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"Trade Intermediation by Producers"

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Trade Intermediation by Producers*

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Abstract

This paper shows that Turkish manufacturing exporters export goods that they have not produced and thus also act as trade intermediaries. This exporting of "sourced" products is ubiquitous across firms, products, and destinations. Beyond these facts, the main contribution of the paper is to show that sourced exports are more sensitive to gravity determinants than produced exports at the aggregate level, but at the firm level, this relationship is reversed. We rationalize these findings by allowing producers to act as intermediaries in a model where profitability at the product-destination level is stochastic and correlated across markets. We provide empirical evidence for the model's core mechanism.

Keywords: international trade; intermediaries; carry-along trade; multi-product firms

JEL Classifications: F12, F14, L2

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1 Introduction

Selling to foreign markets is characterized by many hurdles compared to domestic trade. As a result, a substantial part of aggregate trade is done by professional intermediaries: firms specialized in trading that do not produce goods themselves. However, Bernard et al. (2019) have shown that, in Belgium, many manufacturing exporters also export goods that they do not produce. They show suggestive evidence that demand-scope complementarities may be an important driver of this trade, referring to it as "carry-along trade" (CAT).[1]

In this paper, we first confirm the prevalence of manufacturers exporting goods that are sourced from other producers, using firm-product level data from Turkey for 2005-14. We find that 88% of manufacturing exporters export goods that they do not produce, and 97% of the products are exported by at least one firm that is not producing it. This trade represents 40% to 45% of aggregate exports by manufacturers in value. Taking this form of intermediation into account more than doubles the amount of aggregate trade that is intermediated. Moreover, using the geographic dimension of the data, we show that almost half of these sourced exports are *purely intermediated*: to many destinations, firms sell sourced products only. Beyond documenting these stylized facts, the main contribution of this paper is to show that this trade behaves differently and thus matters for our understanding of trade patterns. We empirically show that sourced exports react differently to gravity determinants, and we develop a model that is able to rationalize these patterns.

We start by comparing aggregate flows of produced and sourced exports for the same product-destination combinations, and show that sourced exports are *more* sensitive to gravity determinants than produced exports.[2] We find that this larger reaction is entirely driven by the extensive margin. This implies that trade of sourced products does not mimic the one of produced products and thus matters for trade patterns.[3] To understand the source of this result, we turn to firm-level flows. Hence, we compare exports of sourced and produced goods at the firm-product-destination level, and find that exports of sourced products react relatively *less* to gravity determinants, conditional on exporting. Together with the result on aggregate flows, this finding indicates that while the firm-level exports of sourced products decline relatively less when selling to smaller and more distant markets, these firm-product lines exit relatively more as the markets become more difficult to reach. We refer to this pattern of elasticities as "elasticity divergence."

The elasticity divergence we find is puzzling for three reasons. First, in most, if not all trade models, firms' decisions of entry and exit are driven by sales and profits. If firm-level sales are less sensitive to trade costs, so should be the entry and exit decisions. Second, produced and sourced products are exported by the same manufacturers. Thus, it is reasonable to assume that the ex-

[1] They document that almost 90% of exporters engage in CAT, making up around 30% of Belgium's aggregate exports in 2005.

[2] While this also holds for GDP and distance, we compute measures of market access and trade freeness as theoretically robust gravity determinants following Head and Mayer (2014).

[3] We show in the last part of the paper that this trade is also different than the one of professional (non-manufacturing) intermediaries.

port technology/information set is the same for both types of flows, in contrast to the traditional explanation for the different behavior of professional intermediaries. Third, when we focus on purely intermediated flows, which make up around half of sourced exports, the pattern of elasticities we find remains. This implies that this elasticity divergence cannot be explained solely by carry-along trade. Yet, this result suggests that the causality from profits to the export decision may not be as direct as usually seen in the literature. To explain it, we need to think about selection in export markets in a new way.

In the second part of the paper, we develop a trade model to rationalize our empirical findings. Beyond allowing producers to act as intermediaries, the key novel feature of the model is that firm-product profitability in each destination is stochastic, with shocks that are correlated across markets, affecting the pattern of entry and exit. We show how these correlated stochastic shocks can generate the pattern of elasticities described above, without assuming a different technology of exporting or complementarities between exported products. Furthermore, the presence of purely intermediated flows arises naturally in this setup.

Our baseline is a standard model of international trade with CES monopolistic competition and heterogeneous firms. As in the literature, only the best firms choose to pay the sunk cost of exporting. To allow trade intermediation by producers, we let domestic firms to choose to pay a sunk cost to match with one of these exporters and utilize their export network. They can then sell indirectly to foreign markets and share the profits with the (actual) exporter. Importantly, we assume that all firms are endowed with an idiosyncratic distribution from which they draw their profitability parameter for each market they want to serve. It follows that profitability in each destination is stochastic and correlated across markets.[4] We further assume that these distributions can be ranked in terms of hazard rate order.[5] Firms with a higher rank (i.e. better distributions) have larger expected profits and will thus pay the sunk cost of exporting by themselves.[6] Firms with lower ranks may choose to use the export network of these exporters to export indirectly. In this case, they still draw their market specific profitability parameter from their own distribution.

As firms move to smaller and more distant markets, expected sales are lower and so is the probability of exporting, for all firms. However, this effect is stronger for exports of sourced products, as a direct consequence of their lower rank in terms of hazard rate. Their sales elasticity, unconditional on exporting, is thus larger because they tend to exit more as markets get more difficult to reach. This in turn generates a larger aggregate elasticity for sourced exports, as in the data. Second, conditional on exporting, the expected profitability parameter will be higher for all firms: the subset of firms that are still able to export will be those with good enough draws. Therefore, the elasticity of their sales, conditional on exporting, is lower than in the standard model. We show that the difference

[4]Several papers have introduced *i.i.d.* stochastic shocks to sales and profits in export markets; see for example Bernard et al. (2011) and Eaton et al. (2011). We are not aware of contributions where these shocks are correlated.

[5]Hazard rate stochastic ordering has been used in the trade literature by Demidova (2008). Whereas she applies it to the distribution of firms across countries, we apply it within firms across destinations.

[6]Note that a higher rank distribution also implies a lower variance in these shocks. Thus, intuitively, a higher rank means both a better and a less risky prospect. We will use this property to empirically test the model's mechanism.

between the elasticity of exporting conditional versus unconditional on exporting, increases for firms with lower rank, inducing the elasticity divergence we document. Finally, we provide an empirical test of the mechanism put forward in our model. We verify that, in each market, exports of sourced products at the firm-level have a lower mean and a larger variance, which is key to explain the elasticity divergence we find in the data. Overall, our results point to a subtle selection process of firm-varieties within products that affects the behavior of aggregate trade patterns.

In the last part of the paper, we relate our findings to the existing literature. First, we address the role of complementarities between exports of sourced and produced products. While our model does not feature any complementarity, it does not mean that they are absent in the data. Here, we use our decomposition of exports of sourced products into purely intermediated (PI) and CAT flows (i.e. those that are bundled with produced products). We find that, across products and destinations, CAT flows are smaller than PI flows on average. This stylized fact indicates that these complementarities exist and thus could be another motive for trade intermediation by producers. Second, the prevalence of PI flows suggests that an important reason for sourced exporting is gains from intermediation only. Hence, we compare the trade of sourced and produced products with the one of professional (non-manufacturing) intermediaries. We find that professional intermediaries react differently to market access, and we interpret this result as suggestive evidence that these firms have a comparative advantage in exporting (based on superior market knowledge or technology) compared to producers.

Our paper is primarily related to the nascent literature initiated by Bernard et al. (2019), who document the prevalence of sourced exports by manufacturers. They show that the number of sourced products exported increase more than proportionally with firm productivity, and provide suggestive evidence for demand complementarities between produced and sourced exports. In contrast, we use the geographical dimension of the data to decompose sourced exports into their CAT and PI components, showing that intermediation is another important reason for these exports. Accessing international markets thus generates gains for manufacturers beyond the benefits of having access to a larger market for their own products. This decomposition also allows us to ensure that the pattern of elasticities we find is not driven by complementarities between produced and sourced exports. Other papers that document the prevalence of sourced exporting include Di Nino (2015) for Italy, van den Berg et al. (2019) for the Netherlands, Abreha et al. (2020) for Denmark, and Arnarson (2020) for Sweden.

The literature on sourced exporting indicates that we should think about multi-product firms in a new way. As Bernard et al. (2019), we find that the majority of the "superstar" firms' exported products are sourced from other firms. This sharply contrasts with the approach first developed in the literature, which assumed that firms produce a set of products and export a subset of them (e.g. Eckel and Neary, 2010; Bernard et al., 2011; Mayer et al., 2014). Recently, Eckel and Riezman (2020) discuss the implications of CAT for firms, and study the strategic choice by a firm to export its product alone directly or indirectly, bundling its product with another one. We, on the other hand, contribute to this literature by modeling sourced exports as trade intermediation by producers, to explain also the purely intermediated part of sourced exports.

Second, this paper is related to the literature on trade intermediation. Some papers have compared the reaction of exports by professional intermediaries versus manufacturers to gravity determinants (e.g. Bernard et al., 2010; Ahn et al., 2011; Crozet et al., 2013; Bernard et al., 2015; Akerman, 2018). These papers show that intermediaries enable less productive firms to export indirectly. Moreover, intermediaries help firms to reach less accessible markets, implying that trade intermediation by professional intermediaries (TII) is more prevalent in markets that are more difficult to access. The explanation for these results is that intermediaries have a comparative advantage in exporting due to, for example, economies of scope or superior knowledge of foreign markets. In relation to this literature, we also find that trade intermediation by producers (TIP) facilitates exports of less profitable products.[7] However, our analysis shows that TIP is more concentrated in easily accessible markets, as opposed to what has been found for TII. When we take TIP and TII together, we find that intermediated trade is actually more concentrated in large and close-by markets. From a theoretical point of view, we do not introduce any superior export technology but assume that there is a cost to match with another firm that is providing an export network. As such, the way we see TIP is closer to the earlier literature on intermediaries that view them as "match-makers" (e.g. Rauch and Watson, 2004; Antràs and Costinot, 2011).

The rest of the paper is organized as follows. Section 2 describes the data, paying special attention to the prevalence of PI flows. Section 3 illustrates the elasticity divergence between sourced and produced exports focusing on aggregate and firm-level regressions. In Section 4, we develop a model that is able to generate the empirical patterns we find. In Section 5, we relate our findings to the literature by first comparing PI and CAT flows of sourced products, and then comparing TIP to TII. Finally, Section 6 concludes and discusses further research.

2 Data

We use three main databases from Turkey in this paper: the first is the *Industry Production Statistics* database that is available for 2005-14 and provides the volume and value of production and sales of each product that is produced by a firm.[8] Products are classified according to the 10-digit PRODTR classification of which the first 8-digits correspond to the EU's official production classification PRODCOM (*production communautaire*).[9] All PRODTR are concorded overtime by the Turkish Statistical Institute (TÜİK) to the 2010 classification for consistency. The second dataset is the *Industry and Services Statistics* database that includes annual statistics such as total sales, number of employees,

[7] In this paper, we use trade intermediation by producers (TIP) and sourced exporting interchangeably.

[8] This dataset has been used for example by Lo Turco and Maggioni (2016), Javorcik et al. (2018), and Erbahar (2020).

[9] The first 6- and 4-digits of PRODCOM correspond to the CPA (*classification of products by activity*) and the NACE (*nomenclature statistique des activités économiques dans la Communauté européenne*) Revision 2 classifications.

wages, expenses, and investment for all firms that have at least 20 employees for 2003-14.[10]

The third dataset we use is the *Foreign Trade Statistics* database which reports exports and imports of each firm annually for 2002-14. Exports and imports are classified by firm-country-GTIP (*Gümrük Tarife İstatistik Pozisyonu*), where GTIP is a 12-digit product code whose first 8-digits correspond to the EU's Combined Nomenclature (CN) and the first 6-digits correspond to the internationally standardized Harmonized Schedule (HS). Since the PRODTR-GTIP concordance table provided by TÜİK is for 2010, the descriptive cross-sectional analysis in this paper uses 2010 as the benchmark year. However, we take advantage of the time dimension in the empirical analysis, and for that we concord the trade data overtime to the HS2007 nomenclature, using Pierce and Schott's (2012) algorithm combined with HS correlation tables from the UN Statistics Division.[11]

In order to match production data with the trade data, we apply the algorithm developed by Van Beveren et al. (2012) to the PRODTR-GTIP correspondence tables provided by TÜİK at the HS6 level and create uniform HS6+ codes. These are codes that match one-to-one to HS6 codes as well as codes that include multiple HS6 codes to fix the issue of one-to-many and many-to-many PRODTR-HS6 matches (see Appendix Table B.2 for an example). The merge results in 2,610 HS6+ products as opposed to 5,052 HS6 products in 2010.[12] This matching at the HS6+ level enables us to classify firm-products as produced versus sourced. Note that this level of aggregation results in a conservative definition of "sourced," since there might still be a subset of products within an HS6+ that are not produced by the firm. In our empirical analysis in Section 3, we switch back to the HS6 level to exploit all the variation in the trade data, and use the 4,558 manufacturing product categories that are classified as either produced or sourced at the firm-HS6+ level.

We merge the *Industry and Services Statistics* database with *Industry Production Statistics*, keeping manufacturing firms only. Then, we follow Erbahar's (2020) data cleaning procedures and restrict the sample to firms with at least 20 employees, and drop observations where exports are larger than total sales, or where production sales are larger than total sales. Finally, we keep firms that have produced and exported at least one manufacturing good in 2005-14. This results in a sample of 23,296 firms, covering around half of manufacturing exports and two-thirds of manufacturing production. In part of our empirical analysis, we add exports done by professional intermediaries which make up about 11%-18% of manufacturing exports.[13]

2.1 Prevalence of sourced exporting by producers

We first confirm some of the findings of Bernard et al. (2019) for Belgian firms by illustrating the prevalence of sourced exporting by Turkish firms. In the next subsection, we provide new stylized

[10]The database also includes a representative sample of firms that have less than 20 employees, but the identity of these firms change every year, and thus we exclude them from our analysis.

[11]The time period we analyze covers three different nomenclatures, and thus we only need to concord products classified at the HS2002 and HS2012 nomenclatures to the HS2007 nomenclature.

[12]With the overtime concordance, the number of HS6+ codes is 2,572.

[13]We classify firms as professional intermediaries if their self-reported NACE Revision 2 sector code falls into the "Wholesale and retail trade" category (divisions 45-47).

facts on trade intermediation by producers (TIP) by decomposing sourced exports into two parts: one where sourced products are exported together with produced goods (CAT), and the other purely intermediated (PI) part where sourced products are exported by themselves.

