore likely that larger technology gaps, that increase the benefits of external knowledge, play a more important role in LBE of Latvian firms than the constraints from lower absorptive capacity. On the other hand, we observe only a weakly significant relation for Estonian firms, which does not unambiguously support H4. However, such vague relation between ex ante productivity levels and ex post productivity gains

[15] For example, for Latvia it is calculated as *exp(0.325)-1*, where 0.325 is the parameter estimate from the DiD regression model.

may be due to the technology gap effect and the constraints from lower absorptive capacity cancelling out each other.

Table 5 The effect of export entry on TFP across different types of exports

Variable	Latvia			Estonia		
	t	t+1	t+2	T	t+1	t+2
Exports entry$_{t-1}$ (X_{t-1})	0.644***	0.300***	0.253***	0.506***	0.195*	0.194
X_{t-1}*Log(TFP$_{t-1}$)	-0.164***	-0.076***	-0.058**	-0.003	0.000	-0.003
X_{t-1}*Exports of intermediate goods$_{t-1}$	-0.003	0.068***	0.065***	0.024	0.038**	0.037*
X_{t-1}*Re-exports$_{t-1}$	0.102***	0.165***	0.127***	0.043**	0.063***	0.042*
X_{t-1}*Exports of transport services$_{t-1}$	0.000	0.085***	0.051	-0.081***	-0.012	-0.018
X_{t-1}*Exports of other services$_{t-1}$	0.225***	0.155**	0.122*	0.140***	0.145***	0.100***
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	6953	6953	6953	12151	12151	12151
R^2	0.448	0.423	0.406	0.384	0.301	0.310

Notes: * significant at 10%, ** significant at 5%, *** significant at 1%. Dependent variables are all in natural logs. Period t+l denotes l years after the year of export entry. The analysis includes only the sample of export entrants and matched non-exporters. Incumbent exporters, that export for the full sample period, are not taken into account. Total factor productivity is estimated using the method developed by De Loecker (2013).

5.2. Robustness of baseline results

In this subsection, we infer the robustness of the baseline results through a couple of exercises. First, we narrow the scope of exporters to persistent export entrants by omitting intermittent exporters (see sub-section 4.2). Second, we use alternative measures of productivity such as labour productivity calculated directly from the dataset as value added per employee and TFP estimated from a more parsimonious specification with endogenous Markov process. Lastly, we match export entrants with five non-exporters with closest propensity score instead of two in the baseline model.

Table A4 in the Appendix compares the productivity gains by the third year of export entry between the baseline and the case when intermittent exporters are excluded. Narrowing the scope of exporters strengthens the overall LBE for both countries (first regression). When looking across different types of exports, the exclusion of intermittent exporters does not alter the core results for Latvia and even increases the productivity gains from exports. However, in case of Estonia, the somewhat weak productivity gains associated with exports of intermediate goods and re-exports are now statistically insignificant, lending less support to hypotheses H1 and H3.

Table A5 summarises the effects of each type of exports on labour productivity. It confirms the baseline findings although the statistical significance of additional productivity gains associated with exports of intermediate goods is weaker. It is noteworthy that initial labour productivity levels contribute negatively to productivity gains of both Estonian and Latvian firms, providing support to the hypothesis H4 in both countries rather than in Latvia alone. This indicates that the technology gap may outweigh limited absorptive capacity also for Estonian firms.

Employing alternative estimation method for TFP and matching exporters with five nearest neighbours produce results that are fairly similar to the baseline[17], particularly for Latvia. The productivity gains associated with exports of intermediate goods and re-exports again turn statistically insignificant for Estonia.

5.3. LBE and positioning in GVCs

In this sub-section, we aim to capture the heterogeneity in learning by exporting across exporters that participate in different segments of GVCs. For that purpose, we use the industry-level indicator of upstreamness and the firm-level share of intermediate inputs (see sub-section 3.2 for the interpretation of

[17] Estimation results are available upon request

these indicators). We are particularly interested in identifying the effect of exporters' positioning in GVCs on LBE generated by their entry to foreign markets.

