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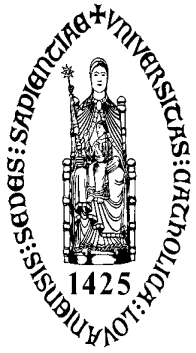

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Pass-on Trade: Why do Firms Simultaneously engage in Two-Way Trade in the Same Varieties?[1]

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Abstract

This paper documents that a large fraction of trade flows at the firm level consists of simultaneous imports and exports in identical products, narrowly defined at the 8-digit product classification, which we call *Pass-On Trade, POT*. We use data on imports and exports at the firm–product level for Slovenian manufacturing firms in the period 1994-2008, to show that, on average, 70 percent of all exporting firms engage in POT. This corresponds to more than 50 percent of all exported products. Thus, imported products that are exported again by the same firm is a statistical regularity of trade of Slovenian manufacturing firms. We document that the use of POT is increasing in firm size, product diversification, multinational status as well as firm productivity and profitability. We offer and explore empirically a number of explanations for POT. Among possible explanations, we find evidence on the importance of firms' multinational networks and demand complementarities between firms' own and POT products. The latter confirms the theoretical explanations for 'Carry-Along Trade' (CAT) as developed by the recent work of Bernard et al (2010, 2012).

JEL: R10, R15

Key words: pass-on trade, multi-product firms, two-way trade

[1] The paper has benefitted from discussion with participants of the ISGEP 2011 workshop (University of Lüneburg), seminars at the University of Ljubljana and UC Louvain, as well as the EBR 2011 Conference (University of Ljubljana) and EITI 2012 Conference (Keio University, Tokyo). We are grateful to the Slovenian Statistical Office for allowing us to access and analyze confidential data on international trade transactions.
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1. Introduction

Back in 1957, at a conference on 'economic consequences of size of nations', a Dutch economist P.J. Verdoorn (published in a conference compendium in 1960) presented path-breaking empirical evidence on the "Intra-block Trade of Benelux" countries. The evidence demonstrated that the Benelux countries engage in simultaneous two-way trade in similar products. This evidence was in sharp contrast to the predictions of the standard Heckscher–Ohlin (HO) model. In particular, it predicts that countries differing in relative factor abundance will specialize in goods produced more intensively in countries' relatively abundant factor, thus leading to one-way trade specialization in homogeneous goods.

Verdoorn's findings ignited a landslide of empirical research studying the extent and determinants of intra-industry trade of differentiated goods. In 1975, the Grubel and Lloyd monograph provided the definitive evidence showing intra-industry trade as a key empirical regularity of trade between developed countries, which was shown to be as high as 70 percent of bilateral trade among some country pairs. However, it lasted more than two decades after the initial work of Verdoorn to come up with theoretical foundations for this regularity, based on a monopolistic competition framework, developed initially by Krugman (1979, 1980). Although firms in the Krugman model are homogenous in terms of size and productivity, the model shows that it is optimal for them to differentiate and specialize in producing one variety. Consequently, countries with similar incomes per capita are shown to engage in trade of differentiated, but not identical varieties.[5] The more recent trade models additionally exploit the role of heterogeneous firms, which reduces the scope for producing and trading identical varieties even further (Melitz, 2003; Bernard, Redding and Schott, 2011).

But recent evidence by Bernard, Blanchard, Van Beveren and Vandenbussche (2010, 2012) using linked production and export data at the firm-product level indicates that there exist additional regularities in trade, which cannot easily be reconciled with existing multi-product models of trade. In particular, they document that three quarters of the exported products and thirty percent of export value of Belgian manufacturers are in goods that are not produced by the firm. This is called Carry-Along Trade (CAT). Furthermore, they find that the shares of CAT products and CAT exports are strongly increasing in firm

[5] Later, it was shown that under special circumstances, such as reciprocal dumping, cross-border and seasonal trade, countries can also engage in two-way trade in identical commodities (Brander, 1981, Greenaway and Milner, 1983; Balassa, 1986).

productivity and hence these products are concentrated in the largest and most productive firms.

This paper documents a related phenomenon. In particular, using detailed transaction-level data for Slovenian manufacturing, we document that a large fraction of firm-level exports occurs in the same 8-digit Combined Nomenclature (CN) product category that a firm has imported in the same or in the previous year. Thus manufacturing firms seem to engage in simultaneous two-way trade in the same varieties, where firms *pass-on* previously imported varieties to exports. We will call this *Pass-on Trade* (POT), which can be seen as a sub-set of CAT.[6]

We document that, on average, over the 1995 – 2008 period, almost 70 per cent of all exporting firms engage to some extent in POT. Almost 40 per cent of all exported products of an average exporter consist of POT products, whereby the intensive margin of POT products is lower than in exports of firms' own products. Overly, by 2008 the value of POT exports is close to 13 per cent of the aggregate value of manufacturing exports. This indicates that POT is a prevailing regularity of trade of Slovenian manufacturing firms. We document that the extent of POT is increasing in firm size, product diversification, multinational status as well as firm productivity and profitability.

There could be various potential explanations for these new facts characterizing trade. The first is related to simple price arbitrage between different markets, with firms acting as trade intermediaries in line with Akerman (2010) and maximizing the profits from price differences within the same product category across markets. Second, a firm may serve as an intermediary within the multinational firms' networks. Bernard, Blanchard, Van Beveren and Vandenbussche (2012) offer additional explanations for CAT, which may be also relevant for pass-on trade. The first one relates to firm's efficiency of distribution networks allowing for selling a wider range of sourced products through an own distribution network. And the second one refers to the complementarities in the demand scope allowing a firm to offer additional sourced products that are complementary to firm's own products.

Confronting these possible explanations with the data points towards three plausible explanations of why do firms engage in POT. These are: (i) firms

[6] Since we have no information on domestic production, we cannot compute the extent of CAT. But it is likely that POT is closely related to CAT as documented by Bernard et al. (2010, 2012). As shown later in this paper, CAT may account for total local and international sourcing of products, while POT entails only internationally sourced products that have been passed-on to exports.

engage in serving as an intermediary within the multinational firms' networks, (ii) firms engage in price arbitrage of ready-made products, which are sourced internationally, across a wide range of markets they serve with their own products, and (iii) firms engage in placing imported products, which are sourced as proprietary products. All of these firms' strategies of engaging in POT, however, require both high firm efficiency in placing the products (efficient distribution network) and a complementarity in firm demand scope. Our empirical work finds robust evidence on the importance of firms' multinational networks and demand complementarities between firms' own and POT products in firms' decision to introduce and expand the number of POT products to any market.

The remainder of the paper is outlined as follows. Next Section describes the data set. Section 3 provides major stylized facts about POT by investigating the extensive and intensive margins of POT exporters as well as the productivity and profit premia of POT exporters. Section 4 empirically accounts for main determinants of POT and provides a number of empirical tests of firm efficiency in placing own and sourced products and the role of complementarity in demand. The last Section concludes.

2. Data and descriptive statistics

2.1. Data

We use data from three sources covering Slovenian manufacturing firms and their trade for the period 1994-2008. The first data set is the firm–transaction–level trade data provided by the Slovenian Customs Administration (CARS) and the Slovenian Statistical Office (SORS), which records all foreign trade transactions of firms that are engaged in international trade in products.[7] These

[7] Note that for the period 1994-2003 trade data is available for all firms engaged in international trade based on their customs declarations reported monthly to the CARS. After accession to the EU, as of May 1st 2004, trade data for *intra-EU* trade (*Intrastat*) are collected by the SORS directly from firms on statistical forms. Firms liable to report for Intrastat in a given reporting year are those, whose trade flows with EU Member States exceeded the exemption threshold in the preceding year for one or both flows of goods (flow of goods is total dispatches or total arrivals). The exemption threshold is set at a level that ensures that the value of at least 97% of the total dispatches and at least 95% of the total arrivals of Slovenia is covered. In a given reporting year also firms that have exceeded the exemption threshold during the year are included. Firms report only for the flow of goods for which the threshold was exceeded. In practical terms, for the period 2004 and 2005 this threshold was a value of transaction close to 100,000 EUR. In recent years this threshold is a bit higher, but not exceeding 200,000 EUR. For

transactions are reported at the 8-digit product-level defined according to the EU Combined Nomenclature (CN), which distinguishes between 10,108 8-digit product codes in 1994, 10,404 product codes in 2003, and 9,699 codes in 2008. CN product codes have been subject to revisions over the period, with major changes of product lines in 1996, 2002 and 2007. These changes are mostly at the last 2– or 3–digits, with either one-to-one code changes (old code abandoned and a new one established), code mergers (old codes merged to a single new or existing one) or code splitting (old code split into two or more new codes). In order to eliminate spurious product churning we account for these CN changes by applying year-to-year corrections in the code throughout the period.[8]

From the original trade dataset, we extract the following information for each shipment: the value of imported and exported products in EUR currency, the physical quantity in units of output (units or kilograms), the corresponding CN code as well as origin– and destination–country codes. The transaction-level import and export volumes and quantities are then aggregated to create an annual firm–product–market trade dataset that is matched with annual data on firm characteristics.