Table 1 sorts manufacturing exporters by the number of HS6+ products they exported in 2010. As expected, the number of exporters (column 3) quickly declines as the number of products exported increases. Importantly, the number of exported products is lower than the average number of produced products (column 2) for single-product exporters only. For multi-product exporters (i.e. exporting more than one product), the number of exported products always exceeds the average number of produced products. This feature becomes striking for the largest multi-product exporters. For example, the average number of produced products for "superstar" firms that exported more than 50 products is only 3.8. This reveals that the multi-product nature of exporters is largely driven by firms selling products that are sourced from other producers.

Table 1: Summary statistics by number of exported products, HS6+

(1) # of exported products	(2) # of produced products	(3) # of firms
1	1.73	1,675
2	1.78	1,187
3	1.85	834
4	2.04	603
5	2.17	522
6	2.40	411
7	2.28	315
8	2.56	285
9	2.59	230
10	2.84	218
11-20	3.04	1,186
21-30	3.59	415
31-40	3.44	204
41-50	4.05	115
> 50	3.79	234

Notes: Summary statistics are based on the 8,434 manufacturing exporters in 2010. Products are based on the HS6+ classification, with maximum number of exported products 394.

Sourced exports also appear at higher levels of aggregation, dispelling the concern that our findings might be due to misclassification of product codes or inaccurate concordance procedures. Table 2 compares summary statistics in 2010 for manufacturing exporters at the HS6+ level, and at the more aggregate HS4+ and HS2+ levels. At the HS6+ level, the average firm produces 2.3 products, but exports 10.1 products due to sourced exports. The average number of exported sourced products is 8.9. These statistics are lower at more aggregate levels, but the average number of exported products stays larger than the number of produced products. Here, we compare the HS6+ and HS2+ results, the HS4+ results being a midway between the two aggregations. Referring to HS6+ as products and HS2+ as sectors, Table 2 highlights that even though the average firm produces multiple products, it is a single-sector firm. However, even at the sector level, the median firm engages in sourced exporting, and the average number of sourced sectors is 2.6.

Table 2: Summary statistics at the firm-product level

	(a) HS6+			(b) HS4+			(c) HS2+		
Variable	Median	Mean	Sd.	Median	Mean	Sd.	Median	Mean	Sd.
# of produced products	1	2.34	2.35	1	1.98	1.77	1	1.34	0.72
# of exported products	4	10.05	19.64	3	7.40	12.43	2	3.72	4.08
# of exported sourced products	3	8.89	19.28	2	6.19	12.15	1	2.64	3.94

Notes: Summary statistics are based on the 8,434 manufacturing exporters in 2010.

In addition to the statistics above, we find that, in 2010, 88% of manufacturing exporters exported at least one HS6+ that they did not produce, the average share of sourced exports in a firm's total exports was 55%, and the average share of goods that were sourced in a firm's export product basket was 74%. Sourced exporting is also not product specific: 97% of HS6+ products were exported by at least one firm that did not produce that good in 2010.

One might be concerned that firms that engage in sourced exporting are re-exporters (firms that export imported goods). We match firms' imports and exports at the product level, and find that the median exporter does not engage in re-exporting, and re-exports make up, on average, 11% of a firm's sourced exports, implying that it cannot explain the widespread sourced exporting that is done by the large majority of exporters.

Overall, our findings show that sourced exporting is prevalent for almost all firms and products. Appendix Table B.1 lists a few examples of firms that are engaged in sourced exporting, and suggests that sourcing activity can be due to a wide variety of reasons including, but not limited to, demand and supply complementarities as well as pure intermediation.

2.2 Decomposing sourced exports

Aggregate exports, X, are the sum of total exports by manufacturers and by professional intermediaries:

$$X = \sum_{i \in \text{Manu.}} X_i + \underbrace{\sum_{i \in \text{Inter.}} X_i}_{TII} \tag{1}$$

where X_i is exports of firm i. We label trade intermediation by professional intermediaries as TII. As Bernard et al. (2019), we decompose total exports by manufacturers into exports that are produced and those that are sourced:

$$\sum_{i \in \text{Manu.}} X_i = \sum_{ih \in \text{Prod.}} X_{ih} + \underbrace{\sum_{ih \in \text{Sourced}} X_{ih}}_{TIP} \tag{2}$$

where ih denotes a firm-product (HS6+) combination. We label trade intermediation by producers as TIP.

Finally, taking advantage of the geographic dimension of the data, we further decompose sourced exports into CAT exports, when they are sold to destination c along with produced exports, and PI exports, when they are sold to destination c by themselves:

$$\sum_{ih\,\in\,\text{Sourced}} X_{ih} = \sum_{ihc\,\in\,\text{CAT}} X_{ihc} + \sum_{ihc\,\in\,\text{PI}} X_{ihc} \tag{3}$$

Table 3 shows the prevalence of sourced exports in Turkey's aggregate exports in 2005-2014. Column 2 based on equation (2) shows that TIP made up 45% of manufacturing exports in 2010. Based on the decomposition in equation (3), column 3 of Table 3 indicates that PI made up 43% of TIP in 2010, with a minimum of 39% in 2007 and a maximum of 53% in 2014. Note also that PI exports are not driven by just a few specialized firms: 74% of firms exporting sourced products have at least one destination market where they sell only sourced products. Overall, TIP made up to 35% (column 4) of exports in our sample in 2010. Notably, these figures are larger than the 22% (column 5) of exports made up by professional intermediaries (TII) in 2010. Taking TIP into account thus more than doubles the amount of Turkey's exports that is intermediated.

Table 3: Aggregate statistics

(1) Year	(2) TIP/manu. exports	(3) PI/TIP	(4) TIP/total exports	(5) TII/total exports
2005	40.9%	43.3%	27.7%	32.3%
2006	39.8%	46.8%	27.2%	31.7%
2007	42.4%	39.0%	31.3%	26.3%
2008	40.9%	43.1%	31.1%	24.0%
2009	42.7%	40.8%	34.8%	18.3%
2010	**45.0%**	**43.4%**	**35.2%**	**21.8%**
2011	42.5%	43.4%	31.9%	24.9%
2012	43.7%	42.7%	32.3%	26.1%
2013	44.5%	48.8%	31.6%	28.9%
2014	45.4%	53.2%	31.2%	31.3%

Notes: Manu. exports refer to the exports of manufacturing firms. TIP refers to trade intermediation by producers as defined in equation (2). TII refers to trade intermediation by professional (non-manufacturing) intermediaries as defined in equation (1). PI refers to the purely intermediated portion of TIP as defined in equation (3). Total exports is the sum of manufacturing and TII exports.

Note that our classification of sourced exporting relies on a firm exporting a product that it does not produce in a given year. However, as shown by Bernard et al. (2017), partial-year effects can confound this definition, if, for example, we classify a product as sourced when it is exported by a firm in January 2010 even though it was produced in 2009. Moreover, firms might be exporting goods that they produced years ago via their inventories. Similarly, PI exports are defined at a yearly level and thus can be sensitive to the same issue. To dispel these concerns, in Appendix Table B.3, we restrict

Table 4: Decomposing trade by sectors and destinations

(a) HS section	Description	(1) Share of total exports	(2) Manu./total exports	(3) TIP/manu. exports	(4) PI/TIP
IV	Prepared foodstuffs	3.8%	71.9%	42.6%	60.8%
VI	Chemicals	3.4%	71.2%	30.3%	60.2%
VII	Plastics and rubber	6.0%	89.4%	28.6%	52.9%
VIII	Leather goods	0.5%	68.8%	25.5%	32.9%
IX-X	Wood and wood products	1.3%	77.9%	51.0%	71.0%
XI-XII	Textiles and apparel	15.3%	71.9%	50.8%	39.1%
XIII-XIV	Stones, ceramics, and glass	3.4%	69.8%	35.6%	71.1%
XV	Metals	18.3%	76.3%	51.0%	63.2%
XVI	Machinery	18.3%	70.5%	45.6%	36.4%
XVII	Vehicles	16.2%	99.2%	45.3%	28.0%
XVIII	Instruments	0.3%	76.1%	60.0%	70.6%
XX	Miscellaneous manufacturing	1.6%	67.8%	39.5%	36.5%
I-III, V, XIX	Other sectors	11.7%	87.2%	10.4%	66.9%

(b) Region	(1) Share of total exports	(2) Manu./total exports	(3) TIP/manu. exports	(4) PI/TIP
East Asia and Pacific	4.5%	81.5%	24.7%	60.6%
Europe	57.3%	81.4%	42.6%	40.1%
Latin America and Caribbean	2.0%	73.2%	41.5%	62.4%
Middle East and North Africa	24.9%	77.8%	39.1%	55.5%
North America	4.3%	88.4%	37.4%	34.9%
South Asia	1.0%	82.5%	35.1%	72.9%
Sub-Saharan Africa	2.1%	76.9%	32.0%	72.2%
West and Central Asia	3.9%	56.4%	53.1%	50.5%

Notes: Statistics are based on Turkey's exports of $59 billion represented by the sample of producers and intermediaries in our sample in 2010. TIP refers to trade intermediation by producers as defined in equation (2). PI refers to the purely intermediated portion of TIP as defined in equation (3). Total exports is the sum of manufacturing and professional intermediary exports. Other sectors refer to HS sections I-III, V, and XIX, which correspond to Agriculture, Mining, and Arms respectively. Countries are allocated to regions according to the World Bank classification.

the definition of sourced to be a product that is not produced by the firm for the entire sample period (i.e. 2005-2014). We further conservatively classify exports into PI exports if the firm has never sold a produced product to a destination that it serves with sourced products in 2005-2014. Even with these restrictive definitions, TIP represents 38% of manufacturing exports, and PI makes up 28% of TIP in 2010.

Are sourced exports, and its purely intermediated portion, specific to certain sectors or destinations? Table 4 panel (a) shows the result of our decomposition by each manufacturing HS section for 2010. Column 1 shows the share of Turkey's $59 billion total exports represented by the sample of producers and intermediaries in our sample in 2010 made up by each HS section. Column 2 illustrates the share of these exports that are done by producers as opposed to intermediaries, and reveals that the majority of exports is done by manufacturers for all sections. Focusing on the four broad sectors that make up more than 15% of Turkish exports each (Textiles and apparel, Metals, Machinery, and Vehicles), column 3 indicates that TIP share is fairly stable ranging from 45% for Vehicles to 51% for Metals. The portion of TIP that is purely intermediated is shown in column 4, and ranges from 28% for Vehicles to 63% for Metals among the top four sections. The figures show that TIP is prevalent in all broad sectors except for Other sectors which consists of mainly non-manufacturing Agriculture, Minerals, and Arms sectors. Column 4 indicates that PI trade makes up the majority of TIP in eight sectors. Appendix Table B.4 panel (a) focuses on the top 10 narrower HS2 industries and finds similar results.

Table 4 panel (b) shifts the attention to destinations. Column 3 shows that TIP share of exports to Turkey's top destination Europe is 43%. This figure ranges from 25% for destinations in East Asia and Pacific to 53% in West and Central Asia. The PI shares in column 4 suggest that the majority of TIP is explained by pure intermediation for six of the eight regions. In Appendix Table B.4 panel (b), we look at Turkey's top 10 destination countries and find similar results. Overall, the findings in this section indicate that pure intermediation by producers is ubiquitous across firms, products, and destinations.

3 Pattern of international trade and the elasticity divergence

Having shown the quantitative importance of sourced exports along several dimensions, we now characterize its specific behavior. We show here that produced and sourced exports behave differently with respect to gravity variables, which in turn means that TIP is important for our understanding of aggregate trade patterns.

First, we follow the gravity literature (Head and Mayer, 2014) and estimate the following equation using bilateral trade data for 228 countries and 96 HS2 sectors for 2005-2014 from the BACI database of CEPII (Gaulier and Zignago, 2010):

$$X_{ocHt} = \underbrace{\mathbf{FE}_{oHt}}_{\text{supply capacity}} + \underbrace{\mathbf{FE}_{cHt}}_{\text{market capacity}} + \underbrace{\epsilon_{ocHt}}_{\text{freeness of trade}} \tag{4}$$

where X_{ocHt} is log exports of country o to country c in HS2 sector H in year t; $\mathbf{FE}_{oHt}$ and $\mathbf{FE}_{cHt}$ are fixed effects that capture the supply capacity of the origin country and the market capacity of the destination country respectively, and ϵ_{ocHt} is the error term capturing the bilateral freeness of trade.[14] Market capacity is the estimate of the multilateral resistance term for the importer at the sector level, and freeness of trade captures all bilateral trade costs such as distance and tariffs. Our strategy is to compare the reaction of produced and sourced flows to gravity variables. Note that in the following, we switch from HS6+ to HS6, which allows us to compare produced and sourced flows

[14]Note that the sector is defined at the HS2 level even though our subsequent regressions are at the HS6 level. The reason is that the number of zeros increases substantially as the products become more disaggregated, and the fixed effect estimates become unstable. In Appendix Tables B.6 and B.10, we replicate our benchmark analyses using estimates at the HS4 level, and results are qualitatively the same. Appendix Table B.9 uses GDP and distance instead of market capacity and freeness of trade and finds qualitatively similar results.

within the more disaggregated HS6 categories.[15] Thus, we estimate the following specification where we use market capacity and freeness of trade when the exporter o is Turkey:

$$T_{mcht} = \beta_1 Sourced_m + \beta_2 (MC_{cHt} \times Sourced_m) + \beta_3 (FT_{cHt} \times Sourced_m) + \mathbf{FE}_{cht} + \epsilon_{mcht} \quad (5)$$

where T_{mcht}, defined for $m = \{P, S\}$ (produced, sourced), is one of three outcome variables at the destination c, HS6 h, and year t level: log aggregate exports X_{mcht}, log average exports per firm X_{mcht}/no_{mcht}, and log number of exporters no_{mcht}. $Sourced_m$ is an indicator variable for sourced flows, and MC_{cHt} and FT_{cHt} are market capacity and freeness of trade estimated from equation (4). Note that we include destination-HS6-year fixed effects, $\mathbf{FE}_{cht}$, in specification (5), effectively comparing two flows (produced versus sourced) of the same HS6 to the same destination in a given year. These fixed effects also capture demand side determinants. ϵ_{mcht} is the error term, and we cluster standard errors at the country and HS6 level to allow for correlated shocks along these two dimensions. Note that we are interested in identifying the interaction coefficients β_2 and β_3, and not the main effects of market capacity and freeness of trade, which are collinear with $\mathbf{FE}_{cht}$. Summary statistics for the variables used in our benchmark regressions are shown in Appendix Table B.5.