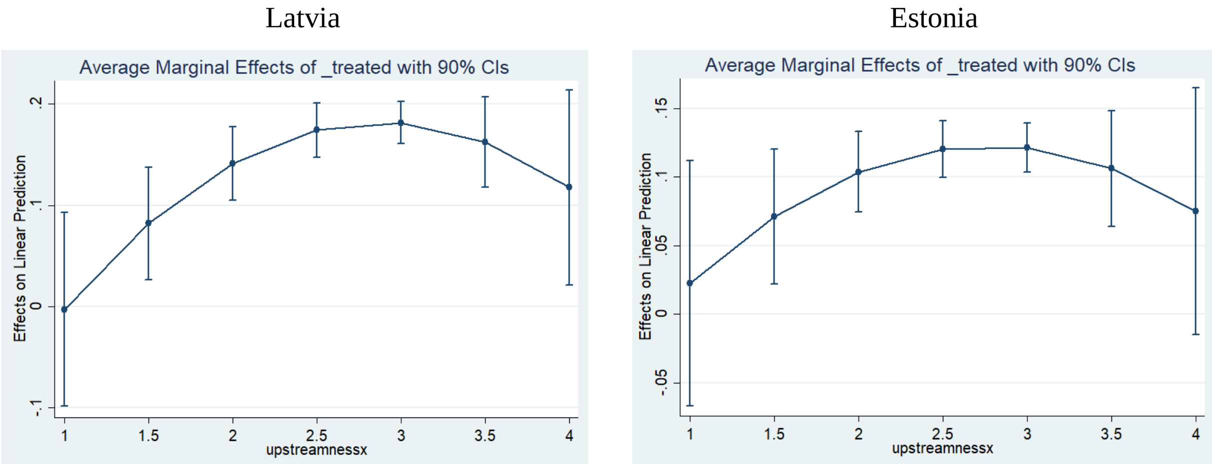
Table 6 reports the results from estimating equation (10) that includes the interaction between export entry dummy X_{it} and the upstreamness index instead of the interaction between X_{it} and D_{mit}. For both countries, the upstreamness of the industry exporters belong to seems to affect significantly the extent of LBE. Furthermore, such an effect is nonlinear: LBE appears to be strongest for exporters from sectors falling within the medium range of the upstreamness index (Figure 1), while it is weaker or even insignificant for exporters from sectors with high or low levels of the upstreamness indicator.

Table 6 The effect of export entry on TFP depending on a position in GVC

Variable	Latvia			Estonia		
	t	t+1	t+2	T	t+1	t+2
Exports entry$_{t-1}$ (X_{t-1})	-0.090	-0.171	-0.118	-0.079	-0.117	-0.076
X_{t-1}*Log(TFP$_{t-1}$)	-0.159***	-0.067***	-0.054*	0.009	0.012	0.005
X_{t-1}*Upstreamness index$_{t-1}$	0.547***	0.387***	0.300**	0.418***	0.204**	0.177
X_{t-1}*Upstreamness index$_{t-1}^2$	-0.098***	-0.070***	-0.052**	-0.079***	-0.038*	-0.032
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	6953	6953	6953	11208	11208	11208
R^2	0.449	0.416	0.402	0.381	0.306	0.320

Notes: * significant at 10%, ** significant at 5%, *** significant at 1%. Dependent variables are all in natural logs. Period t+l denotes l years after the year of export entry. The analysis includes only the sample of export entrants and matched non-exporters. Incumbent exporters, that export for the full sample period, are not taken into account. Total factor productivity is estimated using the method developed by De Loecker (2013).

Figure 1 The non-linear effect of the upstreamness index on LBE in *t+2*



Note: The figure shows the marginal effect of exports entry at different values of the upstreamness index and is based on the coefficients reported in Table 7.

For example, Latvian exporters from sectors with high levels of the upstreamness index such as metal production industry (upstreamness index 3.44 in 2014) or low levels such as manufacture of coke and refined petroleum products (1.90) have smaller productivity gains compared to exporters from sectors with medium levels of the upstreamness index, like manufacture of electrical equipment (2.58) or wholesale trade (2.97). In particular, exporters from far upstream industries like warehousing and support activities for transportation (upstreamness index of 4.20) or far downstream industries (manufacture of food, drinks and tobacco products, 1.42) do not seem to enjoy LBE as their productivity gains are statistically insignificant. The inverted U-shape pattern of LBE depicted in the Figure 1 seems at odd with GVC literature or related empirical studies that document concentration of value added in the upstream and far downstream segments of GVCs (see section 2).

