One Way To The Top (If You Wanna Rock'n'Roll): How Services Boost the Demand for Goods*

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Abstract

Goods and services have been generally analyzed as two different items in the consumer portfolio supplied by firms in separate industries. In this paper, we challenge this view by providing evidence on interactions within the firm between foreign sales of goods and services. We show empirically and theoretically that demand complementarities between both activities enable firms that export goods and services - we call them bi-exporters - to boost their manufacturing exports by also providing services. The provision of services thus participates to the perceived vertical differentiation of the goods. Under monopolistic competition, adding a service boosts firms' sales only through quantities. Accounting for large oligopolistic firms uncovers instead a different channel: bi-exporting may increase firms' market power that translates into higher prices. Our IV estimates show the price channel to be important. Last, our quantification confirms that services are a significant determinant of product appeal and firm-level price dispersion.

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1 Introduction

Until very recently, goods and services have been seen by policy makers and academics as two distinct sectors subject to their own market adjustements and calling for specific policies. Goods and services have been generally analyzed as two different items in the consumer portfolio supplied by firms in separate industries. This shows up both in the way trade agreements are negotiated and designed, and in the way economists model and quantify their effects. In this paper, we challenge this view by providing for the first time evidence on interactions within the firm between foreign sales of goods and services. We show empirically and theoretically that demand complementarities between both activities enable firms that export goods and services - we call them bi-exporters - to boost their manufacturing exports by also providing services. Our results imply that ignoring such complementarities will lead to a mis-quantification of the welfare and business consequences of economic integration. Telling examples of such interactions include Apple selling computers but also softwares and assistance with the utilization of computers and cell phones, Toyota exporting both cars and consumer loans to buy these cars or Technip supplying fertilizers as well as technical and financial solutions combining aspects related to mining, beneficiation and fertilizers manufacturing. The phenomenon is widespread among multinationals but not limited to them, and understanding it is important. At the time of Brexit for example, the identification of firms and sectors that will be mostly harmed by a hard Brexit, as well as its aggregate impact on the British economy, can hardly miss this channel given the size of the service sector in the UK.

One of the reasons why the interaction between services and goods has received little attention is the lack of data on both goods and services activities at the firm-level. In this paper, we bridge this gap by making use of uniquely detailed trade data from the National Bank of Belgium (NBB henceforth). As is standard now for many countries, we have information on goods exports values and quantities at the firm, product and destination country level for the period 1997-2005. Quite uniquely, we can link these data to the universe of services exports at the firm and destination level over the same period.[1] We first show that bi-exporting is a very rare activity both across and within firms, much less frequent than exporting several products for example. However, despite being few, bi- exporters account for about half of the aggregate goods exports and

[1] In most countries, the collection of firm-level services exports data are survey based. Therefore, they include only a subset of services exporters. Moreover, this information cannot usually be linked to information on trade in goods at the firm level for legal reasons.

they are the most successful exporters in many dimensions. Bi-exporters almost never export services alone, and conditional on exporting goods bi-exporting follows gravity: firms provide services in the biggest and closest destinations where they supply goods. Finally, we go at a much finer level and show that within a given market (product-destination-year triplet), firms that also provide services in the destination export more of their good than their competitors, both in values and in quantities. This remains true even when we control for the efficiency of the firm by means of firm-product-year fixed effects. No price premium is detected at this stage.

Based on this descriptive evidence, we develop a model of imperfect competition in markets where goods and services are one-way essential complements. This means that the service itself does not raise the utility of the consumer unless it is associated with a good. In this way, the product is essential while the service is optional. The production and export of services entails a fixed cost; profits being convex in productivity, only the most productive goods exporters can also provide services. Beyond this selection effect, conditional on productivity, the combination of consumers' taste for variety together with one-way complementarity allows bi-exporters to sell more than standard exporters within a product-market. Therefore, the provision of services acts as a demand shifter; it influences the perceived vertical differentiation of the goods and improves the export performance of the firm in a foreign market. This result is first established under monopolistic competition where bi-exporters are shown to differ from standard exporters only by the volume of goods they sell, not their price. We then extend the model to allow for large oligopolistic firms. This deviation from the monopolistic benchmark uncovers a new channel which is absent from our baseline results: large bi-exporters, by increasing their sales also increase their market power and thereby their prices. This price effect comes at the expense of the output one highlighted in the monopolistic competition framework.