Table 5 shows our results. In column 1, we use a less restrictive set of fixed effects ($\mathbf{FE}_{ch}$, $\mathbf{FE}_{ct}$, $\mathbf{FE}_{ht}$) to identify the main effects of market capacity and freeness of trade. Both market capacity and freeness of trade increase exports as expected. Moreover, the interaction coefficients with the sourced dummy are positive and significant at the 1% level, indicating that sourced flows are more sensitive to gravity variables when compared to produced flows. The interaction coefficients are sizable with respect to the main effects. The sourced dummy is also estimated precisely: sourced flows of an HS6 to a destination in a given year are on average 70% smaller than produced flows. In column 2, we add the benchmark $\mathbf{FE}_{cht}$, and the interaction coefficients and their standard errors remain similar. In columns 3 and 4 of Table 5, we decompose aggregate exports into average exports and the number of exporters. The estimates illustrate that the larger elasticity of sourced exports to gravity variables is entirely driven by the extensive margin, and that the number of sourced firm-HS6 flows are on average 11% higher for a given destination-HS6-year combination.

In Appendix Table B.7 we exclude Turkey's export destinations in its customs union partner European Union from the sample, and find very similar results. Finally, to address the concern that the log linear estimates of gravity equations can be biased due to heteroskedasticity, we also estimate equation (5) using Poisson pseudo-maximum-likelihood (PPML). Appendix Table B.8 shows that while the signs are still positive, we lose significance of the interaction terms when we have export values as the dependent variable (columns 1 and 2). However, we keep finding that the number of exporters is more sensitive to gravity variables for sourced exports, which is at the core of our theoretical

[15] Since we categorize a product to be produced or sourced at the more aggregate HS6+ level, our empirical analysis at the HS6 level potentially underestimates the prevalence of sourced exporting, since an HS6+ category is classified as produced as soon as one HS6 (within that HS6+ category) is produced. Hence, this potential measurement error works against finding a different reaction between sourced and produced exports.

Table 5: Aggregate results

Dependent variable:	(1) $\ln X_{mcht}$	(2) $\ln X_{mcht}$	(3) $\ln avg_{mcht}$	(4) $\ln no_{mcht}$
Sourced$_m$	-0.700***	-0.786***	-0.893***	0.108***
	(0.050)	(0.067)	(0.055)	(0.027)
MC_{cHt}	0.334***			
	(0.027)			
× Sourced$_m$	0.087***	0.103***	0.016	0.087***
	(0.020)	(0.022)	(0.016)	(0.019)
FT_{cHt}	0.267***			
	(0.020)			
× Sourced$_m$	0.108***	0.146***	0.018	0.128***
	(0.016)	(0.020)	(0.015)	(0.013)
FE	ch, ct, ht	cht	cht	cht
N	891,582	891,582	891,582	891,582
R^2	0.69	0.89	0.90	0.86

Notes: $\ln X_{mcht}$ is log export values, $\ln avg_{mcht}$ is log average exports per firm, and $\ln no_{mcht}$ is the log number of exporters at the country-HS6-year (cht) level. Sourced$_m$ is dummy variable that indicates whether the export flow m is sourced as opposed to produced. MC_{cHt} and FT_{cHt} refer to market capacity and freeness of trade at the country-HS2-year level (cHt) respectively. Clustered standard errors (by country and HS6) are in parentheses. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels respectively.

mechanism.[16]

Why are sourced exports more sensitive to gravity variables than produced exports? To understand the source of this result, we turn to firm-level flows and estimate the following specification:

$$t_{icht} = \beta_1(MC_{cHt} \times Sourced_{iht}) + \beta_2(FT_{cHt} \times Sourced_{iht}) + \mathbf{FE}_{cht} + \mathbf{FE}_{iht} + \mathbf{FE}_{ict} + \epsilon_{icht} \qquad (6)$$

where t_{icht} is one of three outcome variables at the firm i, destination c, HS6 h, and year t level: firm log export value x_{icht}, log export quantity q_{icht}, and log unit value uv_{icht}. $Sourced_{iht}$ is an indicator variable for sourced flows at the firm-HS6-year level. We include country-HS6-year fixed effects, $\mathbf{FE}_{cht}$, to control for aggregate demand, firm-HS6-year fixed effects, $\mathbf{FE}_{iht}$, to control for supply side factors such as firm-product productivity or quality, and firm-destination-year fixed effects, $\mathbf{FE}_{ict}$, to control for a firm's network (e.g. branding/reputation). ϵ_{icht} is the error term, and we cluster standard errors at the country and HS6 level as in specification (5). Note that the coefficients capturing the differences in these elasticities, β_2 and β_3, are conditional on exporting, and thus should not be directly compared to our estimates at the aggregate level.

Table 6 shows the estimates of equation (6). In column 1, we use a less restrictive set of fixed

[16] We restrict the sample to the one used in our OLS regressions with positive flows since we are interested in comparing positive produced and sourced flows of the same product to the same country. Results are qualitatively similar when we include zeros.

effects to identify the main effects of market capacity and freeness of trade. As expected, both affect firm-level exports positively, with the sourced interaction for freeness of trade estimated to be negative and statistically significant. We also find that sourced flows are substantially lower than produced flows as indicated by the dummy estimate. In column 2, we use the benchmark set of fixed effects and find that the sourced interactions are negative and statistically significant at the 1% level for both market access and freeness of trade.

Table 6: Firm-level results

Dependent variable:	(1) $\ln x_{icht}$	(2) $\ln x_{icht}$	(3) $\ln q_{icht}$	(4) $\ln q_{icht}$	(5) $\ln uv_{icht}$	(6) $\ln uv_{icht}$
Sourced$_{iht}$	-1.021***		-1.204***		0.184***	
	(0.059)		(0.075)		(0.022)	
MC_{cHt}	0.214***		0.199***		0.015**	
	(0.019)		(0.021)		(0.007)	
× Sourced$_{iht}$	0.017	-0.084***	0.045**	-0.086***	-0.028***	0.001
	(0.018)	(0.009)	(0.022)	(0.009)	(0.005)	(0.002)
FT_{cHt}	0.279***		0.285***		-0.006	
	(0.018)		(0.021)		(0.006)	
× Sourced$_{iht}$	-0.072***	-0.065***	-0.070***	-0.064***	-0.002	-0.001
	(0.021)	(0.009)	(0.026)	(0.009)	(0.006)	(0.002)
FE	*ch*, *ct*, *ht*	*cht*, *iht*, *ict*	*ch*, *ct*, *ht*	*cht*, *iht*, *ict*	*ch*, *ct*, *ht*	*cht*, *iht*, *ict*
N	2,006,236	2,006,236	2,006,236	2,006,236	2,006,236	2,006,236
R^2	0.44	0.96	0.57	0.97	0.75	0.99

Notes: $\ln x_{icht}$ is export values, $\ln q_{icht}$ is export quantities, and $\ln uv_{icht}$ is export unit values at the firm-country-HS6-year (*icht*) level. Sourced$_{iht}$ is a dummy variable that indicates whether the export flow of firm i of product h in year t is sourced as opposed to produced. MC_{cHt} and FT_{cHt} refer to market capacity and freeness of trade at the country-HS2-year (*cHt*) level respectively. Clustered standard errors (by country and HS6) are in parentheses. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels respectively.

In columns 3-4 of Table 6, we change our dependent variable to be log export quantities instead of values, and find similar results. When we change the dependent variable to be log unit values in columns 5-6, we find no robustly significant interaction coefficient. Overall, these results show that sourced exports at the firm level are substantially less sensitive to gravity variables than produced exports, and that this effect is entirely driven by the reaction of quantities. In Appendix Table B.11, we exclude EU destinations and verify the findings of Table 6.

What drives the result that firm' sourced exports react less to gravity variables when compared to their produced exports? One answer might be the presence of supply and/or demand complementarities between exports of produced and sourced products, when exported to the same destinations. To see whether this might be an explanation, we decompose sourced exports into CAT and PI as explained in Section 2.2. Since PI flows, that are destination specific, consist solely of products that are not produced by the firm, complementarities do not exist by definition.

Table 7 column 1 shows that both CAT and PI react less to market capacity and freeness of trade.

The effects are larger for PI exports. Excluding the EU in column 2, or redefining PI to be over destinations that are 'never' (i.e. in 2005-2014) served by firms' produced products in column 3, do not change the results qualitatively. This result is remarkable as it indicates that complementarities do not drive the lower elasticity of sourced exports at the firm level.

Table 7: Firm-level results - CAT versus PI

	(1)	(2)	(3)
	All	Excluding the EU	Always PI
Dependent variable:	$\ln x_{icht}$	$\ln x_{icht}$	$\ln x_{icht}$
MC_{cHt} × CAT_{ict}	-0.084***	-0.089***	-0.084***
	(0.009)	(0.012)	(0.009)
MC_{cHt} × PI_{ict}	-0.118***	-0.119***	-0.154***
	(0.028)	(0.032)	(0.036)
FT_{cHt} × CAT_{ict}	-0.064***	-0.086***	-0.064***
	(0.009)	(0.013)	(0.009)
FT_{cHt} × PI_{ict}	-0.115***	-0.134***	-0.131***
	(0.017)	(0.024)	(0.022)
FE	cht, iht, ict	cht, iht, ict	cht, iht, ict
N	2,006,236	1,196,898	2,006,236
R^2	0.96	0.98	0.96

Notes: $\ln x_{icht}$ is export values at the firm-country-HS6-year ($icht$) level. CAT_{ict} refers to destinations where the firm has sold both produced and sourced products, and PI_{ict} refers to destinations where the firm has sold only sourced products. MC_{cHt} and FT_{cHt} refer to market capacity and freeness of trade at the country-HS2-year (cHt) level respectively. Clustered standard errors (by country and HS6) are in parentheses. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels respectively.

The aggregate and firm-level results presented so far point to a puzzle. Aggregate results show that the elasticity of sourced exports, due to the firm extensive margin, is significantly higher when compared to the elasticity of produced exports. On the other hand, the elasticity of sourced export quantities at the firm level is substantially lower than the one for produced export quantities. This divergence hints that selection plays a key role in explaining the pattern of elasticities, which is hard to reconcile with standard trade models. Indeed, if indirect exports are less sensitive at the firm level, why would these firms' entry/exit patterns be more sensitive? In virtually all trade models, profitability determines entry. To explain the pattern we find, we need either a factor that affects profitability and entry in opposite ways, or the fact that successful entry affects (observed) profitability. This later possibility is at the core of the model we present in the next section to rationalize our empirical findings.

4 A model of trade intermediation by producers

In this section, we develop a simple model of international trade where we allow trade intermediation by producers. The main objective is to show how we can generate the pattern of elasticities we uncover in the previous section.

We consider a standard trade model with CES monopolistic competition and heterogeneous firms. The world consists of C countries. We index firms by i, destination countries by c, and (HS6) products by h. As in the literature, only the best firms will serve (some) foreign markets. In addition, we allow them to also serve as intermediaries for less efficient firms (i.e. allowing those to export indirectly). The key change compared to the standard framework is the way we define the best firms. They will be so in a stochastic sense. We first describe the demand side before coming to this feature. We then show how the model predicts the pattern of elasticities found in the data.

4.1 Demand side

The model is standard on the demand side. There are M sectors in the economy. Utility is given by:

$$U_c = \prod_{h=0}^{M} \left(\int_{\Omega_h} (a_{ich} c_{ich})^{\frac{\sigma_h - 1}{\sigma_h}} d\omega \right)^{\frac{\mu_h \sigma_h}{\sigma_h - 1}} \tag{7}$$

with Ω_h the set of varieties of product h, c_{ich} the consumption level of each variety, a_{ich} is a preference parameter, and $\sum_h \mu_h = 1$. Note that we do not preclude firms to sell more than one variety of product h, but we assume that firms are too small to take into account the impact of their decision on aggregates. Demand in country c for a variety of product h supplied by firm i is thus:

$$c_{ich} = \frac{E_{ch}}{P_{ch}^{1-\sigma_h}} a_{ich}^{\sigma_h - 1} p_{ich}^{-\sigma_h} \tag{8}$$

with E_{ch} the expenditure for product h in country c, p_{ich} the price paid by consumers in the destination country and $P_{ch} = \left(\int_{\Omega_h} \left(\frac{p_{ich}}{a_{ich}} \right)^{1-\sigma_h} \right)^{\frac{1}{1-\sigma_h}}$ the perfect price index of sector h in country c. In the standard model, firms are usually endowed with a given productivity/quality parameter (exogenously or as a result of their decisions), and may also face local demand shifters, generating heterogeneity in the term $\frac{p_{ich}}{a_{ich}}$. We take a different approach below.

4.2 Supply side

Given the CES preferences structure within each sector, firms face a constant price elasticity, implying a constant markup over marginal cost: $p_{ich} = \frac{\sigma_h}{\sigma_h - 1} w_{ich} \tau_{och}$, where τ_{och} is an iceberg trade cost between the origin country o and destination c, for varieties of product h, and w_{ich} is the unit cost of producing a variety of product h by firm i in country c. Exports of firm i to country c of product h are thus:

$$x_{ich} = \frac{E_{ch}}{P_{ch}^{1-\sigma}} \tau_{och}^{1-\sigma_h} \left(\frac{\sigma_h}{\sigma_h - 1} \frac{w_{ich}}{a_{ich}} \right)^{1-\sigma_h} \tag{9}$$

where the term $\frac{E_{ch}}{P_{ch}^{1-\sigma}}$ is the counterpart of market capacity in this model, while $\tau_{och}^{1-\sigma_h}$ is the inverse of trade freeness between o and c. We also assume a fixed cost of exporting to each market C_{ch}. Profits of an operating firm selling to c are thus: $\pi_{ich} = \frac{1}{\sigma_h} x_{ich} - C_{ch}$.

Sales depend on the perceived quality adjusted price $\frac{\sigma_h}{\sigma_h - 1} \frac{w_{ich}}{a_{ich}}$, which captures both demand and supply side determinants. From now on, we label $\beta_{ich} \equiv \frac{\sigma_h - 1}{\sigma_h} \frac{a_{ich}}{w_{ich}}$, the inverse of this perceived quality adjusted price, which captures the profitability of firm i in country c. We also label $A_{ch} \equiv \frac{E_{ch}}{P_{ch}^{1-\sigma}} \tau_{och}^{1-\sigma}$, the market specific component of profitability in c from o, a term that summarizes both the impact of market capacity and trade freeness. We thus rewrite sales and profits as:

$$\begin{aligned} x_{ich}(\beta_{ich}) &= A_{ch} \beta_{ich}^{\sigma_h - 1} \\ \pi_{ich}(\beta_{ich}) &= \frac{1}{\sigma_h} A_{ch} \beta_{ich}^{\sigma_h - 1} - C_{ch} \end{aligned}$$

4.3 Stochastic profitability

In this class of models, the key for firm decisions is the value of β_{ich}, which can explain differences in firm productivity, the quality of the product or differences in preferences in destination c. It is often either exogenously given or is the outcome of investments by firms. The country dimension may or may not be present. Here, we do not take a stance on the source of heterogeneity behind β_{ich} across firms. We assume that some firms are more profitable than others (with larger βs), but this will be so in a stochastic way. Formally, we assume that a firm i is endowed with a distribution $F_i(\beta)$, with support over $(\beta^{MIN}, \beta^{MAX})$. Firms can draw a β in their own distribution for each potential destination market.