Table 7 reports the results of estimating equation (10) that includes the interaction between export entry dummy and the intensity of intermediate input use, instead of the interaction between X_{it} and D_{mit}. The results imply that LBE is stronger for firms with lower intensity in the use of intermediate inputs. The effect of intermediate inputs use is non-linear, especially for Estonian firms (Figure 2). While this seems to indicate stronger LBE particularly in upstream segments of GVCs, we also find that Latvian exporters using foreign inputs more intensively reap larger productivity gains whereas the intensity of foreign input use does not have a significant effect on the extent of LBE by Estonian firms. Overall, these findings do not point to a clear relationship between the positioning of firms within GVCs and the strength of LBE.

Table 7 The effect of export entry on TFP depending on intensity of use of intermediate input

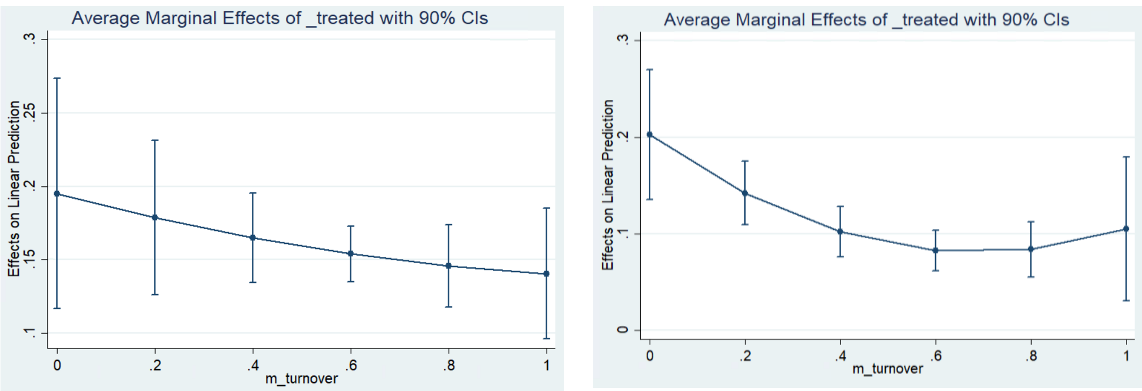
Variable	Latvia			Estonia		
	t	t+1	t+2	t	t+1	t+2
Exports entry$_{t-1}$ (X_{t-1})	0.975***	0.474***	0.323***	0.685***	0.284**	0.250*
X_{t-1}*Log(TFP$_{t-1}$)	-0.153***	-0.068***	-0.052*	0.014	0.010	0.006
X_{t-1}*Intermediate input intensity$_{t-1}$	-0.570***	-0.218***	-0.090	-1.045***	-0.477***	-0.353**
X_{t-1}*Intermediate input intensity$_{t-1}^2$	0.065***	0.010	0.035**	0.812***	0.361**	0.256
X_{t-1}*Foreign input intensity$_{t-1}$	0.043	0.095***	0.109***	0.009	0.018	0.000
X_{t-1}*Foreign input intensity$_{t-1}^2$	-0.003**	-0.009***	-0.010***	0.002	-0.001	0.000
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	6931	6931	6931	12138	12138	12138
R^2	0.469	0.426	0.410	0.389	0.303	0.311

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%. Dependent variables are all in natural logs. Period t+l denotes l years after the year of export entry. The analysis includes only the sample of export entrants and matched non-exporters. Incumbent exporters, that export for the full sample period, are not taken into account. Total factor productivity is estimated using the method developed by De Loecker (2013).

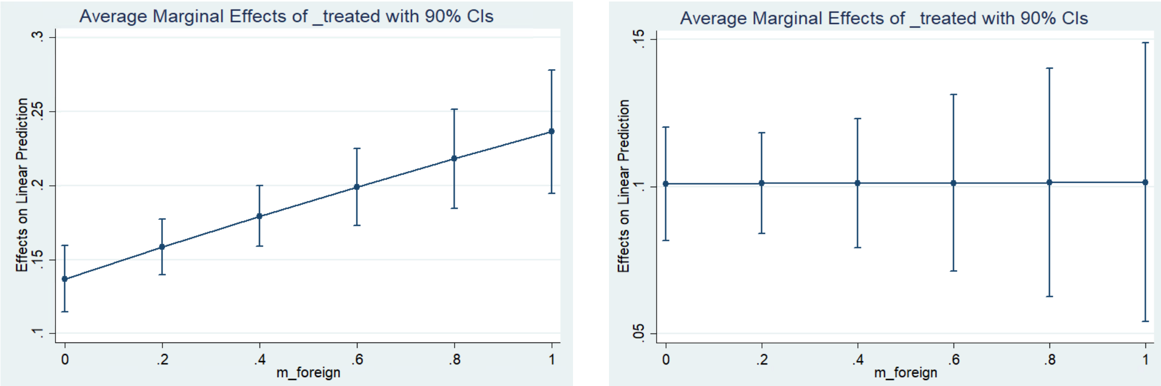
Figure 2 The non-linear effect of the intermediate input share on LBE in *t+2*