The second source of data is the Agency of the Republic Slovenia for Public Records and Related Services (AJPES), which covers the balance sheet and income statements of all Slovenian incorporated firms (all limited liability companies and joint stock companies) as well as large sole proprietors with at least 30 employees. This data set includes complete financial and operational information for all firms. In particular, the accounting data contains information on the total domestic and foreign sales, costs of intermediate goods, materials and services, the physical capital, the total value of assets, the number of employees, and the NACE 5-digit industry code.

The third dataset is provided by the Bank of Slovenia (BS) information on inward and outward capital investments of Slovenian firms with non-residents. Specifically, this data is based on compulsory reports of capital investments between residents and non-residents. The data on capital cross-border investments are obtained from reports on credit transactions with the rest of the

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extra-EU trade, the international trade data collection remains as before with the CARS for each single trade transaction
(http://www.stat.si/doc/metod_pojasnila/24-017-ME.htm).

[8] See Appendix for a detailed description of the applied CN year-to-year corrections. As shown in Table A1 in Appendix, periodic changes in the CN code and corrections of the codes do not have a substantial impact on the average number of exported products and hence do not affect significantly the product churning rates.

world and reports of short-term claims and liabilities arising from business with non-residents. This information enables us to construct variables on engagement of Slovenian firms in inward and outward foreign direct investment (FDI) using the common definition of the IMF's Balance of Payments Manual (5th edition, 1993).

The data from all three sources were matched using a common firm identifier, i.e. firm registration number. We restrict our attention to manufacturing firms and exclude all firms with zero employees and zero output. Thus, our sample of firms ranges between 3,295 firms in 1994 and 4,446 firms in 2008.

2.2. Margins of trade of multi-product firms

Slovenian manufacturing firms are highly engaged in international trade. Table 1 shows that in 2008 about 75 and 83 percent of manufacturing firms have been engaged in exporting or importing at least one product, respectively. In addition, about 83 percent of exporting firms and 85 percent of importing firms are multi-product traders, accounting for 99.4 percent of total exports and 99.8 percent of all imports.[9] Summary statistics also suggest that both exports and imports are highly concentrated in a few large firms. The top 12 percent of exporters that export more than 50 varieties account for 74 percent of total exports. Similarly, the top 20 percent of all firms that import more than 50 different products account for 83 percent of total imports. This suggests that there is a small 'club' of exporters and importers that account for the vast majority of total trade. This is in line, at least for the export part, with findings by Mayer, Melitz and Ottaviano (2010) for French exporters. The data for Slovenia, however, show that when matching exporters with importers (not shown in the tables) both groups of traders almost perfectly overlap. In fact, 58 percent of all manufacturing firms engaged in international trade are both exporters and importers. These two-way traders account for 91 and 93 percent of total employment and value added, respectively, and for 98 and 99 percent of total exports and imports, respectively.[10]

[9] Note that the export numbers are somewhat higher than those reported for other countries. Bernard, Redding and Schott (2010) report for the US that 58 percent of exporters are multi-product and account for more than 99 percent of exports. For Belgium, 65 percent of all exporters are multi-product and account for more than 98 percent of exports (Bernard, Van Beveren and Vandenbussche, 2010).

[10] At the same time, importers and exporters dominate in every respect the whole manufacturing sector as our sample consists of all manufacturing firms with non-zero employment.

[*Table 1 and 2 about here*]

Recent models of multi-product firms typically predict that larger and higher productivity firms have higher volumes of exports due to higher numbers of export products and foreign markets served (e.g. Eckel and Neary, 2010; Mayer, Melitz and Ottaviano, 2010; Bernard, Redding and Schott, 2010; Di Comite, Vandenbussche and Thisse, 2012). Table 2 shows that these predictions about extensive margins hold both for exporters and importers. The average number of export destinations/import source countries per firm is about 7. There is a lot of heterogeneity between firms. Firms that export just one product typically ship it to only one market and similarly firms that import just one product only source it from one market. On the other side, large firms with more than 50 export products ship exports on average to 37 destinations, while similarly diversified importers source their imported products on average from 20 countries.

Table 2 also shows a similar pattern of exporters and importers in terms of the intensive margin of trade (average shipment per product-country), which appears to vary non-monotonically as the number of traded products increases. More diversified firms ship smaller values of exports and imports per product-market, whereby the intensive margin of exports exceed the one for imports by some 40 percent. This suggests lower fixed costs of importing than exporting.[11]

2.3. Product dynamics

In Table 3, we present the statistics on the number of traded products and its dynamics. We present the data as an average over the whole period 1995-2008 and disaggregated by firm size classes. The data shows that imports are by far more diversified in terms of the total number of goods traded than exports. An average firm imports 44 products per year, while an exporter ships on average 14 products a year. Larger firms are of course more diversified, whereby a trading firm with more than 250 employees annually exports 185 products and imports 278 products.

[*Table 3 about here*]

More interesting, though, is the evidence on dynamics in the number of traded goods. Table 3 demonstrates that manufacturing firms engaged in trade seem to simultaneously add and drop both exported and imported products.

[11] In a companion paper, Damijan, Konings and Polanec (2012) document these facts in more detail.

Every year, an average exporter adds 7.9 new products and drops 7.5 products. That is, on average an exporter every year adds about 57 percent of new products to its existing export set and simultaneously drops about 54 percent of existing products. This is an enormous churning process that seems to be going on in exports. But apparently this holds also for imports, where these numbers are double. On average each importer adds every year 15 new products and drops almost 16 products. In relative terms, however, product churning is lower in imports than in imports as each importer every year replaces 'only' one third of its imported product set. Interestingly, though, while in exports churning of products in smaller firms is more intense (i.e. up to two thirds of products being replaced every year by firms with less than 10 employees), in imports churning is most intense with the largest firms. But essentially, the most diversified (mid-size and large) firms seem to replace every year one half of their products traded.

3. Stylized facts on Pass-on trade

Descriptive statistics presented thus far indicate that firms engage in large simultaneous adding and dropping of products in international trade. This is in stark contrast to predictions of recent models with heterogeneous firms and fixed cost of trade. This evidence on product churning in trade is, however, consistent with existing evidence. Bernard et al. (2010) document that a majority of U.S. firms alter at least one five-digit SIC product every five years. Most recently added products and lowest-volume products are more likely to be dropped, confirming a positive correlation between product adding and dropping rates. Iacovone and Javorcik (2010) document churning in exports of Mexican firms, but relate this to trade policies, i.e. to NAFTA agreement between US and Mexico. Similarly, Goldberg, Khandelwal, Pavcnik and Topalova (2010) document product innovation and expansion of export set of Indian firms following trade liberalization in India. Damijan, Konings and Polanec (2012) also document export churning in Slovenia and relate it to globalization enabling firms to source intermediate goods abroad and using them to innovate products and to expand their export scope. However, they also show that gross churning rates of imported and exported products by Slovenian manufacturing firms are much bigger than one would normally expect and also much more intense than documented for other countries.[12] Furthermore, they indicate that simultaneous engagement of firms in extensive adding and dropping of traded goods addresses

[12] Iacovone and Javorcik (2010) document gross churning rates of 30 per cent for Mexican exported products, while these figures in Slovenia are doubled.

only part of the usual firms' product dynamics aiming to optimize both their imported input mix and their exported product set towards their most valuable inputs and produced (exported) products, respectively. They hint to the point that the explanation behind the large churning figures for Slovenian firms seem to be that they, surprisingly, engage in simultaneous adding and dropping of traded products within the same CN-8 categories. In the next Section we study this issue in more detail.

In this Section we provide some stylized facts about simultaneous trading and churning (adding and dropping) of traded products within the same CN-8 varieties, which we call *pass-on trade*. We start with the definition and then study the extent and various dimensions of it.

3.1. Definition of Pass-on trade

Firm's total exports of each product can consist of firm's in-house production, its domestic sourcing or its international sourcing. In this paper we study the extent of simultaneous two-way trade in the same products at the firm level; i.e. we account for the fraction of products within the same product code that have been passed-on from imports to exports. We call these trade flows *Pass-On Trade* (POT). This means that we focus solely on potential international sourcing of products and abstract from potential domestic sourcing. The extent of potential *pass-on trade* (POT) is depicted in Figure 1. Bernard et al. (2010, 2012) find a similar pattern that Belgian firms export products, which they don't produce. However, they match firms' export data and firms' production data (at PRODCOM classification). They label the identified exports of goods not being produced by the same firms as *carry-along trade* (CAT). It is clear that CAT as defined by Bernard et al. (2010, 2012) is a broader concept as it consists of all exports of the good that are not produced in-house, and hence involves potentially both domestic and international sourcing.

[*Figure 1 about here*]

In order to account empirically for the extent of firms' simultaneous imports and exports in the same products, we match firm-level data on exported and imported products defined at the most disaggregated product level (CN-8 product code) and further disaggregated by source and destination countries. We do so for the whole period 1994–2008. This enables us to track exactly the pattern of imports and exports of goods within the same CN-8 category over time and over source and destination countries. Out of these expanded trade data (with about

10 million firm–product–market–trade-type observations), we then identify products that are simultaneously imported and exported at the firm level.

The definition of POT is given in (1). A firm can import POT products either in the current or in the previous years and export them in the current year. A plausible assumption is that the clearing period is two years,[13] i.e. a POT product is defined as any currently exported CN-8 product *c* that a firm *i* has imported in the same or in the previous year (in year *t* or *t-1*) from any of the source countries:

$$POT_{it}^{c}=1 \quad if \begin{cases} m_{it}^{c}>0 \quad or \quad m_{it-1}^{c}>0 \\ x_{it}^{c}>0 \end{cases}, \quad c=CN-8 \tag{1}$$

Thus, POT products are firm's CN-8 category products imported in year *t* or *t-1* that the firm subsequently passed-on further to exports in year *t*.