Definition 1. *The distribution of firm n dominates the distribution of firm m in terms of hazard rate order (HRSD), $F_n(\beta) \overset{hr}{\succ} F_m(\beta)$, if $\frac{f_n(\beta)}{1-F_n(\beta)} \leq \frac{f_m(\beta)}{1-F_m(\beta)}$, $\forall \beta$.*

We assume that firms' distributions can be ranked according to hazard rate stochastic order.

Corollary 1. *For any increasing function $y(x)$, $\mathbb{E}_n[y(x) \mid x > \underline{x}] > \mathbb{E}_m[y(x) \mid x > \underline{x}]$*

Hazard rate stochastic dominance (HRSD) allows a ranking of the conditional expectations of an increasing function above some cutoff level. Thus, HRSD preserves first and second order stochastic dominance for truncated distributions. Put differently, we define a better firm as having a higher expected β, with a lower variance in the draw, regardless of the level of truncation.

Market cutoff and expected profits

In order to export product h to country c, a firm needs to draw a β above the minimum cutoff value $\underline{\beta_{ch}}$, given by:

$$\pi_{ich}\left(\underline{\beta_{ch}}\right) = 0 \Leftrightarrow \underline{\beta_{ch}} = \left(\sigma_h \frac{C_{ch}}{A_{ch}}\right)^{\frac{1}{\sigma_h - 1}} \tag{10}$$

Note that this cutoff is independent of the distribution, it is only market specific. Expected profits of firm i in market ch are thus given by:

$$\mathbb{E}_i\left[\pi_{ich}\right] = \mathbb{E}_i\left[\frac{1}{\sigma_h} A_{ch} \beta_{ich}^{\sigma_h - 1} - C_{ch} \mid \beta_{ich} \geq \underline{\beta_{ch}}\right] \tag{11}$$

Given Corollary 1, firms having distributions of higher hazard rate order (i.e. firms with a better HRSD rank) have larger expected profits in each market.

4.4 Export decision

We consider the set of active firms in the origin country. Each firm i is endowed with a profitability distribution $F_i(\beta)$, and firms are ordered such that i is increasing in the HRSD rank. To export, firms have two options. First, they can pay the sunk cost S_X that allows them to export directly: this gives them the possibility to draw their profitability parameter β_{ich} in each destination market. When a draw is successful, i.e. above $\underline{\beta_{ch}}$, firms pay the fixed export cost C_{ch} associated with this destination and export. If the draw is unsuccessful, they give up exporting to that destination. Note that this implies an imperfect sorting of firms across markets.

Alternatively, firms may choose to pay the sunk cost S_I. This allows them to match with a direct exporter, i.e. a firm that has paid S_X, in turn allowing them to use the export network of the exporter to draw their profitability parameter in each destination market.[17] The profits from successful draws are then split via Nash bargaining, where a share α is going to the indirect exporter while a share $(1-\alpha)$ is going to the actual exporter.

Matching

We deliberately choose to model the matching between direct and indirect exporters as simple as possible for two reasons. First, we do not observe indirect exporters in the data, so we cannot assess the bilateral specificities of the relationship. Second, our objective is to show how to generate the pattern of elasticities we uncover in Section 3 in a model also compatible with the other stylized facts we document. For this, we only need a sorting of firms between direct and indirect exporters based on their HRSD rank. We therefore go for the simplest matching process that delivers this sorting.

Firms decide whether to pay S_X and act as direct exporters, or to pay S_I and match with a direct exporter, or do not export. The identity of the direct exporter does not matter for the indirect exporter as they provide identical export networks. Indirect exporters thus randomly choose a firm that has paid S_X and the match occurs. As they are chosen randomly, all direct exporters have the

[17] As such, the model is closer to the literature viewing intermediaries as providing an export network to indirect exporters, as for example in Rauch and Watson (2004). Compared to them, we allow producers to use their network for themselves *and* for other firms.

same probability to match with each indirect exporter. The expected profits from intermediation for the direct exporter are labeled $\mathbb{E}[\Pi_I]$. This depends on the relative number of firms that have paid S_I and S_X, as well as the HRSD rank of indirect exporters. For simplicity, we assume there are enough firms such that each firm does not take into account the impact of its own choice on $\mathbb{E}[\Pi_I]$. We also assume that firms' export choices do not affect aggregate conditions in each export market.[18] Note that we could assume that $\mathbb{E}[\Pi_I]$ is an increasing function of the rank of the direct exporter, in line with the empirical evidence that the best firms have more sourced products (Bernard et al., 2019). As long as $\mathbb{E}[\Pi_I]$ is not decreasing in the rank of the direct exporter, our results carry through. To sum up, firms compare the following three options:

Status	**Expected profits**
exporting directly	$\pi_i^{XD} = \sum_{c\in C} \mathbb{E}_i[\pi_{ich}(\beta_{ich})] + \mathbb{E}[\Pi_I] - S_X$
exporting indirectly	$\pi_i^{XI} = \alpha \sum_{c\in C} \mathbb{E}_i[\pi_{ich}(\beta_{ich})] - S_I$
not exporting	0

When firms compare profits from exporting directly or indirectly, we get:

$$\pi_i^{XD} \geq \pi_i^{XI} \Leftrightarrow \quad \sum_{c\in C} \mathbb{E}_i[\pi_{ich}(\beta_{ich})] \geq \frac{S_X - \mathbb{E}[\Pi_I] - S_I}{(1-\alpha)}$$

The coexistence of direct and indirect exporters depends on the value of α. If α is too low, no firm would choose to export indirectly as they would not recover the sunk cost S_I. Similarly, if α is too high, profits from indirect exports always dominate the one from direct exporting. This is also true if $S_X - \mathbb{E}[\Pi_I] - S_I < 0$. We thus assume that $S_X - \mathbb{E}[\Pi_I] - S_I > 0$ and $\alpha \in (\alpha_{\min}, \alpha_{\max})$, such that we have the joint presence of direct and indirect exporters, in line with empirical evidence. It follows:

Lemma 1. *(Sorting) Let $F_{XD}(\beta)$ be the lowest ranked distribution for which firms pay the export sunk cost S_X. For any $F_{k>XD}(\beta)$, firms pay the export sunk cost S_X. For any $F_{j<XD}(\beta)$, firms do not pay the export sunk cost S_X.*

Proof: This is a direct application of Corollary 1, which implies that $\sum_{c\in C} \mathbb{E}_i[\pi_{ich}(a_{ich})]$ is increasing in firms' HRSD rank.

The model generates a prediction that is very similar to what already exists in the literature on trade intermediation. The best firms export directly, the least efficient firms do not export and firms in between may export indirectly, taking advantage of the presence of intermediaries (e.g. Ahn et al., 2011). There are two key differences. First, in our model, the direct manufacturing exporters are the intermediaries. As a consequence, the "technology" to export used by intermediaries is the same as for the direct exporters; there is no informational or technological advantage that leads to intermediation by producers. The second important difference is the way we define firm profitability.

[18] In particular, we abstract from potential cannibalization effects between produced and sourced products (see (Eckel and Riezman, 2020) for a discussion.

4.5 Trade patterns

In this section, we compute trade flows from the origin o and show how they react to gravity determinants. Aggregate trade flow of product h to destination c is the sum of (expected) firm sales:

$$X_{ch} = \sum_i \mathbb{E}_i [x_{ich}] \tag{12}$$

In the following, it will be convenient to express the expected firm sales as the firm sales conditional on exporting, weighted by the probability of making a good enough draw to export:

$$\mathbb{E}_i [x_{ich}] = P_i (x_{ich} > 0) \, \mathbb{E}_i [x_{ich} \mid x_{ich} \geq 0] \tag{13}$$

The probability of exporting to a given market for firm i is given by the probability of drawing $\beta_{ich} \geq \underline{\beta_{ch}}$:

$$P_i (x_{ich} > 0) = P_i \left[\beta_{ich} \geq \underline{\beta_{ch}}\right] = 1 - F_i \left(\underline{\beta_{ch}}\right) \tag{14}$$

This probability depends on market conditions in the destination: trade costs and competition/market access, summarized by A_{ch} (as $\underline{\beta_{ch}} = \left(\sigma_h \frac{C_{ch}}{A_{ch}}\right)^{\frac{1}{\sigma_h - 1}}$).

Expected firm sales conditional on exporting are the expected sales conditional on $\beta_{ich} \geq \underline{\beta_{ch}}$:

$$\mathbb{E}_i [x_{ich} \mid x_{ich} \geq 0] = A_{ch} \frac{\int_{\underline{\beta_{ch}}}^{\beta^{MAX}} \beta^{\sigma_h - 1} f_i(\beta) d\beta}{\int_{\underline{\beta_{ch}}}^{\beta^{MAX}} f_i(\beta) d\beta} \tag{15}$$

Note that these expressions hold for direct and indirect exporters. As such, there is a slight abuse of notation since, in the data, exports by indirect exporters are actually done by direct exporters. We can, however, consider them as two different flows (two different i's) as we do in our empirical analysis. Note also that, in line with empirical evidence, expected sales, conditional on exporting, are larger for direct exporters. In the following, we label the elasticity of Y to X as $\varepsilon_{Y/X} \equiv \frac{\partial Y}{\partial X} \frac{X}{Y}$.

Aggregate trade

First, note that the elasticity of aggregate trade to A_{ch} is the sum of the elasticities of firms' expected sales, weighted by their market shares:

$$\varepsilon_{X_{ch}/A_{ch}} = \sum_{ich} \varepsilon_{\mathbb{E}_i[x_{ich}]/A_{ch}} . s^i_{ch} \tag{16}$$

where $s^i_{ch} = \frac{\mathbb{E}_i[x_{ich}]}{X_{ch}}$ is the (expected) market share of firm i among exporters from the same origin in market ch. The elasticity of aggregate trade is thus driven by the unconditional elasticity of each exporter.

The firm level elasticity, unconditional on exporting, is given by:

$$\varepsilon_{\mathbb{E}_i[x_{ich}]/A_{ch}} = 1 + \frac{1}{\sigma_h - 1}\underline{\beta_{ch}}\frac{f_i(\underline{\beta_{ch}})}{1 - F_i\left(\underline{\beta_{ch}}\right)}\frac{\underline{\beta_{ch}}^{\sigma_h-1}}{\mathbb{E}_i\left[\beta_{ich}^{\sigma_h-1} \mid \beta_{ich} \geq \underline{\beta_{ch}}\right]} \tag{17}$$

It follows:

Proposition 1. *Aggregate elasticities are: (i) increased by uncertainty in β, and (ii) lower for flows of direct exports compared to flows of indirect exports.*

Proof: see Appendix A.1.

This expression is strictly decreasing in the HRSD rank of the firm, and larger than 1, which corresponds to the case where there is no uncertainty in β_{ich}. As firms sort themselves according to their HRSD rank, all firms selling indirectly have a lower rank and thus a larger unconditional elasticity. Aggregate elasticities being a weighted sum of the firm level elasticities, they inherit their properties.

Aggregate elasticities are increased by the presence of uncertainty in β because an increase in $\underline{\beta_{ch}}$ not only forces firms to exit at the margin but along the whole distribution. This increase is smaller for flows of direct exports because of the lower hazard rate of better distributions. Elasticities are larger for indirect exporters because these exporters tend to exit more when markets become more difficult to reach, either because they are more costly to access or because they are smaller/more competitive. This matches the result found in Section 3 where we show that the larger aggregate elasticity of indirect exports is driven by a larger exit of firms. The model thus shows how aggregate indirect exports react more strongly to gravity determinants while being exported with the same information set and technology as aggregate direct exports. Note also that in this framework, these goods are similar in all ways to those directly exported, and in particular, the demand elasticity is the same.

Firm level trade

Empirically, the firm level elasticities we have found are elasticities conditional on exporting. Firm level exports, conditional on exporting, are given by:

$$\mathbb{E}_i\left[x_{ich} \mid x_{ich} \geq 0\right] = \mathbb{E}_i\left[A_{ch}\beta_{ich}^{\sigma_h-1} \mid \beta_{ich} \geq \underline{\beta_{ch}}\right] \tag{18}$$

We get:

$$\varepsilon_{\mathbb{E}_i[x_{ich}|x_{ich}\geq 0]/A_{ch}} = 1 - \frac{1}{\sigma_h - 1}\underline{\beta_{ch}}\frac{f_i(\underline{\beta_{ch}})}{1 - F_i\left(\underline{\beta_{ch}}\right)}\left(1 - \frac{\underline{\beta_{ch}}^{\sigma_h-1}}{\mathbb{E}_i\left[\beta_{ich}^{\sigma-1} \mid \beta_{ich} \geq \underline{\beta_{ch}}\right]}\right) \tag{19}$$

It follows:

Proposition 2. *Firm level elasticities are lowered by uncertainty in β.*

Proof: see Appendix A.2.

Without uncertainty in β_{ich}, we would get $\varepsilon_{\mathbb{E}_n[x_{ich}|x_{ich}\geq 0]/A_{ch}} = 1$. These elasticities are thus lowered by the randomness in β_{ich}, because $\varepsilon_{\mathbb{E}_i\left[\beta_{ich}^{\sigma_h-1}|\beta_{ich}\geq\underline{\beta_{ch}}\right]/A_{ch}} < 0$: as firms move to more difficult markets, they need better draws in β_{ich}, implying a larger expected β_{ich}, conditional on exporting. Put differently, the increase of $\mathbb{E}_i\left[\beta_{ich}^{\sigma_h-1} \mid \beta_{ich} \geq \underline{\beta_{ch}}\right]$ makes firms relatively better sellers, conditional on exporting.