Latvia Estonia

Panel A



Panel B



Note: The figure shows the marginal effect of exports entry at different values of the intermediate input share (panel A) and foreign input intensity (panel B) and is based on the coefficients reported in Table 7.

6 Discussion and conclusions

This study explores whether positive effects of export entry on productivity, often referred to as "learning by exporting" (LBE), depend on the types of exports that are associated with different kinds of participation in global value chains (GVCs).

After controlling for the self-selection of more productive firms into exporting, we find that while exporting in general boosts TFP of Estonian and Latvian firms by 35% and 38%, some types of exports are associated with significantly larger productivity gains than the others. For instance, exports of knowledge-intensive services result in significantly larger productivity gains than exports of final goods. Similarly, exports of intermediate goods and re-exports result in stronger LBE for Latvian firms, while such evidence is somewhat weaker for Estonian firms.

Our findings suggest that LBE in GVCs is defined by the extent of interactions with global buyers. Interactions with foreign customers constitute an essential element of exports of knowledge-intensive services or trade intermediation services such as re-exports. Although the literature on "learning by supplying" (Alcacer and Oxley 2014) suggests that exports of intermediate goods involve closer buyer-seller interactions, we only found somewhat fragile evidence of stronger LBE. However, exports of intermediate goods would involve limited knowledge transfer from MNEs if exporters have relatively high capabilities and/or the exported intermediate goods are well standardised or modularised (Gereffi et al. 2005). This can be the case for exports of wood products, which comprise important shares in both Latvia's and Estonia's exports.

While it is often considered that activities generating high value added are concentrated in upstream and far downstream segments of GVCs (Baldwin 2012; Ye et al. 2015), we find that firms from industries located in upstream or far downstream segments of GVCs do not enjoy stronger LBE compared to those from industries positioned at the middle of value chain. One possible interpretation of this result is that the position of an industry in GVCs is a poor predictor of the value added generated within GVCs: exporting goods or services belonging to upstream or far downstream industries does not guarantee that the economy is specialised in knowledge-intensive activities that generate high value added within GVCs. Furthermore, policy makers should not label business activities in downstream industries as low value added, if they are yielding high profits.

We also find that firms with initially lower productivity levels enjoy larger productivity gains from exporting. This suggests that the room for technology catch-up is a more important determinant of LBE than the extent of absorptive capacity. This provides a case for targeting policy measures promoting exports and GVC participation to firms with larger room to boost productivity from GVC participation. Policy makers should at least ensure that such support measures do not impose large administrative burdens to applicants, which act as entry costs that effectively exclude small and less productive firms (Benkovskis et al. 2018).

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Appendix

Detailed data description

Latvian data

Data on financial statements was obtained from firms' indicators comprehensive database of the Central Statistical Bureau (CSB) of Latvia, which is based on information from the State Revenue Service. It contains Latvian firms' balance sheet data, data from profit and loss statements including turnover, the number of persons employed, compensation of employees and value added. It also includes information on the sector of activity according to the two-digit NACE 2 classification. The dataset is complemented by firms' foreign assets and liabilities dataset of the Bank of Latvia, which allows identifying the foreign capital share of companies as well as the countries of origin of capital owners.