In value terms, we put a restriction on the export value of POT products. As we focus solely on potential international sourcing of products, we constrain the maximum value of exports of each POT product to the value of its imports. In more detail, we define export value each POT product as:

$$x_t(\max) \le m, \tag{2}$$

$$m=(m_t+m_{t-1})/2$$

This means that value of exports of each POT product is set to its actual value. In case of export value of POT exceeding its import value, the former is then constrained to the average value of imports in periods *t* and *t*-1.

3.2. Patterns of Pass-on trade

Table 4 presents margins of POT exports. It reveals that simultaneous trade within the same CN-8 category (POT) is a widespread and significant phenomenon in Slovenian foreign trade. Almost 70 percent of exporters regularly engage in POT. Over the period 1995 – 2008, firms not engaged in POT exported on average 3.3 products, while firms engaged in POT exported 23 products.

[13] The clearing period can also be either shorter or longer. We provide below some robustness checks using different lenghts of the clearing period.

Among the latter, only one half of the products being their own products and one half of them consist of POT products. Thus almost 38 percent of the total number of exported products of Slovenian manufacturing firms consists of recently imported products, while POT contributes on average almost 11 percent to the total value of manufacturing exports. The intensive margin of POT is lower than the intensive margin of exports of firms' own products by some 60 percent (see last column of Table 4). Interestingly though, while the intensive margin of POT products is decreasing over time, the extensive margin in terms of number of exported products is increasing. In 2008, number of exported POT products exceeded the number of firms' own products by some 15 percent and POT exports accounted already for 12.6 percent of total value of Slovenian exports.[14]

[*Table 4 about here*]

We check for the robustness of POT figures by allowing for variation in the level of data aggregation and the length of clearing period. First we check how the POT figures are affected when applying a shorter clearing period of only one year, i.e. firms are restricted to import and export the same CN-8 product within the same year. Table 5 shows that the impact on POT margins is only modest. Within the one-year clearing period, the share of firms engaged in POT decreases by 3 percentage points (from 67.6 to 64.3 percent), while the average number of POT products decreases by 0.4 products per exporter. Furthermore, the share of POT products in the total number of exported products decreases by 4 percentage points, while the share of POT in the total value of exports decreases only by 0.1 percentage points. This indicates that with stricter clearing condition some marginal POT exporters are excluded, which does reduce the overall number of POT products but not the value of POT exports. Pass-on trade thus seems to occur mostly within the same year, i.e. exports of particular product occur in the same year as its imports.

[*Table 5 about here*]

Second robustness check involves variation in the level of data aggregation from CN-8 to CN-6 product level (while the clearing period remains within two

[14] Note that we use a rather restrictive measure of POT referring only to simultaneous two-way trade in the same products and hence accounting only for international sourcing. We also restrict the maximum export value of each POT product to the average import value during the recent and previous year, and, hence, we do not account for potential domestic sourcing of products. Bernard et al. (2012) compare firm own production with firm's exports of the same products and hence account also for domestic sourcing of products. They find that more than 90 percent of Belgian exporters export more than they produce and that CAT accounts for more than 30 percent of total export value.

years). Table 5 demonstrates that the impact on margins of POT is not significant. With the CN-6 aggregation of products, the share of firms engaged in POT slightly increases (by 0.6 percentage points), while the average number of POT and non-POT products reduces by similarly small number. The overall impact is low – share of POT products in total number of exported products increases by less than 1 percentage point, while the share of POT in total value of exports remains unchanged. Of course, with higher levels of aggregation POT would become even more pronounced as more exported products would fall into a smaller number of available product groups. However, for reasonable variations in the level of aggregation, POT phenomenon seems to be quite robust.

This pattern of simultaneous trade is widely spread over all exporting firms. Even among firms exporting only one good there is a 27 and 23 percent probability that the existing product or newly added exported product, respectively, will be passed-on from imports. Both shares of POT increase with firms' product diversification. In other words, for firms exporting more than 50 products, more than a half (57 percent) of their total number of exported products will on average consist of passed-on products. For their newly added exported products this figure is 42 percent (see Table 6). At the same time, a substantial part of exported products in bilateral trade with the same country consist of POT (on average about 18.5 percent of firms' total number of exported goods). This shows that firms can source products also from the country to which they export the same goods. All three figures increase in the extent of firm product diversification, indicating that a more diversified firm is also more inclined to complement its existing set of exported own products with a set imported products.

[*Table 6 about here*]

Table 7 further shows that POT is not confined to existing multi-product exporters only, but can be observed also for new exporters. On average, in the first year of exporting, the share of POT is about one third (32 percent). In the second year after starting to export, more than one third (38 percent) of newly added products are likely to be passed-on imported products. The share of passed-on products increases then to one half of total exported products up to the tenth year after starting to export. In other words, the expansion pattern of new exporters along the extensive margin is by a large margin based on their passed-on imported products.

[*Table 7 about here*]

[*Table 8 about here*]

Table 6 above also shows that POT is less frequent within the same pair of countries where source and destination countries are the same. This suggests that firms might be engaged in intermediation of products between different countries. Ruling out the option of firms serving as wholesalers (due to the widespread pattern of POT), one possible explanation for the substantial extent of POT can be firms' engagement in production and trade networks of multinational firms. Foreign owned firms might engage in passing on a number of products from the affiliate in country A to the affiliate in country B. Similarly, firms having affiliates abroad might organize trade flows of the same good between affiliates in different countries for minimizing transaction and trade costs. An important reason for that may be differences in tariff rates and non-trade barriers among countries where affiliates are located. Indeed, Table 8 confirms that firms, which are part of a multinational network, engage in POT more frequently. Firms owned by multinational companies on average simultaneously trade 58 percent of their total number of exported products and 46 percent of all newly added products. These shares are a bit lower (51 and 38 percent, respectively) for firms that have their own affiliates abroad. More frequent is POT among firms which are both foreign owned and having affiliates abroad (58 and 41 percent, respectively). Nevertheless, even pure domestic firms are trading substantial shares of their products simultaneously (33 and 26 percent, respectively).

[*Table 9 about here*]

This indicates that POT trade is a widespread phenomenon among Slovenian manufacturing firms and is not restricted to multinational firms alone. As shown in Table 9, while POT accounts for 18.5 percent of number of all exported goods among the same country pair, it is less characteristic for bilateral trade with the country where firms have located their primary owners or affiliates. With these countries total direct shares of POT in number of exported products is 2.8 (IFDI country) and 4.1 percent (OFDI country) only. This further confirms the general pattern of POT among Slovenian firms.

3.3. Pass-on trade premia

The evidence so far demonstrates that POT is not only a widespread phenomenon among manufacturing firms, but it is also more pronounced among

larger firms with more diversified product sets and for firms with higher multinational status. This implies that POT is likely to be correlated with firm productivity. This is in line with Bernard et al (2012) who also find that it is the most productive firms that are most heavily engaged in CAT. At same time, firms' engagement in POT should be profitable, otherwise there would be no obvious reason for firms to engage in it.

In this section we investigate the correlation between degree of engagement in POT and firms' productivity and profitability. In order to account for this we will estimate the premia of firms' engagement in POT in terms of productivity and profitability. POT premia are defined as the ceteris paribus percentage difference in a particular performance indicator (TFP and return to assets) between firms that are to certain degree engaged in POT. We compute the premia from a regression of log performance indicator on the share of POT and a set of control variables by estimating two specifications of the model:

$$\ln Y_{it} = \alpha + \beta POT_{it} + \gamma Control_{it} + \mu_i + \mu_I + \mu_t + \varepsilon_{it} \quad (3)$$

$$\ln Y_{it} = \alpha + \sum_{d=1}^{5} \beta Sh\_POT_{it}^{d} + \gamma Control_{it} + \mu_i + \mu_I + \mu_t + \varepsilon_{it} \quad (4)$$

where Y is a particular performance indicator (TFP and return to assets (ROA)). In the model (3) *POT* is specified as an overall firm share of POT defined as a continuous variable. In the model (4), we include five dummy variables for different degrees of engagement in POT. POT dummies are taking value 1 if a firm's share of POT exceeds particular threshold – 0, 20, 40, 60 or 80 percent. POT dummy variables are hence defined within specific intervals of shares of POT in the firm's total number of exported products. *Control* variables include log firm size (in terms of employment), log total number of products and markets served, dummy variables for inward and outward FDI, Nace 2-digit industry and year dummies.

TFP is estimated using the Olley-Pakes (1996) approach to estimation of production functions that deals with endogeneity of physical capital in response to shocks to TFP. The estimates of TFP are calculated as the residuals from the estimation of a revenue function with value added deflated by the industry-wide producer price index as the dependent variable, and the numbers of workers based on number of working hours and physical capital deflated by economy-wide capital goods price index as the explanatory variables. The TFP is estimated separately for each of the 2-digit NACE industries to allow for variation in the

estimated coefficients across industries. In addition to TFP, we use an alternative performance measure, the rate of return of main operations on total assets (operating ROA), which measures the rate of firm profitability.