Furthermore, the above expression generates larger firm level elasticities for higher ranked firms, as in the data, for many functional forms of $f(\beta)$, including the Pareto distribution.[19]

Finally, the gap between the conditional and the unconditional elasticity is given by:

$$\varepsilon_{\mathbb{E}_i[x_{ich}]/A_{ch}} - \varepsilon_{\mathbb{E}_i[x_{ich}|x_{ich}\geq 0]/A_{ch}} = \frac{1}{\sigma_h - 1}\underline{\beta_{ch}}\frac{f_i(\underline{\beta_{ch}})}{1 - F_i\left(\underline{\beta_{ch}}\right)} \tag{20}$$

It follows:

Proposition 3. *The difference between the conditional and the unconditional elasticity increases for firms with lower HRSD rank (elasticity divergence).*

This difference is the elasticity of the probability of exporting, as the difference between conditional and unconditional expected exports is simply the probability of exporting; see equations (13) and (18). By definition of HRSD, it is decreasing in the rank of the firm.

The gap between the conditional and the unconditional elasticities is thus larger for indirect exporters, in line with our empirical results (as the unconditional elasticity drives the aggregate one). As A_{ch} decreases (more difficult markets), $\underline{\beta_{ch}}$ increases and relatively more indirect exporters are forced to exit at the margin. An increase in $\underline{\beta_{ch}}$ thus transfers more probability mass towards higher values of possible β_{ch} for indirect exporters. This result shows that in this model, observed firm performance does not fully determine the pattern of entry/exit. In other words, the causality from observed profitability to the probability of exporting is not perfect. The uncertainty about β_{ch}, which is correlated across markets, can thus explain the pattern of elasticities we find in the data.

Note that in the standard model without any uncertainty (i.e. with β constant across destinations), these two elasticities are equal, except for firms at the margin (those that exit). If *i.i.d.* shocks are present, the probability of exporting to the next market will be different than 0 or 1. This probability then depends on the profitability of the firm. For the most productive firms, only large shocks may force them to exit.[20] The probability of exit is thus moving together with the profitability of the firm. Thus, this class of models cannot generate the elasticity divergence we observe.

[19] Suppose β is drawn from a Pareto distribution over $(0, 1)$, with a shape parameter $\alpha > 1$: $F_\alpha(\beta) = \beta^\alpha$. A larger α implies a better distribution in terms of HRSD. We get: $\mathbb{E}_i\left[\beta_{ich}^{\sigma_h-1} \mid \beta_{ich} \geq \underline{\beta_{ch}}\right] = \frac{\alpha}{\sigma_h+\alpha-1}\frac{1-\underline{\beta_{ch}}^{\sigma_h+\alpha-1}}{1-\underline{\beta_{ch}}^{\alpha}}$. Thus:

$$\varepsilon_{\mathbb{E}_i[x_{ich}|x_{ich}\geq 0]/A_{ch}} = 1 - \frac{1}{\sigma_h - 1}\left(\alpha\frac{\underline{\beta_{ch}}^{\alpha}}{1-\underline{\beta_{ch}}^{\alpha}} - (\sigma_h + \alpha - 1)\frac{\underline{\beta_{ch}}^{\sigma_h+\alpha-1}}{1-\underline{\beta_{ch}}^{\sigma_h+\alpha-1}}\right)$$

which is increasing in α.

[20] See for example Bernard et al. (2011) and Eaton et al. (2011).

It is also possible to get endogenous firm level conditional elasticities, for example in the presence of a non-constant demand elasticity. However, assuming that demand becomes more elastic moving up the demand curve (i.e. assuming Marshall's second law of demand, which has large empirical support), larger/better firms would have a lower conditional elasticity. No matter the case considered, if sales decline less for some firms, we expect them to have a larger probability to continue exporting. It is thus not simple to find a rationale for the pattern we find in the data with existing models.

Finally, our model is consistent with the other stylized facts we document. In particular, the model predicts lower export flows for sourced products and the presence of PI flows arises naturally.

4.6 Testing the model's mechanism

The model provides a rationale for the pattern we find in the data. The mechanism generating this result is tied to the assumption that firm profitability is stochastic across markets and can be ordered across firms by hazard rate stochastic ordering (HRSD). Here, we check whether the data are consistent with this key assumption and thus support the mechanism put forward in the model.

While we cannot directly observe the distributions $F_i(\beta)$, we can recover the realizations across markets for each firm-product pair. In turn, we can compare them for each product between sourced and produced exports. Note that these distributions are firm-product specific.[21] Realizations, on the other hand, are firm-product-destination-year specific. Hence, we run the following regression to isolate the firm-product specific component of sales:

$$x_{icht} = \mathbf{FE}_{iht} + \mathbf{FE}_{cht} + \mathbf{FE}_{ict} + \mathbf{FE}_{ich} + \epsilon_{icht} \tag{21}$$

Compared to equation (6), we add $\mathbf{FE}_{ich}$, to ensure that $\mathbf{FE}_{iht}$ captures solely the firm-product-year dimension of sales. For robustness and to make it more comparable with our previous results, we also run equation (21) without the last set of fixed effects $\mathbf{FE}_{ich}$. Thus, $\mathbf{FE}_{iht}$ provides an estimate of the mean of $F_i(\beta)$ for each firm-product pair, and $\mathbf{FE}_{iht} + \epsilon_{icht}$ provides an estimate of the realizations of the draws in $F_i(\beta)$ by firm i for product h in country c, i.e. estimates of each β_{ich} at time t.

One key implication of HRSD is that it preserves first and second order stochastic dominance for truncated distributions (see Corollary 1). It follows that, in each market, sales of sourced products have a lower mean and a larger variance, compared to produced products.[22] The lower mean leads sales of sourced products to be smaller and less profitable. Hence, they tend to exit more when moving to the next, more difficult market. The larger variance leads sales of sourced products, in each market, to also be more dispersed, i.e. sales of sourced products are more "risky." When moving to the next market, it implies that, conditional on the mean, the probability to make better draws is also larger,

[21] In the model, we assume for simplicity that these distributions are stable over time. However, our results would also hold if we let these distributions evolve over time, as long as their ranking is left unaffected. To take into account this possibility, we also control for the time dimension in our sets of fixed effects.

[22] Formally, Corollary 1 implies that if $F_n(\beta) \overset{hr}{\succ} F_m(\beta)$, then $\mathbb{E}_n\left[\beta_{ich} \mid \beta_{ich} \geq \underline{\beta_{ch}}\right] > \mathbb{E}_m\left[\beta_{ich} \mid \beta_{ich} \geq \underline{\beta_{ch}}\right]$, $\forall \underline{\beta_{ch}}$ and $\mathbb{V}_n\left[\beta_{ich} \mid \beta_{ich} \geq \underline{\beta_{ch}}\right] < \mathbb{V}_m\left[\beta_{ich} \mid \beta_{ich} \geq \underline{\beta_{ch}}\right]$, $\forall \underline{\beta_{ch}}$.

in turn generating a relatively lower reaction of their sales, conditional on exporting. Therefore, we want to test here whether these two properties of HRSD that are driving our theoretical results do appear in the data.

We first collect $\mathbf{FE}_{iht}$ for each firm-product pair. Then, for a given product, we compare the mean of $\mathbf{FE}_{iht}$ in each market for produced and sourced flows, i.e. $\mathbb{E}^{m}_{cht}\left[\mathbf{FE}_{iht}\right]$, with $m = \{P, S\}$ (produced, sourced). We test for the following condition:

$$\mathbb{E}^{P}_{cht}\left[\mathbf{FE}_{iht}\right] > \mathbb{E}^{S}_{cht}\left[\mathbf{FE}_{iht}\right], \forall\, cht$$

Second, we collect ϵ_{icht} for each firm-product pair. Then, for a given product, we compare the variance of ϵ_{icht} in each market for produced and sourced flows, i.e. $\mathbb{V}^{m}_{cht}\left[\epsilon_{icht}\right]$, with $m = \{P, S\}$. Thus, we check whether:

$$\mathbb{V}^{S}_{cht}\left[\epsilon_{icht}\right] > \mathbb{V}^{P}_{cht}\left[\epsilon_{icht}\right], \forall\, cht$$

To have meaningful estimations, we restrict our sample to markets where we have at least five observations, per market-year, of produced and of sourced flows for a given product h. For robustness, we further restrict the sample to have at least 10 observations of each.

Table 8 panel (a) shows the results with minimum five observations, and panel (b) shows the corresponding results with minimum 10 observations. Note that we include cht fixed effects in all regressions. Hence, we compare the mean and the variance of produced and sourced flows for a given product, in the same markets and years, as required by the model. Column 1 regresses $\mathbf{FE}_{iht}$ that is obtained from a first-stage regression with cht, iht, ict, and ich fixed effects, i.e. from equation (21), on a dummy that indicates whether the flows are sourced, and finds that $\mathbf{FE}_{iht}$, capturing the mean of $F_i(\beta)$, is significantly lower for sourced products. Column 2 uses $\mathbf{FE}_{iht}$ estimated from the first-stage regression without ich fixed effects and finds a similar coefficient.

In column 3 of Table 8, we regress the within product-market variance of residuals that are estimated from the first-stage regression (equation (21)) with the most restrictive fixed effects, and find that these variances are larger for sourced products when compared to produced products. Column 4 uses residuals from the less restrictive first-stage regression, and confirms the higher variability of sourced flows within a given market. In panel (b), to make sure that fixed effects and residuals are estimated with enough variation, we restrict the sample to $mcht$ with at least 10 observations. The results corroborate the findings of panel (a). These results indicate that sourced exports are both less profitable and more risky. On average, this pattern is true across markets (and thus no matter the truncation of $F_{ih}(\beta)$), which thus provides evidence of the model's mechanism that explains the pattern of elasticities we find in the data.

Table 8: Testing for the model's mechanism

Dependent variable:	$\mathbb{E}^{m}_{cht}[\mathbf{FE}_{iht}]$		$\mathbb{V}^{m}_{cht}[\epsilon_{icht}]$	
(a) $\geq$ 5 obs.	(1)	(2)	(3)	(4)
Sourced_m	-0.816***	-0.969***	0.036***	0.080***
	(0.033)	(0.025)	(0.012)	(0.021)
First-stage FE	cht, iht, ict, ich	cht, iht, ict	cht, iht, ict, ich	cht, iht, ict
FE	cht	cht	cht	cht
N	23,453	45,199	23,453	45,199
R^2	0.96	0.95	0.90	0.90
(b) $\geq$ 10 obs.	(1)	(2)	(3)	(4)
Sourced_m	-0.913***	-0.947***	0.064***	0.105***
	(0.057)	(0.037)	(0.017)	(0.027)
First-stage FE	cht, iht, ict, ich	cht, iht, ict	cht, iht, ict, ich	cht, iht, ict
FE	cht	cht	cht	cht
N	5,422	11,708	5,422	11,708
R^2	0.97	0.97	0.91	0.91

Notes: $\mathbb{E}^{m}_{cht}[\mathbf{FE}_{iht}]$ is the mean of the estimated $\mathbf{FE}_{iht}$ for $m = P, S$; $\mathbb{V}^{m}_{cht}[\epsilon_{icht}]$ is the variance of the estimated residuals ϵ_{icht}. Sourced_m is dummy variable that indicates whether the export flow m is sourced as opposed to produced. Panel (a) restricts the sample to $mcht$ with at least 5 observations, and panel (b) restricts the sample to $mcht$ with at least 10 observations. Columns 1 and 3 use estimates obtained from a first-stage regression with cht, iht, ict, and ich fixed effects, whereas columns 2 and 4 use estimates obtained from a first-stage regression with cht, iht, and ict fixed effects. Robust standard errors are in parentheses. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels respectively.

5 TIP, CAT, and TII

In this final section, we discuss two issues raised by our results. First, the literature has suggested that trade intermediation by producers is driven by complementarities between exports of produced goods and sourced goods (e.g. Bernard et al., 2019; Eckel and Riezman, 2020). Our model, on the other hand, does not include complementarities between these flows and is thus uninformative about them. In Section 5.1, we propose a simple test to see whether these possible complementarities also appear in our data. Second, we have shown that producers act as trade intermediaries. Hence, it seems natural to ask whether there is a difference between this trade of sourced products and the trade done by professional (non-manufacturing) intermediaries. Therefore, in Section 5.2, we compare trade intermediation by producers (TIP) to trade intermediation by professional intermediaries (TII).

5.1 TIP: is it about intermediation only?

Our model does not incorporate complementarities between exports of sourced and produced products. This is first motivated by the fact that the gravity pattern remains when we look at PI exports. This result implies that these complementarities, if present, are not driving the difference in elasticities we find. However, this does not mean that they are not present in our data. Here, we do not assess what type of complementarities could be present, but provide a clear indication that there are some.[23] To do so, we take advantage of the presence of PI flows for which such possible complementarities cannot be present by definition. Note that this is a new approach to provide evidence for these complementarities, as we focus on trade of sourced products and not of produced products, in contrast to what has been done in the literature (e.g. Bernard et al., 2019; Arnarson, 2020).

The idea is simple: if there are some complementarities, they may appear for flows of sourced products when exported together with produced products, and not when exported alone. These complementarities should generate additional gains that would make it possible to profitably export less of the sourced product. In terms of our model, it should lower $\underline{\beta_{ch}}$; for a given sourced product, each destination becomes easier to access when bundled with a produced product. By definition, this cannot be the case for a PI flow.

We thus plot firm-level export flows for each HS section and for each of the eight main regions of the world. We first compare sourced exports to produced exports as decomposed in equation (2). We then split sourced exports into CAT exports (for which complementarities may be present) and PI exports as in (3). Figure 1 depicts the histogram for the main HS section (Textiles and Apparel), and Figure 2 depicts it for the top regional destination of Turkish exports (Europe).

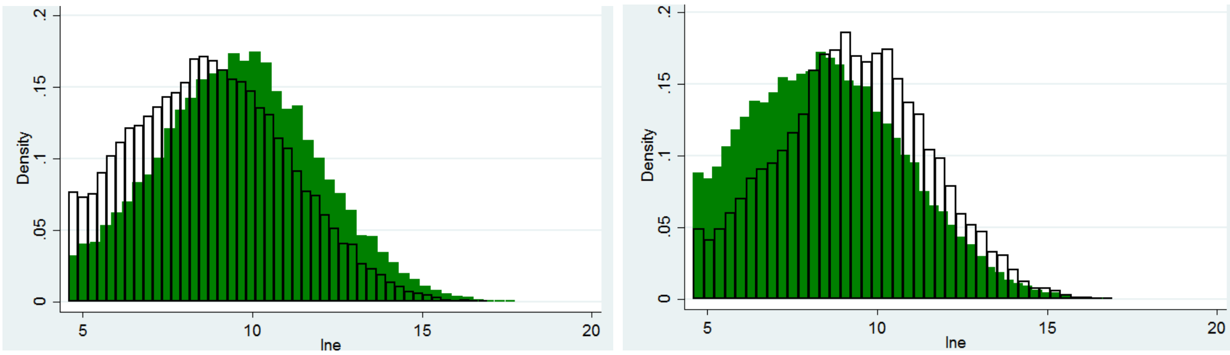
Panels (a) of Figures 1 and 2 show that, as expected, exports of sourced products (transparent bars) are on average lower than produced exports (shaded bars). More importantly, panels (b) illustrate that PI exports are on average larger than CAT exports. This is what the model would predict if $\underline{\beta_{ch}}$ is lowered for CAT exports across destinations compared to PI exports. This pattern holds true for *all* HS sections and destinations (see Appendix Figures B.1 and B.2). We interpret this systematic pattern as suggestive evidence of some positive complementarities between exports of sourced and produced products. These complementarities make smaller exports of sourced products profitable when exported together with a produced product. When firms cannot take advantage of these complementarities, they need to export on average more of the sourced product. While our main results support the view that accessing export markets generates gains for firms beyond the increased market size for their own products as they also act as intermediaries, this last result suggests that firms may additionally benefit from complementarities between sourced and produced products when possible.