Guided by these findings, we come back to the data and implement a two-step approach to correct for the unobserved firm-product-destination determinants of both services provision and goods export performance. In the first step, we use a probit to estimate the determinants of the firm-level probability of associating services with goods. Identification is assured by the presence of two excluded variables that affect the firm-level probability of exporting services in a destination without impacting directly firm-level export performance for goods in that destination: a variable measuring the average "service bundleability" of the goods composing the product portfolio of the firm and its interaction with the aggregate imports of services by the destination country (excluding the imports from Belgium). From this, we compute the firm-destination predicted probability of bi-exporting and use it in a second step as an instrument for the dummy identifying bi-exporters. The results we obtain with this 2SLS strategy confirm the sales premium of bi-exporters highlighted in the stylized facts. The channel is however now different. In line with the oligopolistic version of our model, the sales premium comes from a price-premium, and not from a quantity premium as in the non instrumented regressions. The difference between the premia obtained with the 2SLS and those measured in the stylized facts can be fully rationalized based on our model. We discuss alternative theories to ours and show that they cannot account for the empirical results we uncover.

Our paper speaks to different strands of the literature.

First, our paper relates to the literature analyzing the structural transformation of the economy and the increasing participation of manufacturing firms in services activities. This phenomenon is often viewed as a substitution process: firms progressively give up producing goods to increasingly specialize in services. This is the consequence of trade in goods liberalization (Breinlich et al., 2014; Pierce and Schott, 2016), firm specialization (Bernard and Fort, 2015; Bernard et al., 2014) or offshoring (Berlingieri, 2014). Our paper adopts a different (but not exclusive) perspective by showing that the production and exports of goods and services can be complementary. Consistent with our theory, Crozet and Milet (2015) show that French firms in the manufacturing sector that start selling services increase their profitability and total sales of goods. Focusing on the import side, Ariu et al. (2016) estimate a general equilibrium model in which goods and services are imported intermediate inputs that may generate synergies within the firm. However, both papers remain silent on the various mechanisms underlying the complementarity between goods and services and its consequences for producers' behavior. We provide a model that details the channels through which producers exploit this complementarity (namely quantity and price), and by relying on firm-level export data for which both quantities and values sold are available, we can identify empirically which of these channels mainly explains the sales premium of bi-exporters.

Our paper also participates to the literature on multi-product firms. Indeed, not only bi-exporters are in their vast majority multi-product exporters, but they can also be seen as firms providing two varieties of the same good, the good alone and the good with the service. The decision to provide the variety with the service and its impact on overall goods sales, in particular the risk of cannibalization, are very close to what happens for multi-product firms. Our model consequently relies on mechanisms that are present in the multi-product firm literature (e.g. Eckel and Neary, 2010; Bernard et al., 2011; Dhingra, 2013; Nocke and Yeaple, 2014; Mayer et al., 2014; Hottman et al., 2016). Theoretically, bi-exporters can be viewed as a two-product firm where the good alone is its core variety and the good bundled with the service is a peripheral variety costlier to produce. Contrary to these models however, adding a service does not come down to expanding the product scope with a differentiated variety. Instead, adding a service generates demand linkages that boost the sales of the core variety. These differences are discussed further in section 5. They come from the fact that we introduce the assumption of one way complementarity between the consumption of the good and the service. So, our paper is also related to the analysis on demand-scope complementarities present in Bernard et al. (2012). They show that "carry-along" products (i.e. those exported but not produced by the firm) as well as "regular" products can allow firms to raise their prices in export markets without harming demand. Our paper focuses instead on complementarities between services and goods. That being said, in the words of our model, one-way complementarity between the goods exported by a firm provides a simple micro-foundation for the demand-scope complementarities between goods. By considering bi-exporters as "multi-item" firms that exploit complementarities in the consumption of goods and services, we thus provide an original model that builds bridges between the literatures on servitization, multi-product firms and demand-scope complementarities.

Finally, we contribute to the literature on the sources of firm profitability. First, firms may differ in the quality/appeal of their product (e.g. Crozet et al., 2012; Manova and Zhang, 2012). We show in this paper that supplying a service acts as a demand shifter for the good as derived by Khandelwal et al. (2013). This demand shifter is defined under CES preferences irrespectively of the market structure. It measures how much a firm is able to sell conditional on price and market-specific aggregate demand, so that it is typically interpreted as measuring perceived quality. Services thus appear as a determinant of the perceived vertical differentiation of the goods. Second, firms' differences in market power are reflected in markups and also participate to differences in profitability: for instance Loecker and Warzynski (2012), among others, show that larger firms charge higher markups. In our framework, supplying a service allows firms to increase their market share. Under oligopolistic competition, this translates into larger markups, and we show that this channel is empirically relevant. Third, firms can also grow larger by adjusting their product scope, and Hottman et al. (2016) estimate that together with appeal/quality this channel accounts for 80% of the observed variation in overall sales of US firms. While they focus on manufacturing activities of firms, we show that services are a relevant determinant of firm-level product scope and appeal.

The rest of the paper is organized as follows. We describe the data and outline several stylized facts on bi-exporters in section 2. In section 3, we develop an imperfect competition model featuring both consumers' love for variety and one-way complementarity between goods and services; monopolistic competition and oligopolistic competition are both considered. Based on the model, we come back to the data in section 4 and address the endogeneity issues stylized facts suffer from to assess the impact of service provision on firm-level export performance for goods. Section 5 discusses alternative explanations for our results. Finally, section 6 concludes.