In line with the standard literature, we estimate (3) and (4) by OLS.[15] The coefficients from the OLS regressions can be interpreted as conditional differences in TFP and ROA of different degrees of engagement in POT as compared to the reference group, that is the industry-year averages of firms with no POT products.

[*Table 10 about here*]

Results for POT premia for both performance indicators are presented in Table 10. First two specifications including the share of POT as a continuous variable both show that firms engaged in POT earn significant positive premia in all respects – they are more productive and earn higher profits per unit of assets than non-POT firms (see columns 1 and 2). This confirms our expectations about higher productivity and higher profits of POT firms. Next specifications including dummies for different degrees of engagement in POT show some non-linearities in the relationship between firm performance and engagement in POT (see columns 3 and 4). For firms which are the least engaged in POT, there is no significant POT premia found. For the TFP measure, firms have to exceed the threshold of 20 percent share of POT products to obtain a significant POT premia, while for the ROA measure the threshold is at 60 percent share of POT. At the same time, estimated coefficients on dummy variables increase with the degree of POT, indicating that productivity and profitability of firms are monotonically increasing in the share of POT.

[*Figure 2 about here*]

This is further confirmed by Figure 2, which shows unconditional differences in TFP and ROA of different degrees of engagement in POT when the latter is defined as a continuous variable. It shows that the extent of POT is positively

[15] Though the efficiency of OLS estimator may suffer due to unobserved firm heterogeneity, the use of fixed effects regression (FE) is not appropriate in this case. Since FE regression captures firms' deviations from their own long-term average, the interpretation of results obtained by this type of regression on dummy variables for different degrees of POT is cumbersome. The FE regressions will in fact identify only firms that changed their POT engagement over time to a lower or higher degree as measured by the POT dummy variables. Hence, FE regressions will estimate a correlation between a switch in the POT dummy and a change of the dependent variable. Switches in the POT dummy variables are rarer and, hence, the results obtained by FE regressions are not very informative.

correlated with measure of productivity (Olley-Pakes based TFP) as well as with firms' measured financial return on assets (ROA). The relationship between the extent of POT and firm performance, however, is not linear. Clearly, the estimated POT premia seems to increase at declining rate with TFP and highly non-linear for ROA.

To summarize, the stylized facts presented in this Section clearly show that pass-on trade is widespread phenomenon among Slovenian manufacturing firms. Almost 40 percent of total products exported and more than half of the products exported by firms engaged in POT consist of previously imported products. POT is not confined to small and low productivity firms. On the contrary, the degree of engagement in POT is increasing in firm size, product diversification, multinational status as well as firm productivity and profitability. This implies that for firms engagement in POT is an equally possible option of serving foreign markets than exporting their own in-house produced varieties. Next section investigates these implications in more detail.

4. Explanations and determinants of Pass-on trade

Probably the most important implication of the previous Section is that POT is regularity among exporting manufacturing firms and that firms may consider serving foreign markets with their in-house produced or POT products as an equally possible option. This section draws on these findings and investigates several dimensions related to firms' entry and expansion dynamics of POT products relative to their own produced varieties. We first outline several potential explanations for firms to engage in POT. Next we study firms' decision to engage in POT and continue with investigating the survival and dynamics of POT products. We finish with an analysis of complementarity between POT and own products as a potential explanation for the widespread phenomenon of POT.

4.1. Explanations of Pass-on-trade

As simultaneous exports and imports within the same product category is a new phenomenon for manufacturing firms, the literature does not provide many explanations for it. There has been some theoretical work on the role of networks in promoting trade (e.g. Rauch, 2001; Rauch and Watson, 2004; Petropolou, 2007) and on the role of intermediaries in trade (e.g. Ahn, Khandelwal and Wei, 2010;

Akerman, 2010). However, empirical and theoretical work in this area is based on the assumption that intermediary firms are non-producing, which rules out the case of manufacturing firms.

The only exception is recent work by Bernard, Van Beveren and Vandenbussche (2010) and Bernard, Blanchard, Van Beveren and Vandenbussche (2012) who investigate the empirical finding of firms' exports of goods that they do not produce – Carry-along Trade (CAT). In their first version of paper, Bernard, Van Beveren and Vandenbussche (2010) list some potential explanations for the existence of CAT. However, as shown above CAT trade does not necessarily overlap completely with the observed POT trade. In case of CAT, firms can – in addition to their own products – export any kind of products that they do not produce that can be sourced either in the local market or internationally. In contrast, POT trade is restricted only to simultaneous exports and imports within the same product category. Nevertheless, the four possible explanations for CAT trade as outlined by Bernard, Van Beveren and Vandenbussche (2010) may serve as a good starting point to explain also a part of POT trade.

The first possible explanation is that firms, once making the decision about starting to export and paying the fixed country-specific entry cost, may expand a set of exported products by passing-on part of the imported products. In this case firms behave as trade intermediaries in line with Akerman (2010) by paying the product-country fixed cost and setting price as a markup over the price of imported products. One can think of firms that engage in price arbitrage between different markets by maximizing the profits from price differences within the same product category across markets. In addition, serving as an intermediary within the multinational firms' networks may as well account for a substantial part of simultaneous POT. Both seem to provide a likely explanation for large parts of observed POT.

Other explanations for CAT trade offered by Bernard, Van Beveren and Vandenbussche (2010) relate to firms' re-exports of complementary products to the core exported products and to firms' exports of inputs and parts to their affiliates abroad. These explanations, however, do not necessarily apply to pass-on trade unless these exported products have been sourced internationally. More plausible is the fourth explanation referring to rebranding of imported goods. A firm that has developed its brand equity either as a firm or for its core products can use it for selling a wider range of products not produced by this firm. Importing products, rebranding and selling them with positive profits net of

country– and product – fixed cost of exporting seem to be a viable explanation for a large part of POT.

More recently, Bernard, Blanchard, Van Beveren and Vandenbussche (2012) find that both the set of firms' own and a set of firms' sourced (locally or internationally) products is increasing in firm productivity. Similarly to this paper, they find that it is the most productive firms that are most heavily engaged in exporting of sourced products. In their model they derive conditions which allow the theoretical predictions in a multi-product context to match the stylized facts found in the data. On the supply side, a necessary condition is to allow for marginal cost of sourcing to be lower than marginal cost of producing in-house. An alternative adjustment would be to assume that most productive producers have also the most efficient distribution network allowing them to obtain lower marginal costs of CAT. On the demand side, they show that introducing demand scope complementarity again enables to match the empirical facts that most diversified producers also introduce the most of sourced products to their exports product set.

Matching the above theoretical implications with observed facts in our data, however, does require some streamlining of potential plausible explanations of POT. The data seem to suggest that introducing new sourced (POT) products to exports is associated with similar fixed cost as introducing own in-house produced varieties.[16] Similarly, it may also imply that overall marginal costs of a sourced product should be equal (or lower) than the overall marginal cost of placing own product.[17] The above condition may easily be obtained if a firm is engaged in simple price arbitrage across markets or as an intermediary within the multinational firms' networks. In this case, the marginal cost of sourcing and placing non-proprietary products in exports may well be lower than marginal cost of producing the equivalent products in-house or of sourcing them in a traditional proprietary way and placing them in exports. The former, however, requires an efficient distribution network. This requirement is satisfied with firm's sufficiently high productivity level.

[16] Stylized data above shows that for an average exporter the number of POT products is larger than the number of non-POT products.

[17] The overall marginal cost here refers to either total cost of development and placement of own products or to total cost of proprietary or non-proprietary sourcing and placement of sourced products. Proprietary sourcing referrs to establish own affiliate abroad or to develop a product and out-source its production to outside firms. Non-proprietary sourcing instead referrs to simple purchasing of ready-made varieties abroad.

In addition, theoretical models of multi-product firms that operate in multiple markets (e.g. Bernard, Redding and Schott, 2010) typically ignore the positive relationship between the total development cost and product range and assume that firms pay a one-off cost to start producing all existing products and decide which of these they produce only upon learning how efficient they are in producing them. These models also ignore the fact that firms must decide on production capacity for each product. When explaining the expansion pattern of new exporters, Damijan, Kostevc and Polanec (2012) argue that some firms that are capacity constrained may well find it cheaper to source ready-made products abroad and after rebranding pass them on to exports together with their own core products. This again requires higher productivity of firms in production of their core products and higher efficiency in placing their own products to foreign markets.

All of these plausible reasons for engaging in POT (or CAT) – i.e. serving as an intermediary within the multinational firms' networks, engaging in price arbitrage or sourcing proprietary or ready-made products – however, require both firm efficiency in placing the products (efficient distribution network) and a complementarity in firm demand scope. In next sub-sections we provide some empirical tests of firm efficiency in placing own and sourced products and the role of complementarity in demand.