[23] Bernard et al. (2019) discuss in detail the various possible complementarities that can be at work.

Figure 1: Distribution of flows for Textiles and apparel

(a) Produced vs. sourced

(b) CAT vs. PI

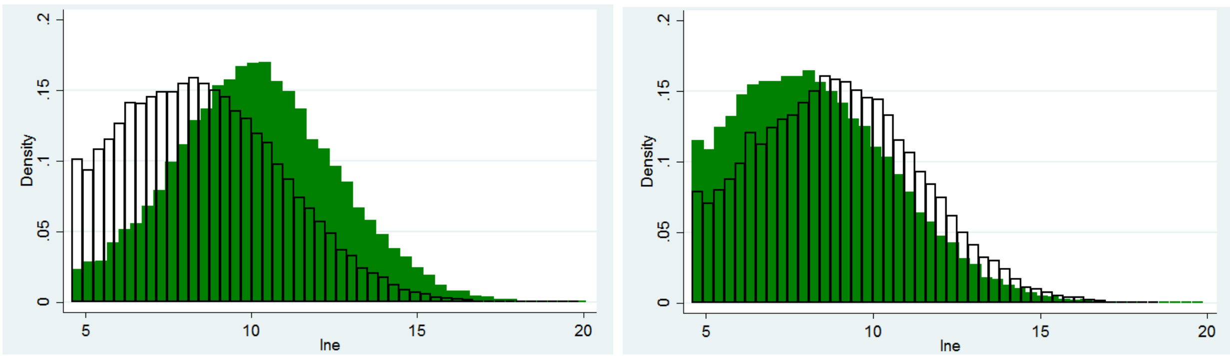


Notes: Panel (a) shows the histogram of produced (shaded bars) versus sourced (transparent bars) export flows. Panel (b) shows the histogram of CAT (shaded bars) versus PI (transparent bars) export flows. Exports are in logs (*lne*). The sample includes exports of products in the Textiles and apparel sector in 2010.

Figure 2: Distribution of flows to Europe

(a) Produced vs. sourced

(b) CAT vs. PI



Notes: Panel (a) shows the histogram of produced (shaded bars) versus sourced (transparent bars) export flows. Panel (b) shows the histogram of CAT (shaded bars) versus PI (transparent bars) export flows. Exports are in logs (*lne*). The sample includes exports to Europe in 2010.

5.2 Comparing TIP and TII

The literature that compares the behaviour of professional intermediaries to manufacturing exporters mainly shows that intermediaries facilitate international trade in two ways.[24] First, intermediaries export goods produced by firms that are not productive enough to export directly, thus allowing more goods to be exported. This is also the case in our model as exports of sourced products have a lower HRSD rank. Second, intermediaries have a comparative advantage in exporting due to some specific market knowledge, information and/or technological advantage. They are thus able to alleviate the difficulty of reaching less-accessible markets.[25] By definition, this type of technological or

[24] See, for example, Bernard et al. (2010), Blum et al. (2010), Ahn et al. (2011), Crozet et al. (2013), Bernard et al. (2015), and Akerman (2018).

[25] Typically, it has been shown that the share of aggregate exports by intermediaries tends to rise with various measures of destination specific fixed/sunk costs of exporting.

informational advantage cannot be present when we compare exports of produced and sourced goods by manufacturers, as the exporters are the same firms. As we show below, we also find suggestive evidence for this comparative advantage of intermediaries in our data.

Table 9: Results with professional intermediaries

Dependent variable:	(1) $\ln X_{mcht}$	(2) $\ln avg_{mcht}$	(3) $\ln no_{mcht}$
Sourced$_m$	-0.662***	-0.771***	0.109***
	(0.059)	(0.049)	(0.024)
Inter.$_m$	-0.741***	-0.708***	-0.034
	(0.068)	(0.059)	(0.028)
MC_{cHt}	0.094***	0.007	0.087***
× Sourced$_m$	(0.021)	(0.015)	(0.017)
MC_{cHt}	-0.078**	-0.057**	-0.021
× Inter.$_m$	(0.031)	(0.026)	(0.017)
FT_{cHt}	0.105***	-0.005	0.111***
× Sourced$_m$	(0.019)	(0.015)	(0.012)
FT_{cHt}	0.103***	-0.010	0.113***
× Inter.$_m$	(0.039)	(0.023)	(0.025)
FE	*cht*	*cht*	*cht*
N	1,340,628	1,340,628	1,340,628
R^2	0.81	0.81	0.78

Notes: $\ln X_{mcht}$ is log export values, $\ln avg_{mcht}$ is log average exports per firm, and $\ln no_{mcht}$ is the log number of exporters at the country-HS6-year (cht) level. Sourced$_m$ is a dummy variable that indicates whether the export flow m is sourced as opposed to produced. Inter$_m$ is a dummy variable that indicates whether the export flow m is done by professional intermediaries. MC_{cHt} and FT_{cHt} refer to market capacity and freeness of trade at the country-HS2-year level (cHt) respectively. Clustered standard errors (by country and HS6) are in parentheses. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels respectively.

We follow the same empirical strategy as before to compare TIP and TII, estimating a gravity equation at the aggregate (product) level to directly compare our results to the literature. In contrast to previous literature though, we compare exports by professional intermediaries to the two export flows of producers (sourced and produced), for the same good sold to the same destination. To do so, we now add to our dataset the exports of professional intermediaries.[26]

Table 9 shows the results of estimating specification (5) including professional intermediaries. First, column 1 shows that the interactions with the sourced dummy are virtually unchanged compared to our baseline, providing another robustness check to our main result. The interactions of FT with the intermediary dummy and the sourced dummy are similar – both TIP and TII react more strongly to trade freeness than flows of produced goods. However, the interaction of the intermediary dummy with MC is negative and significant at the 5% level; exports by intermediaries react even less to MC than produced exports. This result confirms what has been found in the literature. A low market

[26] Professional intermediaries are defined as in footnote 2.

capacity captures various hurdles to trade with this country. Some specific knowledge or information associated with this country may therefore be particularly important to sell there. As market capacity gets lower, such specific knowledge becomes relatively more important to export. Columns 2 and 3 show the corresponding results for average exports and number of exporters respectively.

In Table 10, we run two alternative specifications. We first run our specification bundling the exports of sourced and produced products together, thus comparing trade by manufacturers to trade by intermediaries (TII), to make our results directly comparable with the literature. Second, we bundle trade by intermediaries and sourced exports together, to compare trade of direct exports to trade of indirect exports (i.e. TIP+TII).

Table 10: Results with bundled flows

	(1)	(2)
Dependent variable:	$\ln X_{mcht}$	$\ln X_{mcht}$
Inter.$_m$	-0.587***	
	(0.054)	
MC_{cHt} × Inter.$_m$	-0.253***	
	(0.033)	
FT_{cHt} × Inter.$_m$	-0.020	
	(0.039)	
Sourced$_m$		-0.289***
		(0.059)
MC_{cHt} × Sourced$_m$		0.103***
		(0.023)
FT_{cHt} × Sourced$_m$		0.221***
		(0.026)
FE	cht	cht
N	1,181,528	1,089,332
R^2	0.88	0.90

Notes: $\ln X_{mcht}$ is log export values at the country-HS6-year (cht) level. Inter$_m$ is dummy variable that indicates whether the export flow m is done by professional intermediaries as opposed to producers. Sourced$_m$ is dummy variable that indicates whether the export flow m is sourced as opposed to produced, and it includes both sourced exports of manufacturers and professional intermediaries. MC_{cHt} and FT_{cHt} refer to market capacity and freeness of trade at the country-HS2-year level (cHt) respectively. Clustered standard errors (by country and HS6) are in parentheses. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels respectively.

Table 10 column 1 shows that when we compare manufacturers with professional intermediaries, we get similar results to what has been shown in the literature: intermediaries react less to MC and FT than producers do (although the coefficient for the latter is not statistically significant). In contrast, when we compare direct trade to intermediated trade in column 2, we get the opposite result: intermediated trade reacts more to MC and FT. Put differently, there is a difference between intermediated trade and trade by intermediaries. This is driven by the difference between TIP and

TII: exports that are intermediated by manufacturers are more sensitive to gravity determinants and therefore more present in easily accessible markets – which is also in line with the fact that these goods are less profitable – while professional intermediaries seem to have more specific market knowledge to export. A comparison between producers and professional intermediaries may thus be misleading about the characteristics of intermediated trade.

6 Conclusion

In this paper, we have first confirmed that manufacturing exporters also export sourced products. This phenomenon is ubiquitous across firms, products and destinations. Taking this intermediation by producers into account leads to more than double the amount of aggregate exports of Turkey that is intermediated. We further document that, to many destinations, producers ship only sourced products, engaging in pure intermediation (PI). We then show that this trade is more sensitive to gravity determinants at the aggregate level, but it is less sensitive at the firm level, conditional on exporting, what we refer to as an elasticity divergence. We take advantage of the presence of PI exports to show that this striking pattern cannot be explained by complementarities between exports of produced and sourced products.

We then develop a model to rationalize the data. Beyond allowing producers to act as intermediaries, the key novel feature of the model is that profitability in each destination is stochastic and these shocks are correlated across markets, thus affecting firms' pattern of entry and exit. We further provide empirical evidence in favor of the model's core mechanism. In the last part of the paper, we compare PI flows to CAT flows and find suggestive evidence for complementarities between exports of produced and sourced products. Finally, we highlight the different behavior of trade intermediation by producers (TIP) compared to trade intermediation by professional intermediaries (TII).

The different reaction of sourced exports to gravity determinants is important because it points to a specific selection mechanism and it implies that sourced exports matter for the pattern of aggregate trade. It also shows that TIP is not a statistical artifact, driven by misclassification of product codes or inaccurate concordance procedures. Overall, our results imply that building an export network can generate gains for firms beyond having access to a larger market for their products. It allows them to reap further benefits through intermediation and potential complementarities between sourced and produced exports.

We have left two important questions aside for future research. First, we remain silent about the determinants of the match between a direct exporter and an indirect exporter. Yet, the data suggest that there is heterogeneity among manufacturing exporters regarding how much they engage in sourced exporting. Second, we abstract from the export dynamics of sourced products. Are they introduced first in some specific destinations, together or not with produced products? How much of firms' export growth is driven by sourced exports? These types of questions are key to understand the selection and dynamics of firms in export markets.

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A Theoretical appendix

A.1 Computation of the aggregate elasticity

Computation of $\varepsilon_{X_{ch}/A_{ch}}$:

$$\varepsilon_{X_{ch}/A_{ch}} = \sum_{ich} \varepsilon_{\mathbb{E}_i[x_{ich}]/A_{ch}}.s^i_{ch}$$

First, note that:

$$\mathbb{E}_i\left[x_{ich}\right] = P_i\left(x_{ich} > 0\right)\mathbb{E}_i\left[x_{ich} \mid x_{ich} \geq 0\right] = A_{ch}\int_{\underline{\beta_{ch}}}^{\beta^{MAX}} \beta^{\sigma_h - 1} f_i(\beta)d\beta$$

We get:

$$\frac{\partial A_{ch}\int_{\underline{\beta_{ch}}}^{\beta^{MAX}} \beta^{\sigma_h-1} f_i(\beta)d\beta}{\partial A_{ch}} = \int_{\underline{\beta_{ch}}}^{\beta^{MAX}} \beta^{\sigma_h-1} f_i(\beta)d\beta - A_{ch}\frac{\partial \underline{\beta_{ch}}}{\partial A_{ch}}\underline{\beta_{ch}^{\sigma_h-1}} f_i(\underline{\beta_{ch}})$$

Thus:

$$\begin{aligned}\varepsilon_{\mathbb{E}_i[x_{ich}]/A_{ch}} &= \left(\int_{\underline{\beta_{ch}}}^{\beta^{MAX}} \beta^{\sigma_h-1} f_i(\beta)d\beta - A_{ch}\frac{\partial \underline{\beta_{ch}}}{\partial A_{ch}}\underline{\beta_{ch}^{\sigma_h-1}} f_i(\underline{\beta_{ch}})\right)\frac{A_{ch}}{\mathbb{E}_i\left[x_{ich}\right]} \\ &= 1 - A_{ch}\frac{\partial \underline{\beta_{ch}}}{\partial A_{ch}}\frac{\underline{\beta_{ch}^{\sigma_h-1}} f_i(\underline{\beta_{ch}})}{\int_{\underline{\beta_{ch}}}^{\beta^{MAX}} \beta^{\sigma_h-1} f_i(\beta)d\beta}\end{aligned}$$

Further note that:

$$\frac{\partial \underline{\beta_{ch}}}{\partial A_{cH}} = -\frac{1}{\sigma-1}\frac{1}{A_{ch}}\underline{\beta_{ch}}$$

We obtain the expression in the text:

$$\begin{aligned}\varepsilon_{\mathbb{E}_i[x_{ich}]/A_{ch}} &= 1 + \frac{1}{\sigma-1}\underline{\beta_{ch}}\frac{\underline{\beta_{ch}^{\sigma-1}} f_i(\underline{\beta_{ch}})}{\int_{\underline{\beta_{ch}}}^{\beta^{MAX}} \beta^{\sigma-1} f_i(\beta)d\beta} \\ &= 1 + \frac{1}{\sigma_h-1}\underline{\beta_{ch}}\frac{f_i(\underline{\beta_{ch}})}{1-F_i\left(\underline{\beta_{ch}}\right)}\frac{\underline{\beta_{ch}^{\sigma_h-1}}}{\mathbb{E}_i\left[\beta_{ich}^{\sigma_h-1} \mid \beta_{ich} \geq \underline{\beta_{ch}}\right]}\end{aligned}$$

By definition of HRSD, $\frac{f_i(\underline{\beta_{ch}})}{1-F_i(\underline{\beta_{ch}})}$ is lower for firms with a higher HRSD rank. Similarly for those firms, $\mathbb{E}_i\left[\beta_{ich}^{\sigma_h-1} \mid \beta_{ich} \geq \underline{\beta_{ch}}\right]$ is larger (see Corollary 1), implying lower unconditional elasticity for firms with higher HRSD rank.