The dataset is matched with the goods trade database of the CSB which includes information on merchandise flows (exports and imports), where merchandises are classified according to the eight-digit Combined Nomenclature (CN8) classification, the partner country, statistical value of transaction (in f.o.b. prices for exports and c.i.f. prices for imports), net weight of traded goods in kilograms, as well as product volume in supplementary measures (if available), and time period of the trade flow (year and month). It is matched with the Services trade database of the Bank of Latvia, which provides information on all types of services apart from travel, construction, insurance and government services for which detailed firm-level information is not collected. Unlike the goods trade database, the service trade database does not include information on the partner country. The matched data are available for the period 2006–2014.[18]

Estonian data

Data on financial statements come from the Estonian Business Registry, which includes information on balance sheets, profit and loss statements, cash flow statements and general information such as five-digit industry classification codes, ownership, number of employees, turnover by industries. It is complemented by Statistical Profile of Enterprises by Statistics Estonia which provides information about foreign ownership, numbers of employees, turnover, legal form etc. This is matched with the International goods trade dataset by Statistics Estonia based on the customs statistics. The Business Registry dataset is also matched with the Services trade dataset by the Bank of Estonia which includes exports and imports of various types of services. The dataset includes information on the destination country. All datasets are available for the period 1995-2014 except the services trade dataset which is only available for the period 2005-2012 and 2014.

For both countries we eliminate outlying observations following Lopez-Garzia et al. (2015), who apply a multi-step exclusion procedure based on the values of various ratios (capital, turnover, labour costs, intermediate inputs and value added to labour or capital) and their numerator and the denominator.[19]

[18] The matched data are anonymous (i.e. individual firms cannot be identified).

[19] First, the given ratio is replaced by a missing in case of an abnormal growth – more than two interquartile ranges above or below the median growth in a respective sector and year. Moreover, the procedure identifies the source of the extreme growth (numerator or denominator) and replaces it with a missing. Second, the variable is replaced with a missing if it's ratio with respect labour or capital falls into top 1 and 99 percentile of the distribution for the respective ratio.

Tables

Table A1 Exporters' premia

Type of exports	Latvia: Log total factor productivity (1)	Latvia: Log labour productivity	Latvia: Log wage	Latvia: Log employment	Latvia: Capital labour ratio	Estonia: Log total factor productivity (1)	Estonia: Log labour productivity	Estonia: Log wage	Estonia: Log employment	Estonia: Capital labour ratio
All exporters (goods and services)	0.428***	0.750***	0.574***	1.299***	0.694***	0.382***	0.563***	0.443***	0.914***	0.414***
Goods exporters	0.430***	0.717***	0.541***	1.222***	0.713***	0.334***	0.522***	0.400***	0.913***	0.492***
Exporters of intermediate inputs	0.422***	0.642***	0.512***	1.177***	0.623***	0.243***	0.466***	0.372***	0.898***	0.464***
Exporters of final goods	0.391***	0.612***	0.434***	1.091***	0.649***	0.201***	0.390***	0.313***	0.855***	0.257***
Re-exporters	0.440***	0.840***	0.714***	1.425***	0.768***	0.359***	0.634***	0.512***	1.091***	0.544***
Service exporters	0.343***	0.835***	0.711***	1.693***	0.518***	0.420***	0.577***	0.492***	0.886***	0.209***
Transport service exporters	0.262***	0.692***	0.478***	1.614***	0.839***	0.183***	0.403***	0.285***	0.819***	0.455***
Non-transport service exporters	0.456***	1.010***	1.078***	1.764***	0.036	0.454***	0.591***	0.529***	0.867***	0.145***

Note: *** - significant at 1%, ** - significant at 5%, * - significant at 1 %. Table reports the coefficients from OLS regressions of log values of firm characteristics on export status. All regressions include firm age, foreign ownership dummy, capital region dummy as well as 2-digit NACE sector and year dummies. (1) Estimated using the method of De Loecker (2013).

Table A2 The number of exporters, export entrants and persistent entrants in Latvia and Estonia

Year	Latvia: Number of exporters	Latvia: Number of entrants	Latvia: Number of persistent entrants	Estonia: Number of exporters	Estonia: Number of entrants	Estonia: Number of persistent entrants
2006	3146	N/A	N/A	4654	2158	370
2007	3291	746	N/A	6711	3962	1875
2008	3448	813	345	8645	4076	1384
2009	3957	1214	551	9017	3804	853
2010	4267	1235	532	8767	3567	741
2011	4553	1101	401	8889	3151	1176
2012	4556	921	302	9038	2887	948
2013	4666	1012	314	9512	3108	903
2014	4642	1015	332	10246	3803	1288
2015	4657	990	605			

Note: export entrants are firms that did not export at time t–1 but do so at time t. These firms also include intermittent exporters that stop exporting soon after entry. Persistent entrants are firms that did not export in both t–2 and t–1 and start to export in period t and continue exporting in period t+1.