4.2. Entry with POT and own products

The stylized facts on equal number of own and POT products in the export scope of an average exporter suggest that fixed cost of entry to foreign markets may be alike for own and POT products. To empirically account for possible differences (similarities) in entry cost, we assume that a firm has a choice of entry to a foreign market with either own or sourced (POT or CAT) product. Since these decisions are not independent, we have to model them as joint decisions allowing for correlations in error terms caused by the same unobservables. A natural choice for modeling joint decisions is to use bivariate probit estimation, which in our case assumes the following properties:

$$\Pr(Y_{it}^{P}=1 \,|\, Y_{it-1}^{P}=0, Y_{it}^{O}=1 \,|\, Y_{it-1}^{O}=0)=\Phi_2\left(X_{it-1}\widehat{\beta}^{P}, X_{it-1}\widehat{\beta}^{O}, \widehat{\rho}\right), \tag{5}$$

where Y_{it}^{P} and Y_{it}^{O} denote firm's i decision to enter foreign market either with POT or own product in year t. Each of them assumes value 1 if a firm recorded

positive value of exports in year t either with a POT or own product, respectively, and 0 otherwise. Φ_2 denotes the bivariate cumulative distribution function of the standard normal distribution. To deal with endogeneity, the vector of control variables, X_{it-1}, includes the lagged values of measures of firm size, performance, access to financing and multinational status. The model also includes time and 2-digit NACE industry fixed effects. The corresponding sets of coefficients are in vectors β^P and β^O. Since the probability of entry with POT product is conditional on the probability of entry with firm's own product, and vice versa, the error terms of both binary variables are correlated, i.e. $Cov(\varepsilon^P, \varepsilon^O) = \rho$; where ρ indicates the strength of correlation.

[*Table 11 about here*]

We estimate model (5) using a sample of 14,170 observations for manufacturing firms with no prior experience in foreign markets and that were active in both periods t-1 and t over the period 1995-2008. Results presented in Table 11 show that the estimate of parameter ρ is positive and significant, which suggests that some unobserved factors that affect the decision to export own and POT product indeed exist. As the value of ρ is fairly high (ρ = 0.64), this indicates that firms' decisions to enter foreign markets with either own or POT products are highly correlated.

The probability of starting to export POT products seems to be negatively correlated with TFP, but not for own products, while the return on assets has a significant (and positive) impact only on entry with own products. While access to finance (debt to assets ratio) is a significant determinant of export entry, firm size is only a strong predictor for own products. Among variables accounting for firm multinational status, inward FDI increases the likelihood of starting to export POT products more than starting to export own products. On the other side, outward FDI decreases the probability of entering foreign markets with POT products, but not for the own products. The likelihood to engage in export of POT products is quite high for firms that are both owned by the multinational company and have their own affiliates abroad. The latter confirms that firms that are multinational in scope will more likely engage in intermediation of POT products across different markets.

To summarize, the results indicate that – though the decisions to start exporting own or POT products are highly correlated – exporting POT products

requires relatively low productivity, larger firm size, better access to finance and advanced multinational status as compared to exporting own products.

4.3. Survival and dynamics of POT products

In this sub-section, we investigate the export survival and export dynamics of firms with POT products after they enter foreign markets. We follow the standard approach in empirical studies of firm dynamics that feature both survival and growth (Dunne et al., 1988). In our case, survival refers to continued presence of POT products in the foreign markets conditional on firm own products, while growth refers to the changes in the number of exported POT products. This structure is consistent with the bivariate selection model or type-2 tobit model proposed by Heckman (1979), which is estimated using a two step estimator. The models have the following specifications.

Export survival with POT products:

$$\Pr\left[Exp_{it}^{P}=1 \,\middle|\, Exp_{it-1}^{P}=1\right]=\Phi\left(\rho h_{it-1}^{P}+\chi h_{it-1}^{O}+\delta m_{it-1}+\widehat{\beta}X_{it-1}\right), \tag{6}$$

Dynamics of POT products in export markets:

$$h_{it}^{P}=\rho h_{it-1}^{P}+\chi h_{it-1}^{O}+\delta m_{it-1}+\widehat{\beta}X_{it-1}+\varepsilon_{itm} \tag{7}$$

In the survival equation (6), $\Pr\left[Exp_{it}^{P}=1 \,\middle|\, Exp_{it-1}^{P}=1\right]$ denotes the probability that exporter i (in period t-1) will continue exporting POT products also in period t, and Φ is a cumulative density of the standard normal distribution. In addition to the set of control variables introduced in the model of joint entry decision (X_{it}), the probability of survival with POT products in foreign markets contains also the lagged number of markets (m_{it-1}) and all products (h_{it-1}), both in logs and in particular the complementarities with own products (χh_{it-1}^{O}).

In equations for the dynamics of number of POT products (products adding and dropping), we include lagged dependent variable with corresponding autoregressive coefficient (ρ), and terms that allow to account for product-market complementarities (δm_{it-1}) and complementarities with own products (χh_{it-1}^{O}), which reflect aspects of efficiency and demand preferences of product-market that are unobserved. The other explanatory variables included in the model are the same as above. The empirical estimation uses the two-step

Heckman estimator without exclusion restrictions. In the first stage, the export survival equation (6) is estimated and in the second stage the Mills ratio (φ/Φ) is included in the market and product dynamics equations (7). This allows us to obtain the corresponding parameters, λ, which reflect the correlations between the error terms in the export survival equation and the number of exported POT products.

Results presented in Table 12 (column 1) show that survival of POT products in the export markets is positively correlated with number of lagged POT products exported and number of markets served. This indicates significant complementarities of POT products with firm export diversification along both extensive margins. At the same time, survival of POT products is not significantly (but positively) related to lagged number of firm's own exported products, which implies no substitution effects between POT and own products in export markets. Among other control variables, survival of POT products is positively affected by firm TFP, size and access to finance (measured with firm equity and debt to assets ratio).

As for the dynamics of POT products (see columns 2 and 3), both adding and dropping of POT products is positively correlated with the lagged number of exported POT and own products. This indicates a vivid process of churning of POT products. On the other side, number of markets has a positive impact on adding of POT products (though not significant), and a negative impact on product dropping. The latter suggest complementarities of POT products with firm's own products in a range of export markets. In other words, firms with a larger number of export markets are less likely to withdraw their POT products benefiting from complementarities with their own products served in these markets. Results also show that higher productivity boosts expansion of POT products, while smaller exporters and exporters with lower productivity are more likely to contract the number of POT products. Interestingly, foreign owned firms are less dynamic both in adding and dropping of POT products, while firms with affiliates abroad are engaged more intensively in the churning of POT products.

These results suggest that the dynamics of POT products in exports is fairly similar to the dynamics of firms' own products,[18] while on the other side POT products are likely to benefit from firms' diversified exports in terms of markets and own products exported. Complementarity to firms' own products thus seems to drive a substantial part of the export dynamics of POT products.

[18] See Damijan, Kostevc and Polanec (2012) for a direct comparison of export dynamics of both groups of exported products.

4.4. Demand scope complementarity of POT with own products

The evidence on demand scope complementarity between own and POT products is laid out in two steps. First we show that the likelihood of overlap between own and POT products increases with relative importance of own products in exports. The complementary products may be defined at different levels. We consider complementary products as those 8-digit CN codes that correspond to the same 4-digit CN industry. The number of such industries exceeds 1,000 in all time periods. We justify our, clearly arbitrary, choice with the fact that these products are fairly similar. Based on these definition, we define an overlap between own and POT products as those 4-digit CN industries with both sets of products. In order to capture the importance of these industries for each firm, we calculate the shares of total value of exports and the number of 8-digit CN products in each industry.

[*Figure 3 about here*]

Figure 3 presents the relationship between the likelihood of overlap of own and POT products and compare these shares across all firm-year observations with a fixed number of 4-digit CN industries. The plots are prepared separately for firms with 4, 8 and 12 industries, as the number of industries increases the likelihood of overlap. From these cross-sectional plots we can see that the likelihood of overlap generally increases with importance of specific industry, which confirms our conjecture that firms engage in POT trade due to complementarities in demand. This evidence is, however, not causal and does not control for the differences in firm characteristics. Hence we construct the following empirical model of likelihood of exporting a POT product:

$$\Pr\left[Exp^{P}_{kit} = 1 \middle| Exp^{P}_{kit-1} = 0 \right] = \Phi\left(\delta Exp^{O}_{kit-1} + \widehat{\beta} X_{it-1} \right), \tag{8}$$

where Exp^{P}_{kit} denotes a dummy variable that assumes value 1 if firm exports at least one product that corresponds to 4-digit CN industry (denoted with index k) and 0 otherwise, Exp^{O}_{kit-1} is a measure of importance of own products in the industry and X_{it-1} are the control variables.

Our key interest is in the statistical significance of coefficient δ and the economic significance of the corresponding marginal effect, which measures the likelihood of choosing POT products within industry in response to the change of

the variable measuring the importance of own products in the same industry. If the coefficient assumes positive, then own and POT products are complementary in demand. It is important to note that we devise our test in a way that firms are allowed to introduce products in any 4-digit CN industry. Thus, we expand each firms' choice set to include more than 1,000 options for introducing a POT product. The number of firm-year-industry observations is hence rather large and computationally demanding. In our test we limit the sample to firms that indeed introduced a new POT product in any industry, which results in more than 16 million observations. Since we are dealing with multiple observations within each firm-year pair, we use probit estimator with two-way clustered standard errors.