A.2 Computation of the firm level elasticity

We have:

$$\mathbb{E}_i\left[x_{ich} \mid x_{ich} \geq 0\right] = A_{ch}\mathbb{E}_i\left[\beta_{ich}^{\sigma_h-1} \mid \beta_{ich} \geq \underline{\beta_{ch}}\right]$$

The elasticity of expected firm sales, conditional on exporting is given by:

$$\varepsilon_{\mathbb{E}_i[x_{ich}|x_{ich}\geq 0]/A_{ch}} = 1 + \varepsilon_{\mathbb{E}_i\left[\beta_{ich}^{\sigma_h-1}|\beta_{ich}\geq\underline{\beta_{ch}}\right]/A_{ch}}$$

We get:

$$\begin{aligned}
&\varepsilon_{\mathbb{E}_i\left[\beta_{ich}^{\sigma_h-1}|\beta_{ich}\geq\underline{\beta_{ch}}\right]/A_{ch}} \\
= & \frac{-\frac{\partial\underline{\beta_{ch}}}{\partial A_{ch}}\underline{\beta_{ch}}^{\sigma_h-1}f_i(\underline{\beta_{ch}})\int_{\underline{\beta_{ch}}}^{\beta^{MAX}} f_i(\beta)d\beta + \int_{\underline{\beta_{ch}}}^{\beta^{MAX}} \beta^{\sigma_h-1}f_i(\beta)d\beta\frac{\partial\underline{\beta_{ch}}}{\partial A_{ch}}f_i((\underline{\beta_{ch}})}{\left(\int_{\underline{\beta_{ch}}}^{\beta^{MAX}} f_i(\beta)d\beta\right)^2}\frac{A_{ch}}{\mathbb{E}_i\left[\beta_{ich}^{\sigma_h-1}\mid\beta_{ich}\geq\underline{\beta_{ch}}\right]} \\
= & \frac{\partial\underline{\beta_{ch}}}{\partial A_{ch}}f_i(\underline{\beta_{ch}})A_{ch}\frac{\int_{\underline{\beta_{ch}}}^{\beta^{MAX}} \beta^{\sigma_h-1}f_i(\beta)d\beta - \underline{\beta_{ch}}^{\sigma_h-1}\int_{\underline{\beta_{ch}}}^{\beta^{MAX}} f_i(\beta)d\beta}{\int_{\underline{\beta_{ch}}}^{\beta^{MAX}} f_i(\beta)d\beta\int_{\underline{\beta_{ch}}}^{\beta^{MAX}} \beta^{\sigma_h-1}f_i(\beta)d\beta} \\
= & \frac{\partial\underline{\beta_{ch}}}{\partial A_{ch}}A_{ch}\frac{f_i(\underline{\beta_{ch}})}{1-F_i\left(\underline{\beta_{ch}}\right)}\left(1-\frac{\underline{\beta_{ch}}^{\sigma_h-1}}{\mathbb{E}_i\left[\beta_{ich}^{\sigma_h-1}\mid\beta_{ich}\geq\underline{\beta_{ch}}\right]}\right)
\end{aligned}$$

Again, noting that $\frac{\partial\underline{\beta_{ch}}}{\partial A_{cH}}A_{cH} = -\frac{1}{\sigma-1}\underline{\beta_{ch}}$, we obtain the expression in the text:

$$\varepsilon_{\mathbb{E}_i[x_{ich}|x_{ich}\geq 0]/A_{ch}} = 1 - \frac{1}{\sigma_h-1}\underline{\beta_{ch}}\frac{f_i(\underline{\beta_{ch}})}{1-F_i\left(\underline{\beta_{ch}}\right)}\left(1-\frac{\underline{\beta_{ch}}^{\sigma_h-1}}{\mathbb{E}_i\left[\beta_{ich}^{\sigma-1}\mid\beta_{ich}\geq\underline{\beta_{ch}}\right]}\right)$$

By definition of HRSD, $\frac{f_i(\underline{\beta_{ch}})}{1-F_i\left(\underline{\beta_{ch}}\right)}$ is lower for firms with a higher HRSD rank, which would imply larger elasticity for those firms. However, $\mathbb{E}_i\left[\beta_{ich}^{\sigma_h-1}\mid\beta_{ich}\geq\underline{\beta_{ch}}\right]$ is larger for these firms (see Corollary 1). Which effect dominates depends on the functional form of f. For many functional forms, the effect on $\frac{f_i(\underline{\beta_{ch}})}{1-F_i\left(\underline{\beta_{ch}}\right)}$ dominates, as for example with the Pareto example we gave in the text, implying larger conditional elasticity for firms with higher HRSD rank.

B Empirical appendix

B.1 Data and descriptive statistics

Table B.1 shows examples of firms that engage in sourced exporting and their products ranked by sales.[27] For instance, a large manufacturer of motor vehicles produced four HS4+ products in 2010: *buses*, *lorries*, *trailers*, and *passenger cars*. However, it exported 64 HS4+ products, 62 of which were not produced by this firm. These sourced products consisted mostly of inputs such as *motor vehicle bodies*, *safety glass*, and *new pneumatic tyres*. The second example is a mid-sized manufacturer of apparel that produces two different kinds of *men's shirts*, but exports only one of them, alongside other exported products such as *women's blouses and shirts*. The third example is a small manufacturer of textiles that produces *woven fabrics of carded wool* that it does not export, and instead, it exports *carpets* and *bedspreads*.

Table B.1: Examples of sourced exporting firms

Product	Produced	Exported
Large manufacturer of motor vehicles		
1. Buses	Yes	Yes
2. Lorries	Yes	Yes
3. Trailers	Yes	No
4. Passenger cars	Yes	No
5. Motor vehicle bodies	No	Yes
6. Safety glass	No	Yes
7. New pneumatic tyres	No	Yes
...		
Mid-sized manufacturer of apparel		
1. Men's shirts (not knitted or crocheted)	Yes	Yes
2. Men's shirts (knitted or crocheted)	Yes	No
3. Women's blouses and shirts	No	Yes
Small manufacturer of textiles		
1. Woven fabrics of carded wool	Yes	No
2. Carpets and other textile floor-coverings	No	Yes
3. Bedspreads and textile wall-coverings	No	Yes
...		

Notes: The size of the firm is based on its number of employees. Products are identified at the HS4+ level, and are ranked according to sales. ... indicates that the firms export more products but we omit them in the table for brevity.

[27] This table does not include exhaustive information about the firms due to confidentiality reasons.

Table B.2: Trade versus production codes: *Tyres*

Trade codes:

HS 40	Rubber and articles thereof
HS 4011	New pneumatic tyres
HS 401110	For motor cars
HS 401120	For buses
HS 401130	For aircraft
HS 401140	For motorcycles
HS 401150	For bicycles
...	

Production codes:

NACE 22	Manufacture of rubber and plastics products
NACE 2211	Rubber tyres and tubes
CPA 221111	New pneumatic tyres for motor cars
CPA 221112	New pneumatic tyres for motorcycles and bicycles
CPA 221113	New pneumatic tyres for buses, lorries, and aircraft
PROD 22111355	For buses or lorries with a load index $<= 121$
PROD 22111357	For buses or lorries with a load index > 121
PROD 22111370	For aircraft
...	

Notes: Trade codes are based on the international Harmonized Schedule (HS) system, and production codes are based on the PRODCOM system of the EU.

Table B.3: Aggregate statistics - conservative definition

(1) Year	(2) TIP/manu. exports	(3) PI/TIP	(4) TIP/total exports	(5) TII/total exports
2005	36.7%	27.5%	24.8%	32.3%
2006	33.7%	29.9%	23.0%	31.7%
2007	35.9%	26.1%	26.4%	26.3%
2008	34.6%	29.5%	26.3%	24.0%
2009	35.8%	25.3%	29.2%	18.3%
2010	**38.3%**	**28.4%**	**30.0%**	**21.8%**
2011	36.7%	29.0%	27.6%	24.9%
2012	38.3%	30.2%	28.3%	26.1%
2013	38.8%	30.7%	27.6%	28.9%
2014	40.1%	35.9%	27.5%	31.3%

Notes: Manu. exports refer to the exports of manufacturing firms. TIP refers to trade intermediation by producers as defined in equation (2). TII refers to trade intermediation by professional (non-manufacturing) intermediaries as defined in equation (1). PI refers to the purely intermediated portion of TIP as defined in equation (3). Total exports is the sum of manufacturing and TII exports. Sourced product is defined to be not produced by the firm in 2005-2014. Purely intermediated exports are sales to destinations that the firm has not sold a produced product in 2005-2014.

Table B.4: Top 10 HS2 sectors and destinations

(a) HS2	Description	(1) Exports (in millions)	(2) Manu./total exports	(3) TIP/manu. exports	(4) PI/TIP
87	Vehicles	$ 9,262	99.2%	46.0%	27.3%
72	Iron and steel	$ 6,022	68.0%	35.2%	47.0%
84	Nuclear reactors, boilers, machinery and mechanical appliances	$ 5,559	76.3%	36.6%	37.3%
85	Electrical machinery and equipment and parts thereof	$ 5,244	64.2%	57.0%	35.7%
61	Articles of apparel and clothing accessories, knitted or crocheted	$ 3,148	63.2%	53.1%	14.4%
73	Articles of iron or steel	$ 2,433	83.4%	69.3%	78.4%
39	Plastics and articles thereof	$ 2,095	88.5%	40.8%	50.8%
62	Articles of apparel and clothing accessories, not knitted or crocheted	$ 1,840	71.9%	47.5%	30.7%
40	Rubber and articles thereof	$ 1,466	90.6%	11.6%	63.5%
76	Aluminum and articles thereof	$ 1,326	73.4%	80.8%	56.0%

(b) Country	(1) Exports (in millions)	(2) Manu./total exports	(3) TIP/manu. exports	(4) PI/TIP
Germany	$ 6,392	84.9%	41.0%	35.3%
UK	$ 4,465	74.5%	37.4%	50.0%
Italy	$ 4,105	86.3%	57.3%	17.2%
France	$ 3,232	78.1%	46.6%	27.4%
Spain	$ 2,476	75.6%	46.0%	47.2%
USA	$ 2,265	89.6%	37.2%	30.0%
Iraq	$ 2,208	67.9%	47.4%	34.4%
Russia	$ 2,002	79.4%	38.7%	58.7%
United Arab Emirates	$ 1,823	90.8%	20.3%	52.7%
Iran	$ 1,579	76.7%	46.3%	44.1%

Notes: Statistics are based on Turkey's exports of $59 billion represented by the sample of producers and intermediaries in our sample in 2010. TIP refers to trade intermediation by producers as defined in equation (2). PI refers to the purely intermediated portion of TIP as defined in equation (3). Total exports is the sum of manufacturing and professional intermediary exports. Sectors and countries are ranked according to export values as indicated in column 1.

B.2 Additional summary statistics and robustness checks

Table B.5: Summary statistics for the benchmark regressions

	Aggregate		Firm-level	
Variable	Mean	Sd.	Mean	Sd.
Sourced_m, Sourced_{iht}	0.68	0.47	0.73	0.45
MC_{cHt}	8.13	1.90	8.53	1.92
FT_{cHt}	1.39	1.49	1.80	1.44

Notes: Summary statistics are for the benchmark aggregate and firm-level results in Tables 5 and 6 respectively. For aggregate regressions, Sourced_m is dummy variable that indicates whether the export flow m is sourced as opposed to produced. For firm-level regressions, Sourced_{iht} is a dummy variable that indicates whether the export flow of firm i of product h in year t is sourced as opposed to produced. MC_{cHt} and FT_{cHt} refer to market capacity and freeness of trade at the country-HS2-year (cHt) level respectively.

Table B.6: Aggregate results - with HS4 MC_{cHt} and FT_{cHt}

	(1)	(2)	(3)	(4)
Dependent variable:	$\ln X_{mcht}$	$\ln X_{mcht}$	$\ln avg_{mcht}$	$\ln no_{mcht}$
Sourced_m	-0.526***	-0.602***	-0.848***	0.246***
	(0.040)	(0.053)	(0.043)	(0.028)
MC_{cHt}	0.464***			
	(0.025)			
$\times$ Sourced_m	0.056**	0.071**	0.005	0.066***
	(0.027)	(0.028)	(0.017)	(0.025)
FT_{cHt}	0.440***			
	(0.018)			
$\times$ Sourced_m	0.045***	0.082***	-0.012	0.094***
	(0.017)	(0.020)	(0.014)	(0.015)
FE	*ch, ct, ht*	*cht*	*cht*	*cht*
N	875,221	875,221	875,221	875,221
R^2	0.69	0.89	0.89	0.87

Notes: $\ln X_{mcht}$ is log export values, $\ln avg_{mcht}$ is log average exports per firm, and $\ln no_{mcht}$ is the log number of exporters at the country-HS6-year (cht) level. Sourced_m is dummy variable that indicates whether the export flow m is sourced as opposed to produced. MC_{cHt} and FT_{cHt} refer to market capacity and freeness of trade at the country-HS4-year level (cHt) respectively. Clustered standard errors (by country and HS6) are in parentheses. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels respectively.

Table B.7: Aggregate results - excluding the EU

Dependent variable:	(1) $\ln X_{mcht}$	(2) $\ln X_{mcht}$	(3) $\ln avg_{mcht}$	(4) $\ln no_{mcht}$
Sourced$_m$	-0.660***	-0.733***	-0.846***	0.113***
	(0.050)	(0.067)	(0.056)	(0.026)
MC_{cHt}	0.372***			
	(0.031)			
× Sourced$_m$	0.061***	0.087***	0.016	0.071***
	(0.019)	(0.021)	(0.016)	(0.016)
FT_{cHt}	0.286***			
	(0.024)			
× Sourced$_m$	0.091***	0.129***	-0.006	0.134***
	(0.019)	(0.022)	(0.015)	(0.014)
FE	*ch, ct, ht*	*cht*	*cht*	*cht*
N	585,721	585,721	585,721	585,721
R^2	0.70	0.91	0.91	0.86

Notes: $\ln X_{mcht}$ is log export values, $\ln avg_{mcht}$ is log average exports per firm, and $\ln no_{mcht}$ is the log number of exporters at the country-HS6-year (*cht*) level. Sourced$_m$ is dummy variable that indicates whether the export flow m is sourced as opposed to produced. MC_{cHt} and FT_{cHt} refer to market capacity and freeness of trade at the country-HS2-year level (*cHt*) respectively. Clustered standard errors (by country and HS6) are in parentheses. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels respectively.