Table A3 Results of the balancing property test (p-values for t-test on differences in main determinants of export entry after matching)

Variable	Latvia	Estonia
Log(TFP)$_{t-1}$	0.740	0.117
Log(employment)$_{t-1}$	0.501	0.143
Log(employment)$_{t-1}^2$	0.435	0.886
Age$_{t-1}$	0.784	0.000
Age$_{t-1}^2$	0.732	0.001
Capital to labour ratio$_{t-1}$	0.652	0.856
Liquidity ratio$_{t-1}$	0.681	0.929
ROA$_{t-1}$	0.388	0.478
State ownership dummy$_{t-1}$	0.130	0.621
Foreign ownership dummy$_{t-1}$	0.505	0.055

Table A4 The effect of export entry on TFP in *t+2* when excluding intermittent exporters

Variable	Latvia		Estonia	
	All types of entry	Persistent entry	All types of entry	Persistent entry
1st regression				
Exports entry$_{t-1}$ (X_{t-1})	0.167***	0.251***	0.109***	0.194***
Control variables	Yes	Yes	Yes	Yes
Number of observations	6953	3191	12151	5098
R^2	0.400	0.394	0.306	0.384
2nd regression				
Exports entry$_{t-1}$ (X)	0.253***	0.388***	0.194	0.197
X_{t-1}*Log(TFP)$_{t-1}$	-0.058**	-0.076**	-0.003	0.020
X_{t-1}*Exports of intermediate products$_{t-1}$	0.065***	0.063*	0.037*	0.013
X_{t-1}*Re-exports$_{t-1}$	0.127***	0.135***	0.042*	0.027
X_{t-1}*Exports of transport services$_{t-1}$	0.051	0.016	-0.018	-0.052
X_{t-1}*Exports of other services$_{t-1}$	0.122*	0.290***	0.100***	0.091***
Control variables	Yes	Yes	Yes	Yes
Number of observations	6953	3191	12151	5098
R^2	0.406	0.404	0.310	0.393

Notes: * significant at 10%, ** significant at 5%, *** significant at 1%. Dependent variables are all in natural logs. Period t+l denotes l years after the year of export entry. The analysis includes only the sample of export entrants and matched non-exporters. Incumbent exporters, that export for the full sample period, are not taken into account. Total factor productivity is estimated using the method developed by De Loecker (2013).

Table A5 The effect of export entry on *labour productivity* across different types of exports

Variable	Latvia			Estonia		
	t	t+1	t+2	t	t+1	t+2
1st regression						
Exports entry$_{t-1}$ (X_{t-1})	0.162***	0.117***	0.120***	0.143***	0.121***	0.130***
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	6982	6982	6982	12088	12088	12088
R^2	0.211	0.165	0.147	0.241	0.285	0.284
2nd regression						
Exports entry$_{t-1}$ (X_{t-1})	0.465***	0.250***	0.172*	0.999***	1.010***	0.949***
X_{t-1}*Log(labour productivity)$_{t-1}$	-0.112***	-0.088***	-0.058**	-0.081***	-0.090***	-0.080***
X_{t-1}*Exports of intermediate products$_{t-1}$	0.000	0.077*	0.051	0.032*	-0.006	-0.031
X_{t-1}*Re-exports$_{t-1}$	0.093**	0.216***	0.182***	0.075***	0.102***	0.083***
X_{t-1}*Exports of transport services$_{t-1}$	-0.052	0.184*	0.277***	0.075**	0.096***	0.087**

X_{t-1}*Exports of other services$_{t-1}$	0.222**	0.384***	0.331***	0.145***	0.120***	0.109***
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	6982	6982	6982	12088	12088	12088
R^2	0.289	0.323	0.306	0.251	0.291	0.289

Notes: * significant at 10%, ** significant at 5%, *** significant at 1%. Dependent variables are all in natural logs. Period t+l denotes l years after the year of export entry. The analysis includes only the sample of export entrants and matched non-exporters. Incumbent exporters, that export for the full sample period, are not taken into account. Total factor productivity is estimated using the method developed by De Loecker (2013).