[*Table 13 about here*]

Table 13 presents overwhelming evidence that own and POT products are complementary. Column (1) shows the estimates with a measure of importance of own products (Exp^{O}_{kt-1}) that treats all industries in which firm has at least one product symmetrically – a dummy variable for presence of own products. The corresponding marginal effect is 0.243, which suggests that firm with own products within a 4-digit CN code is 24.3 percentage points more likely to introduce a POT product that falls within that industry. Next, column (2) shows that the number of own products that a firm exports within 4-digit industry also increases the likelihood of introducing a POT product. The marginal effect is 0.026, which implies that doubling the number of products in the industry increases the likelihood of introducing a POT product by 2.6 percentage points. Finally, column (3) shows the results with export value share of products within a 4-digit industry as a measure of importance of that industry in exporting. Again, the coefficient is positive and statistically significant, with corresponding marginal effect suggesting that increasing the share of value of exports by 10 percent increases the likelihood of choosing that industry by 1 percentage point. We can thus conclude that complementarity between own and POT products is likely to be a strong motive for firms to introduce POT products.

5. Conclusions

Recent evidence demonstrates that churning of products in imports and exports is bigger than suggested by recent trade models with heterogeneous firms and fixed cost of trade. This paper investigates the surprising fact that a

substantial proportion of this product churning is due to simultaneous imports and exports of firms in identical varieties within the same CN-8 product code (so called pass-on trade, POT). Using detailed data on imports and exports at the firm–product level for Slovenian manufacturing firms in the period 1994-2008, we document that, on average, almost 70 per cent of all exporting firms engage to some extent in POT. Almost 40 percent of total products exported and more than half of the products exported by firms engaged in POT consist of previously imported products. This indicates that POT is a prevailing regularity of trade of Slovenian firms. POT is not confined to small and low productivity firms. On the contrary, the degree of engagement in POT is increasing in firm size, product diversification, multinational status as well as firm productivity and profitability. This implies that for firms engagement in POT is an equally possible option of serving foreign markets than exporting their own in-house produced varieties.

Confronting several possible explanations for POT with the data points towards three most plausible explanations of why do firms engage in POT. The first explanation is that firms engage in serving as an intermediary within the multinational firms' networks. The second possibility is that firms engage in price arbitrage of ready-made products, which are sourced internationally, across a wide range of markets they serve with their own products. Third explanation stress the possibility that firms engage in placing imported products, which are sourced as proprietary products. All of these firms' strategies of engaging in POT, however, require both high firm efficiency in placing the products (efficient distribution network) and a complementarity in firm demand scope. Our empirical work finds robust evidence on the importance of firms' multinational networks and demand complementarities between firms' own and POT products in firms' decision to introduce and expand the number of POT products to any market they already serve.

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Tables

Table 1: Summary statistics for importing and exporting firms by number of traded products in 2008, in EUR (mean values, 1994 prices)

No. of products traded	Exporters					Impoters				
	No. of firms	Freq. (%)	No. of empl.	Value of exports	Cum. Freq. (%)	No. of firms	Freq. (%)	No. of empl.	Value of imports	Cum. Freq. (%)
0	1122	25.2	15.8	0	0.00	747	16.8	9.2	0	0.00
1	565	12.7	13.6	48,348	0.58	559	12.6	8.7	13,507	0.20
2	357	8.0	17.2	71,679	0.54	291	6.5	13.4	24,769	0.19
3	260	5.9	18.5	124,780	0.69	194	4.4	15.1	59,850	0.30
4	173	3.9	21.9	263,908	0.97	129	2.9	17.5	109,790	0.37
5	138	3.1	23.3	232,854	0.68	115	2.6	16.8	108,073	0.32
6-10	398	9.0	39.8	387,860	3.28	355	8.0	19.3	166,403	1.53
11-20	429	9.7	47.4	667,734	6.09	414	9.3	36.1	249,393	2.67
21-50	486	10.9	85.4	1,265,407	13.07	725	16.3	51.2	603,553	11.33
>50	518	11.6	279.9	6,759,066	74.10	917	20.6	201.3	3,500,629	83.10
Total	4,446	100.0	59.7	1,059,098	100.00	4,446	100.0	59.9	868,856	100.00

Source: CARS, SORS, AJPES; own calculations.

Table 2: Extensive and intensive margins for importing and exporting firms by number of traded products in 2008, in EUR (mean values, 1994 prices)

No. of products	No. of import origin countries	Value of imports per firm - product - country	Value of imports per firm – product	Value of imports per firm - country	No. of export destinat. countries	Value of exports per firm - product - country	Value of exports per firm - product	Value of exports per firm - country
0	0	0.00	0.00	0.00	0	0.00	0.00	0.00
1	1	21,331	21,331	21,331	1	70,168	70,168	70,168
2	1.46	13,210	18,324	26,420	1.59	39,540	57,352	79,080
3	1.82	16,901	28,031	50,702	2.06	34,948	62,910	104,843
4	2.34	18,866	42,205	75,463	2.48	34,141	70,702	136,565
5	2.71	13,917	31,171	69,586	2.96	24,484	59,629	122,422
6-10	3.73	10,641	30,191	81,680	4.03	22,874	76,779	164,533
11-20	5.23	4,999	21,094	72,725	6.42	13,657	66,420	195,080
21-50	9.20	3,066	22,148	95,098	12.53	5,657	53,643	178,295
>50	20.21	1,428	22,362	173,817	36.61	2,357	53,015	268,564
Total	6.89	7,301	19,790	75,265	7.17	20,491	47,136	114,775

Source: CARS, SORS, AJPES; own calculations.

Table 3: Extensive margin and product churning (adding and dropping), by size classes, per-firm average over 1995-2008

Exports

Size class	Total$_t$	Added$_t$	Dropped$_t$	% Added/ Total$_{t-1}$	% Dropped/ Total$_{t-1}$
emp < 10	2.0	1.3	1.2	0.67	0.63
9 < emp < 50	12.6	7.7	7.0	0.65	0.59
49 < emp < 250	42.8	23.6	22.7	0.56	0.54
249 < emp	185.5	95.2	91.5	0.52	0.50
Total	14.2	7.9	7.5	0.57	0.54

Imports

Size class	Total$_t$	Added$_t$	Dropped$_t$	% Added/ Total$_{t-1}$	% Dropped/ Total$_{t-1}$
emp < 10	13.3	3.6	3.6	0.27	0.27
9 < emp < 50	34.2	16.8	16.9	0.49	0.49
49 < emp < 250	79.3	43.5	45.7	0.53	0.56
249 < emp	277.6	152.7	166.3	0.52	0.57
Total	44.5	15.0	15.8	0.33	0.35

Source: CARS, SORS, AJPES; own calculations.

Table 4: Margins of POT, measured at the CN-8 product level, per-firm average over 1995-2008

Year	Share of exporters with POT	Average number of exported products			Share of POT (in %)		Shipment per product: Ratio pure POT vs. non-POT
		Exporters without POT	Exporters with POT		Total number of exp. products	Total value of exports	
			non-POT products	POT products			
1995	64.9	3.3	9.7	6.6	33.0	8.0	0.44
1996	65.6	3.7	11.5	8.6	33.1	10.1	0.76
1997	70.0	3.4	10.5	9.2	38.3	9.4	0.80
1998	70.1	3.1	9.8	9.7	40.0	10.1	0.64
1999	70.5	2.9	10.2	10.5	41.0	10.0	0.45
2000	70.9	2.9	10.9	11.5	40.2	9.8	0.61
2001	71.5	3.0	10.9	12.0	40.6	10.2	0.54
2002	72.1	3.0	11.3	12.3	40.7	9.6	0.55
2003	71.5	3.1	10.6	12.2	40.2	9.5	0.56
2004	66.9	3.2	11.2	12.8	38.2	10.3	0.45
2005	64.7	3.1	12.3	13.7	36.6	11.1	0.38
2006	60.9	3.5	13.3	14.5	33.7	12.4	0.29
2007	62.8	3.4	13.5	14.4	35.0	12.7	0.30
2008	62.8	3.1	12.3	14.0	35.7	12.6	0.33
Average	67.6	3.2	11.3	11.6	37.7	10.8	0.43

Notes: 1/ Exporters with POT defined as firms exporting at least one POT product. 2/ POT is defined at CN-8 product in current or lagged period. 3/ Value of exports of POT products is set at its actual value. In case of export value of POT exceeding its import value, the former is constrained to the average value of imports in years t and t-1 according to: $x_t(\max) \leq (m_{t-1} + m_t)/2$; where x and m denote exports and imports of CN-8 product at the firm level.

Source: CARS, SORS, AJPES; own calculations.

Table 5: Robustness check: Margins of POT accounting for the length of the clearing period and aggregation level of products, per-firm average over 1995-2008

Definition of POT		Share of exporters with POT	Average number of exp. products			Share of POT in	
			Exporters without POT	Exporters with POT		Total number of exp. products	Total value of exports
Aggregation level	*Clearing period*			non-POT products	POT products		
CN-8	current and lagged year	67.6	3.2	11.3	11.6	37.7	10.8
CN-8	current year only	64.3	3.4	12.4	11.2	33.8	10.7
CN-6	current and lagged year	68.2	2.9	10.1	10.4	38.5	10.8

Notes: 1/ Exporters with POT defined as firms exporting at least one POT product. 2/ Value of exports of POT products is set at its actual value. In case of export value of POT exceeding its import value, the former is constrained to the average value of imports in the clearing period.

Source: CARS, SORS, AJPES; own calculations.