Table B.8: Aggregate results - PPML

Dependent variable:	(1) X_{mcht}	(2) X_{mcht}	(3) avg_{mcht}	(4) no_{mcht}
Sourced$_m$	-0.590***	-0.719***	-0.902***	0.223***
	(0.192)	(0.244)	(0.302)	(0.051)
MC_{cHt}	0.648***			
	(0.077)			
× Sourced$_m$	0.008	0.032	-0.033	0.056*
	(0.047)	(0.057)	(0.073)	(0.030)
FT_{cHt}	0.733***			
	(0.045)			
× Sourced$_m$	-0.016	0.003	0.020	0.122***
	(0.049)	(0.052)	(0.111)	(0.018)
FE	*ch, ct, ht*	*cht*	*cht*	*cht*
N	585,721	585,721	585,721	585,721
pseudo-R^2	0.88	0.88	0.91	0.49

Notes: X_{mcht} is the value of exports in US \$, avg_{mcht} is the average exports per firm, and no_{mcht} is the number of exporters at the country-HS6-year (*cht*) level. Sourced$_m$ is dummy variable that indicates whether the export flow m is sourced as opposed to produced. MC_{cHt} and FT_{cHt} refer to market capacity and freeness of trade at the country-HS2-year level (*cHt*) respectively. Clustered standard errors (by country and HS6) are in parentheses. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels respectively.

Table B.9: Results with GDP and distance

	(1)	(2)
	Aggregate	Firm-level
Dependent variable:	$\ln X_{mcht}$	$\ln x_{icht}$
Sourced_m	-0.580	
	(0.429)	
$\ln(GDP)_{ct} \times \text{Sourced}_m$	0.059***	
	(0.018)	
$\ln(distance)_c \times \text{Sourced}_m$	-0.184***	
	(0.037)	
$\ln(GDP)_{ct} \times \text{Sourced}_{iht}$		-0.059***
		(0.006)
$\ln(distance)_c \times \text{Sourced}_{iht}$		0.110***
		(0.016)
FE	cht	cht, iht, ict
N	881,946	2,092,184
R^2	0.89	0.96

Notes: $\ln X_{mcht}$ is log export values at the country-HS6-year (cht) level. Sourced_m is dummy variable that indicates whether the export flow m is sourced as opposed to produced. $\ln x_{icht}$ is export values at the firm-country-HS6-year ($icht$) level. Sourced_{iht} is a dummy variable that indicates whether the export flow of firm i of product h in year t is sourced as opposed to produced. Clustered standard errors (by country and HS6) are in parentheses. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels respectively.

Table B.10: Firm-level results - with HS4 MC_{cHt} and FT_{cHt}

Dependent variable:	(1) $\ln x_{icht}$	(2) $\ln x_{icht}$	(3) $\ln q_{icht}$	(4) $\ln q_{icht}$	(5) $\ln uv_{icht}$	(6) $\ln uv_{icht}$
Sourced$_{iht}$	-1.053***		-1.230***		0.177***	
	(0.057)		(0.070)		(0.019)	
MC_{cHt}	0.284***		0.274***		0.010	
	(0.027)		(0.030)		(0.006)	
× Sourced$_{iht}$	0.014	-0.085***	0.038	-0.086***	-0.024***	0.001
	(0.019)	(0.009)	(0.024)	(0.009)	(0.007)	(0.002)
FT_{cHt}	0.355***		0.360***		-0.005	
	(0.035)		(0.040)		(0.006)	
× Sourced$_{iht}$	-0.082***	-0.079***	-0.076***	-0.077***	-0.006	-0.002
	(0.020)	(0.008)	(0.027)	(0.008)	(0.008)	(0.002)
FE	ch, ct, ht	cht, iht, ict	ch, ct, ht	cht, iht, ict	ch, ct, ht	cht, iht, ict
N	2,087,740	2,087,740	2,087,740	2,087,740	2,087,740	2,087,740
R^2	0.42	0.96	0.55	0.97	0.73	0.99

Notes: $\ln x_{icht}$ is export values, $\ln q_{icht}$ is export quantities, and $\ln uv_{icht}$ is export unit values at the firm-country-HS6-year ($icht$) level. Sourced$_{iht}$ is a dummy variable that indicates whether the export flow of firm i of product h in year t is sourced as opposed to produced. MC_{cHt} and FT_{cHt} refer to market capacity and freeness of trade at the country-HS4-year (cHt) level respectively. Clustered standard errors (by country and HS6) are in parentheses. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels respectively.

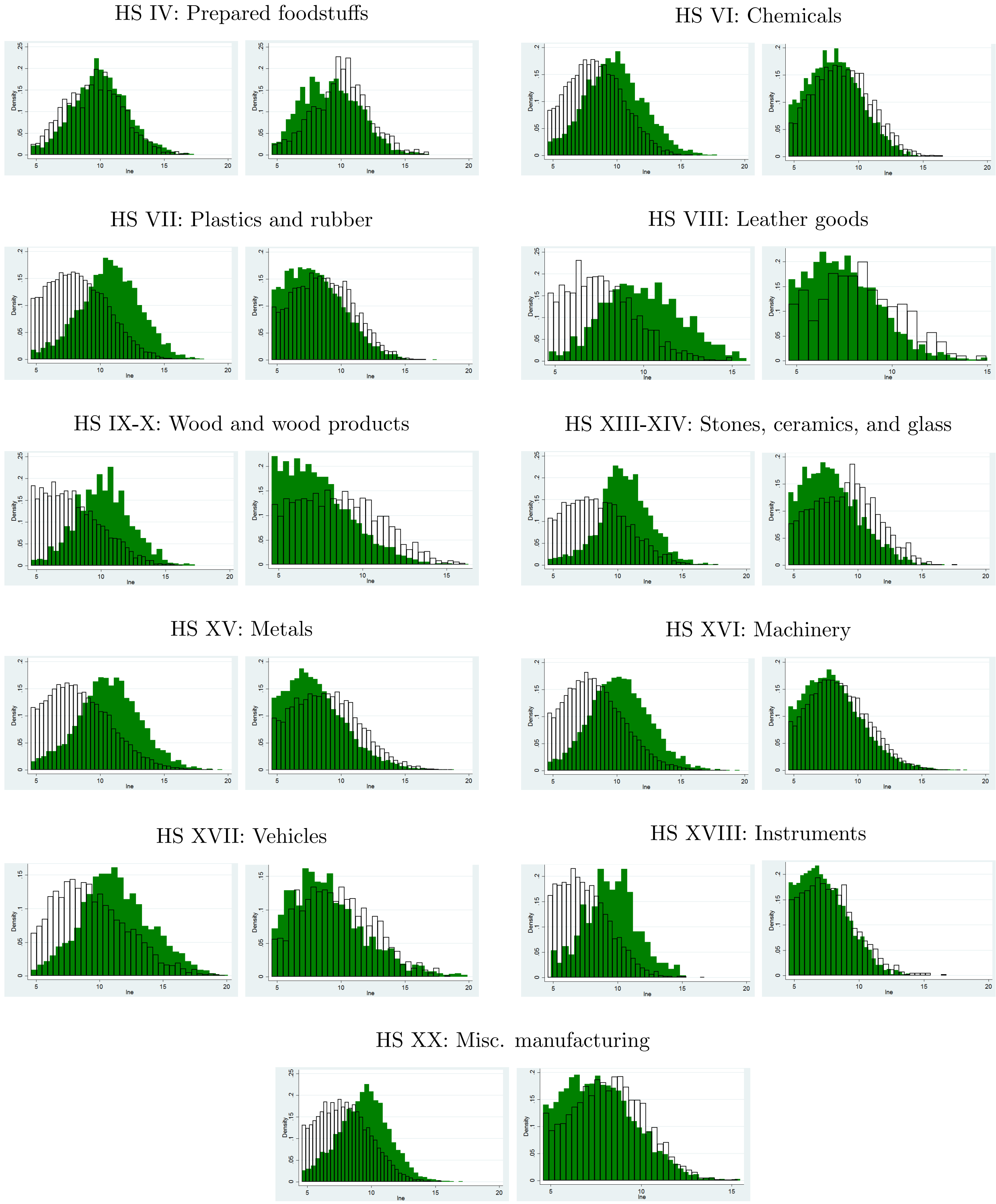
Table B.11: Firm-level results - excluding the EU

Dependent variable:	(1) $\ln x_{icht}$	(2) $\ln x_{icht}$	(3) $\ln q_{icht}$	(4) $\ln q_{icht}$	(5) $\ln uv_{icht}$	(6) $\ln uv_{icht}$
Sourced$_{iht}$	-0.904***		-1.070***		0.165***	
	(0.049)		(0.063)		(0.022)	
MC_{cHt}	0.250***		0.248***		0.001	
	(0.019)		(0.023)		(0.011)	
× Sourced$_{iht}$	-0.015	-0.090***	-0.001	-0.089***	-0.014	-0.002
	(0.023)	(0.012)	(0.029)	(0.012)	(0.009)	(0.003)
FT_{cHt}	0.323***		0.336***		-0.014**	
	(0.015)		(0.017)		(0.006)	
× Sourced$_{iht}$	-0.127***	-0.087***	-0.137***	-0.084***	0.010*	-0.003
	(0.014)	(0.013)	(0.017)	(0.014)	(0.005)	(0.003)
FE	ch, ct, ht	cht, iht, ict	ch, ct, ht	cht, iht, ict	ch, ct, ht	cht, iht, ict
N	1,196,898	1,196,898	1,196,898	1,196,898	1,196,898	1,196,898
R^2	0.48	0.98	0.62	0.98	0.75	0.99

Notes: $\ln x_{icht}$ is export values, $\ln q_{icht}$ is export quantities, and $\ln uv_{icht}$ is export unit values at the firm-country-HS6-year ($icht$) level. Sourced$_{iht}$ is a dummy variable that indicates whether the export flow of firm i of product h in year t is sourced as opposed to produced. MC_{cHt} and FT_{cHt} refer to market capacity and freeness of trade at the country-HS2-year (cHt) level respectively. Clustered standard errors (by country and HS6) are in parentheses. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels respectively.

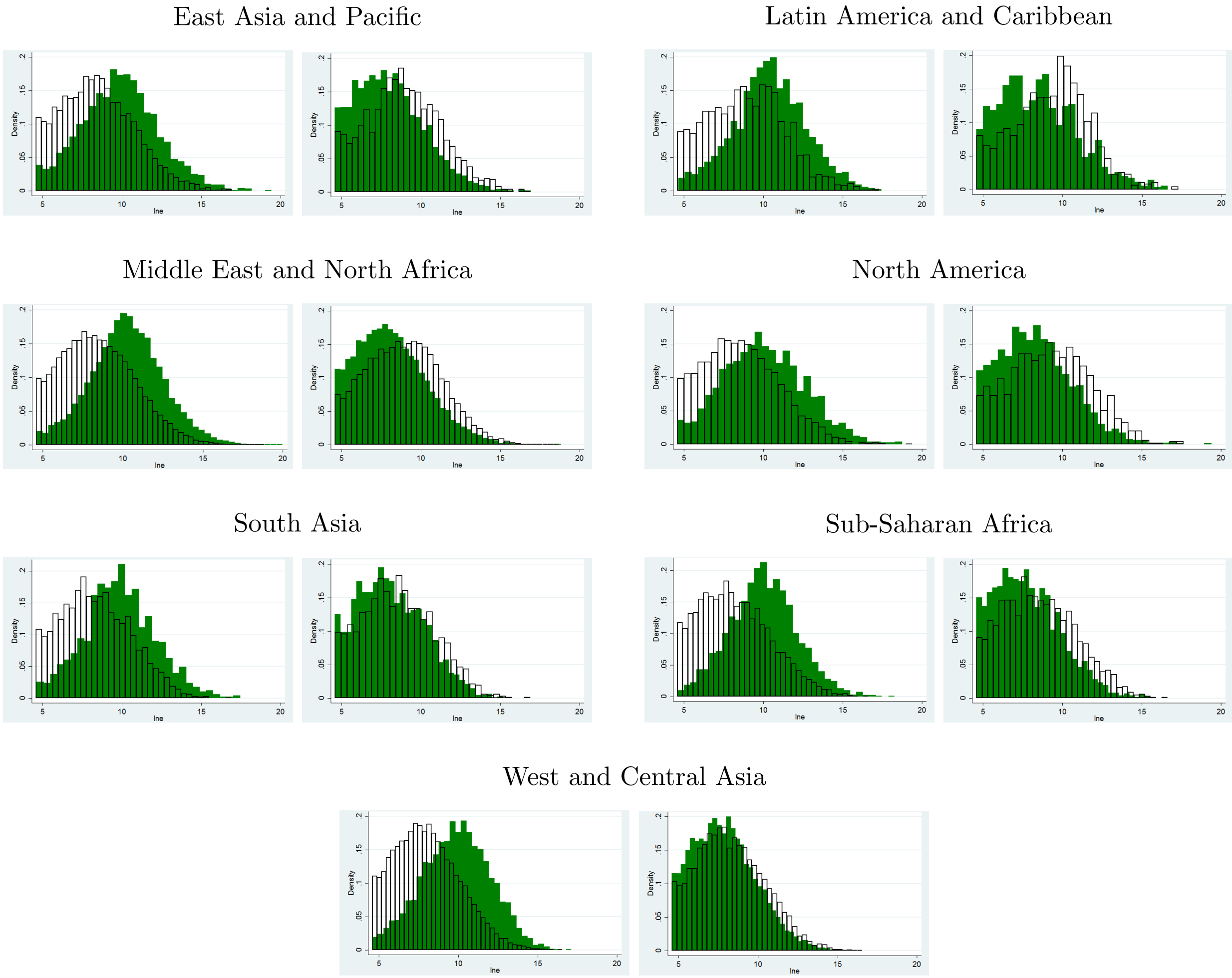
B.3 Distribution of trade flows by HS and region

Figure B.1: Distribution of flows by HS section: produced vs. sourced, CAT vs. PI



Notes: The left panel of each section shows the histogram of produced (shaded bars) versus sourced (transparent bars) export flows. The right panel of each section shows the histogram of CAT (shaded bars) versus PI (transparent bars) export flows. Exports are in logs (lne). The sample includes exports by producers in 2010.

Figure B.2: Distribution of flows by region: produced vs. sourced, CAT vs. PI



Notes: The left panel of each region shows the histogram of produced (shaded bars) versus sourced (transparent bars) export flows. The right panel of each region shows the histogram of CAT (shaded bars) versus PI (transparent bars) export flows. Exports are in logs (*lne*). The sample includes exports by producers in 2010.