Table 6: Extent of POT as a share in overall exports, measured at CN-8 product level, per-firm average over 1995-2008 (in %)

Number of products exported	N	Share in no. of all exported goods	Share in no. of newly added exported goods	Share in no. of total exported goods from same country
1	6,037	27.5	23.0	14.2
2	3,887	29.2	25.8	15.3
3	2,791	30.5	28.1	14.9
4	2,034	32.1	30.1	16.5
5	1,623	35.7	32.2	18.5
6-10	5,266	38.6	34.2	19.4
10-20	4,674	44.2	36.8	21.7
20-50	4,165	50.0	38.3	23.2
>50	2,235	56.6	42.2	24.9
Total	32,712	37.7	29.9	18.5

Source: CARS, SORS, AJPES; own calculations.

Table 7: Extent of POT trade among surviving new exporters, per-firm average over 1995-2008

t	No. of all exported goods	No. of POT goods	Share of POT goods (in %)	
			All	Added
0	6.4	2.4	32.4	
1	9.6	4.5	42.5	37.9
2	10.9	5.5	45.2	35.8
3	12.9	6.8	47.3	38.9
4	14.7	7.6	45.5	32.0
5	15.6	8.5	46.6	31.5
6	16.8	9.7	50.0	34.9
7	17.4	9.9	49.0	33.5
8	17.8	10.7	50.3	36.7
9	18.4	10.9	49.5	36.0
10	18.2	10.7	46.2	32.3

Notes: 1/ New surviving exporters are defined as those that continue exporting for at least 5 years since start. 2/ *t* is technical time counting years after export start (t=0 denotes entry year).

Source: CARS, SORS, AJPES; own calculations.

Table 8: Extent of POT trade as a share in total and newly added exported products by firm multinational status, measured at CN-8 product level, per-firm average over 1995-2008

Outward FDI[1]	Inward FDI[2]	Share in no. of all exported goods	Share in no. of newly added exported goods
No	No	33.3	26.1
Yes	No	51.2	38.0
No	Yes	58.4	46.2
Yes	Yes	58.0	41.2

Notes: 1/ IFDI (= inward FDI), firms that are majority foreign owned. 2/ OFDI (= outward FDI), firms that have affiliates abroad.

Source: CARS, SORS, AJPES; own calculations.

Table 9: Extent of POT trade as a share in number of exported products by type of country, measured at CN-8 product level, per-firm average over 1995-2008 (in %)

	All countries	Same country[1]	With IFDI country[2]	With OFDI country[3]
Share in no. of all exported goods	37.7	18.5	2.8	4.1
Share in no. of newly added exported goods	15.3	15.3	2.2	3.9

Notes: 1/ Source and origin countries of POT trade are the same; 2/ Firms' trade with countries of firms' major foreign owners (IFDI = inward FDI); 3/ Firms' trade with countries, where firms have their foreign affiliates (OFDI = outward FDI).

Source: CARS, SORS, AJPES; own calculations.

Table 10: Premia of firms engaged in POT in terms of TFP and ROA (OLS results)

	Dependent variable			
	TFP[1]	ROA[2]	TFP[1]	ROA[2]
Explanatory variables	(1)	(2)	(3)	(4)
POT	0.087***	0.006***		
	(0.01)	(0.00)		
Share POT (0-20%)			-0.017	-0.006
			(0.02)	(0.00)
Share POT (20-40%)			0.038***	-0.001
			(0.01)	(0.00)
Share POT (40-60%)			0.074***	0.004
			(0.01)	(0.00)
Share POT (60-80%)			0.110***	0.010***
			(0.01)	(0.00)
Share POT (80-100%)			0.141***	0.013***
			(0.01)	(0.00)
Log Employment	-0.043***	-0.019***	-0.045***	-0.019***
	(0.00)	(0.00)	(0.00)	(0.00)
Log Products	0.032***	0.005***	0.042***	0.006***
	(0.00)	(0.00)	(0.00)	(0.00)
Log Markets	0.055***	0.004***	0.054***	0.004***
	(0.01)	(0.00)	(0.01)	(0.00)
Outward FDI	0.088***	0.009**	0.077***	0.008**
	(0.02)	(0.00)	(0.02)	(0.00)
Inward FDI	0.137***	0.017***	0.117***	0.015***
	(0.01)	(0.00)	(0.01)	(0.00)
Outward and inward FDI	0.123***	0.006	0.136***	0.008
	(0.03)	(0.01)	(0.03)	(0.01)
Time dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Observations	27,926	27,926	27,926	27,926
R2 Adjusted	0.393	0.057	0.395	0.058

Notes: 1/ Revenue based Olley-Pakes measure of total factor productivity; 2/ Returns-to-assets (ROA). 3/ POT is a continuous share of POT. The Share POT are dummy variables with specific intervals of shares of POT in the firm's total number of exported products.

Standard errors in parentheses. Significance levels: * p<0.10, ** p<0.05, *** p<0.01.

Table 11: Joint Entry Decision to Export with POT and Own Products, 1995-2008 (bivariate probit estimation)

	(1)		(2)	
	Pr[Export POT = 1]	Pr[Export Own = 1]	Pr[Export POT = 1]	Pr[Export Own = 1]
TFP(t-1)	-0.149***	-0.037		
	(0.06)	(0.03)		
ROA(t-1)			0.346	0.184**
			(0.31)	(0.09)
Equity(t-1)	0.278***	0.243***	0.233***	0.231***
	(0.04)	(0.02)	(0.03)	(0.02)
Debt-to-assets ratio(t-1)	2.076***	1.120***	2.002***	1.115***
	(0.25)	(0.09)	(0.24)	(0.09)
Employment(t-1)	0.091**	0.031	0.126***	0.040*
	(0.04)	(0.02)	(0.04)	(0.02)
Outward FDI(t-1)	-4.688***	0.0430	-4.492***	0.0852
	(0.24)	(0.40)	(0.61)	(0.40)
Inward FDI(t-1)	0.663***	0.305**	0.609***	0.300**
	(0.19)	(0.14)	(0.16)	(0.14)
Inw. and outw. FDI(t-1)	3.754***	-0.992	3.595	-1.068
	(0.82)	(0.69)	(0.82)	(0.69)
Observations	14,170		14,170	
ρ (Chi²-test)	0.638	(188.8)	0.637	(188.2)
Log-likelihood	-3702.6		-3702.2	

Notes: The estimates of TFP are obtained using the Olley-Pakes estimator. ROA denotes the return on total assets. Equity, employment, TFP are included in logs. The industry fixed effects are captured with inclusion of 2-digit NACE industry dummies. The dummy variables for outward and inward FDI are 1 if foreign ownership share is at least 10 percent of equity. Robust standard errors in parentheses. ***, ** and * denote statistical significance at 1, 5 and 10 percent.

Table 12: Export survival and export dynamics of POT products, 1995-2008 (2-stage Heckman estimation)

	(1)	(2)	(3)
	Pr[Export(t)=1 | Export(t-1)==1]	POT Products added (t)	POT Products dropped (t)
POT Products (t-1)	0.125***	0.189***	0.125***
	(0.02)	(0.01)	(0.00)
Own Products (t-1)	0.0215	0.417***	0.781***
	(0.02)	(0.01)	(0.00)
No. Markets (t-1)	1.405***	0.005	-0.062***
	(0.03)	(0.01)	(0.01)
TFP (t-1)	0.084***	0.037***	-0.0146*
	(0.03)	(0.01)	(0.01)
Equity (t-1)	0.149***	0.060***	0.014***
	(0.02)	(0.01)	(0.00)
Debt-to-assets ratio (t-1)	0.640***	0.416***	0.165***
	(0.07)	(0.04)	(0.02)
Employment (t-1)	0.037**	-0.011	-0.038***
	(0.02)	(0.01)	(0.00)
Outward FDI (t-1)	0.071	0.057**	-0.004
	(0.12)	(0.02)	(0.01)
Inward FDI (t-1)	-0.134**	-0.056***	0.036***
	(0.05)	(0.02)	(0.01)
Out. and inward FDI (t-1)	0.340	0.131***	0.131***
	(0.24)	(0.05)	(0.03)
Observations	19,320	19,320	19,320
Chi2		8,615.7	43,683.2
Lambda		0.331	-0.0120
s.e.(Lambda)		0.0268	0.0161

Notes: The estimates of TFP are obtained using the Olley-Pakes estimator. Number of products and markets, equity, employment and TFP are included in logs. The industry fixed effects are captured with inclusion of 2-digit NACE industry dummies. The dummy variables for outward and inward FDI are 1 if foreign ownership share is at least 10 percent of equity. Robust standard errors in parentheses. ***, ** and * denote statistical significance at 1, 5 and 10 percent.

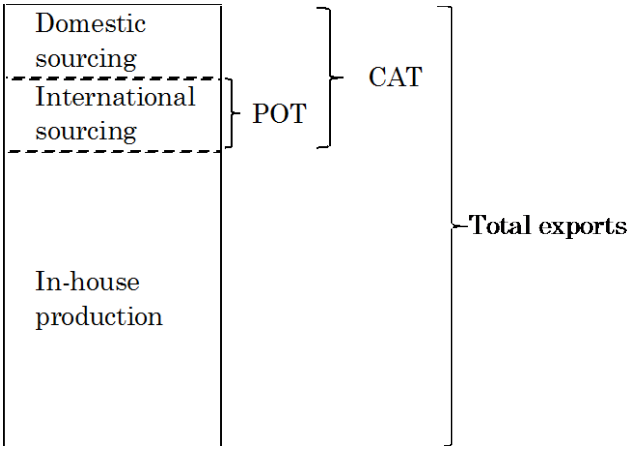
Table 13: Probability of introducing a POT product in 4-digit CN industry, 1995-2008

	(1)	(2)	(3)
	Dependent variable: Pr[Export POT(k,t)=1 | Export(k,t-1)==1]		
Dummy for own products (k,t-1)	1.861***		
	(0.021)		
Number of own products (k,t-1)		2.81***	
		(0.029)	
Share of export value of own products (k,t-1)			6.150***
			(0.164)
TFP (t-1)	0.035***	0.029***	0.039**
	(0.011)	(0.008)	(0.014)
Equity (t-1)	0.036***	0.021***	0.052***
	(0.010)	(0.008)	(0.011)
Debt-to-assets ratio (t-1)	0.193***	0.135***	0.254***
	(0.049)	(0.042)	(0.054)
Employment (t-1)	0.085***	0.059***	0.096***
	(0.011)	(0.009)	(0.012)
Outward FDI (t-1)	0.103***	0.044***	0.135***
	(0.023)	(0.018)	(0.024)
Inward FDI (t-1)	0.095***	0.103***	0.072***
	(0.021)	(0.016)	(0.024)
Firm-year-industry observations	14,000,672	14,000,672	14,000,672
Chi2	244,036.0	327,186.8	71,984.5
Log-likelihood	-611558.2	-387109.4	-630731.1
Pseudo R2	0.161	0.469	0.134

Notes: The estimates of TFP are obtained using the Olley-Pakes estimator. Number of own products within 4-digit CN industry, equity, employment and TFP are included in logs. The number of products is increased by 1 to avoid dropping industries with zero products (8-digit CN code). The dummy variables for outward and inward FDI are 1 if foreign ownership share is at least 10 percent of equity. The time fixed effects are captured using time dummies. Two-way clustered standard errors for firms and time periods in parentheses. ***, ** and * denote statistical significance at 1, 5 and 10 percent.

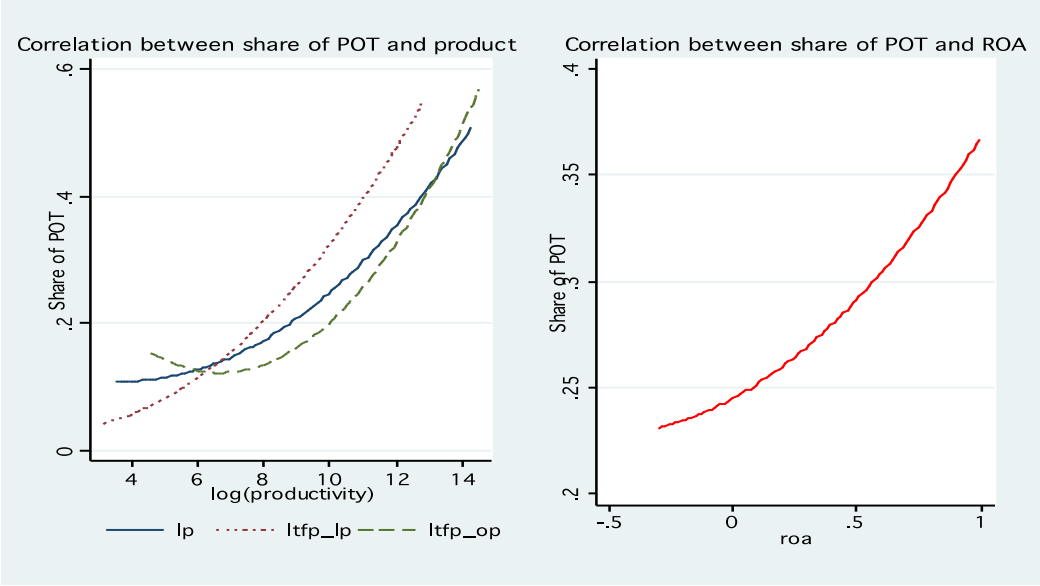
Figures

Figure 1: Definition of POT vs. CAT



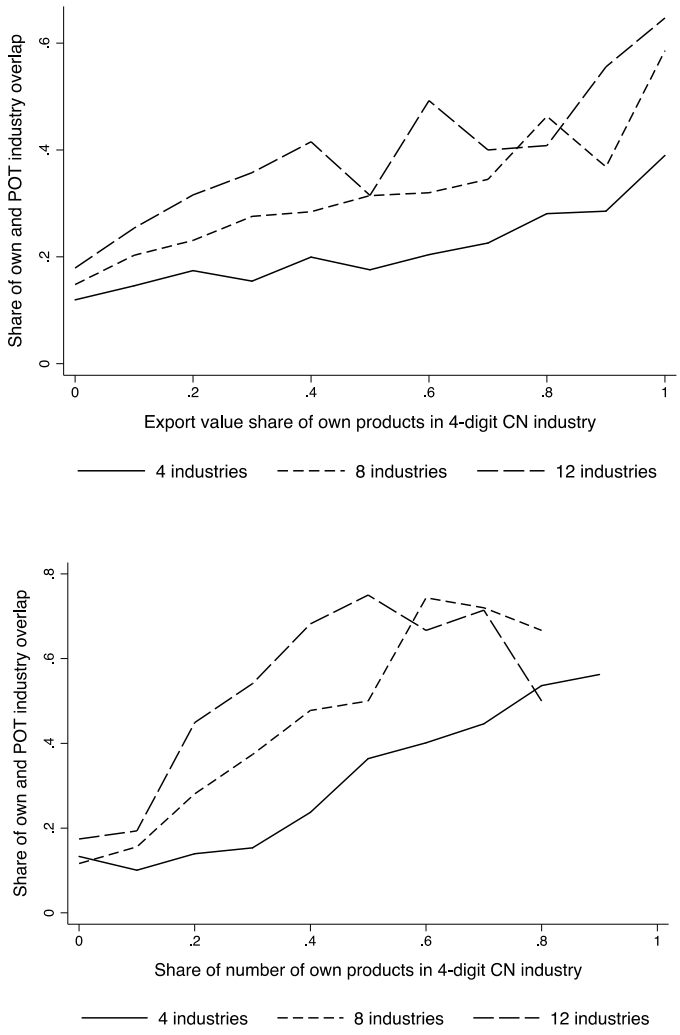
Note: POT (pass-on trade) – firm's simultaneous two-way trade within the same product code. CAT (carry-along trade) – exports of goods that a firm does not produce.

Figure 2: Correlation between POT, TFP and ROA, period 1995- 2008



Note: Figure shows unconditional differences in measures of productivity and ROA in relation to firms' share of POT. Fitted figures are produced using non-weighted quadratic fit.

Figure 3: Complementarity between own and POT products, 1995-2008



Notes: On the y-axis is the share of overlapping industries with own and POT products across all firms with the same number of 4-digit CN industries, where industry is defined as a 4-digit CN code. On the x-axis is either the share of export value of own products that belong to 4-digit CN industry (top panel) or the share of number of own products (defined as 8-digit CN code) in an industry.

Source: CARS, SORS, AJPES; own calculations.

Appendix

The Combined Nomenclature (CN) codes change over time and these changes alone could affect product and product-market churning measures. There are four types of changes: i) one-to-one ii) one-to-many splits, iii) many-to-one mergers and iv) many-to-many transformations. Using concordance files for annual changes in codes, we can create common codes that eliminate spurious product churning for one-to-one, one-to-many and many-to-one changes. The many-to-many changes, however, cannot be resolved in such a way. In Table A1 we compare the average numbers of exported products, number of product-markets and total value of exports per product and per product-market for four distinct Combined Nomenclature codes. The columns contain the measures of extensive and intensive margins for different versions of CN code. CN8 is the original 8-digit CN code, CN8 C.1 denotes the 8-digit CN code corrected for splits and mergers of codes, CN8 C.2 applies the same corrections as CN8 C.1 in addition to replacement of 8-digit CN code with 6-digit CN code for many-to-many transformations and CN6 C.1 is a 6-digit code extracted from CN8 C.1 code. Comparison between intensive and extensive margins for 8-digit CN codes shows that the average values are not very sensitive to the choice of correction, suggesting that the results should not hinge on the type of correction. The 6-digit CN code, however, yields different average values, which is due to significant reduction in the number of codes. Namely, the total number of distinct codes at 8-digit level in the entire period is 15,629, while there are only 5,981 distinct codes at the 6-digit level. In the estimations we use the CN8 C.1 correction.

Table A1: Average Number of Products for New and Incumbent Exporters in Slovenian Manufacturing, 1995-2008

	New Exporters				Incumbent Exporters			
	CN8	CN8 C.1	CN8 C.2	CN6 C.1	CN8	CN8 C.1	CN8 C.2	CN6 C.1
Products	5.07	5.03	4.98	4.59	17.35	17.16	16.88	15.01
Product-markets	8.71	8.65	8.54	7.97	41.02	40.67	40.08	36.59
Value per product	51.47	51.86	52.23	56.46	175.44	177.06	180.37	198.29
Value per product-market	32.88	33.11	33.04	34.72	81.06	81.62	82.56	87.31

Source: CARS, SORS, AJPES; own calculations.