2 Data description and stylized facts

2.1 Data

The main data used in this paper come from three different datasets provided by the National Bank of Belgium. They contain information on trade in goods (NBB Trade in Goods dataset), trade in services (NBB Trade in Services dataset) and firm-level accounts (NBB Business Registers) from 1997 to 2005.

Information on trade in goods is organized at the firm-product-destination-year level. We have information on the exported values and quantities, so that we can compute nominal f.o.b. unit values.[2] Firms are identified thanks to their VAT number and products are classified following the 6-digit Harmonized System Nomenclature (HS6). We restrict our analysis to transactions involving a change in ownership and we discard those referring to movements of stocks, replacement or repair of goods, processing of goods, returns and transactions without compensation. Declaration thresholds are applied to collect these data. In particular, firms have to declare to the NBB any transaction directed to extra-EU countries exceeding 1,000 Euros and this threshold has remained stable over time. For flows directed to EU countries instead, firms have to declare their transactions if their total exports in the European Union are above 250,000 Euros in the previous year (this threshold was equal to 104,115 Euros in 1997).

Data on services exports are collected by the NBB to compile the balance of payments. A specified list of firms had to directly declare to the NBB any service transaction with a foreign firm above 12,500 Euros (9,000 Euros from 1995 to 2001) with indication of the destination or origin, type of service and value of the transaction.

[2] In the paper we will also refer to unit values as prices.

For all the other firms, the bank involved in the transaction was legally bounded to record the same information and send it to the NBB. The peculiarity of this collection system with respect to the more widely used survey-based is that it provides a more exhaustive picture of firms, services and destinations involved in services' trade.[3] The dataset is organized at the firm-service-destination-year level, firms are identified by their VAT number and services are classified following the usual Balance of Payments codes. We drop from the original data all the transactions referring to *"Merchanting"* and *"Services between Related Enterprises"* because the first includes also the values of the goods involved and the second does not indicate which service is traded within the firm, and is possibly contaminated by transfer pricing issues. In order to reduce the dimensionality of the data, we aggregate the service classification at the 1-digit level of the Balance of Payments classification, which distinguishes across: Transport, Travel, Communication, Construction, Insurance, Financial, Computer and Information, Royalties, Business, Personal and Cultural, and Government services. The data comprises modes one, two and four of trade in services defined in the General Agreement on Trade in Services (GATS). However, since firms do not declare the transaction mode, there is no direct way to infer it.

Quite uniquely, we are able to put together information on goods and services exports thanks to the common VAT and destination identifiers. We thus construct a dataset at the firm-product-destination-year level which gathers information on exported values and quantities (and thus on unit values) and on the presence of services exports in the destination. The exhaustiveness of the trade in services dataset is a great advantage here, since it allows us to correctly identify the "bi-exporters", i.e. the goods exporters that also export services in a given destination.[4]

We complete the resulting dataset with information on the firm-level accounts of the firm. We get from the Business Registers (which cover the population of firms required to file their unconsolidated accounts to the NBB) the firm-level turnover, value-added, number of employees as well as the industry code of the firm (at the NACE 2-digit level). Moreover, we use information on the presence of foreign affiliates abroad and

[3] After 2005 the collection system has become survey based. Therefore, it is not possible to extend the analysis to more recent years. Refer to Ariu (2016) for more information about the change in the collection system.

[4] Note that given the absence of customer identifiers, we cannot be entirely sure that bi-exporters sell both goods and services to the same buyer in a given market. Moreover, whenever a firm exports more than one product in a market, the information on the services exports is attached to every product. Hence, there might be some noise in the measurement of bi-exporting. If anything, this should yield to an attenuation bias in the estimation of the effect of services provision on firm-level goods export performance.

on ownership status of the firm from the NBB FDI Survey. To be included in this survey firms have to comply with at least one of the following requirements: i) have more than five million Euros of financial assets; ii) have more than ten million Euros equity; iii) have more than 25 Million Euros turnover; iv) report foreign participations in their annual accounts; v) publish information related to new investments abroad in the Belgian Official Journal. For outward FDI, the survey has information on all the foreign affiliates in which the firm has more than 10% of the common shares with details about the country, sector (NACE 2-digit) and total turnover of the affiliate. For inward FDI we have information on all the foreign owners with more than 10% of the common shares with indication of the origin and sector of the investor and the percentage of equity in its hands. In all our estimations we control by means of adequate dummies for the the multinational nature of exporters and for the presence of affiliates or headquarter in the destination of exports. Moreover, in robustness checks we show that our results hold when we discard flows directed to destinations where firms have foreign affiliates and/or parent firms. In this way, we ensure that all potential goods intra-firm trade flows are excluded from the analysis (as stated above, intra-firm trade flows for services are directly identified in the original data and removed from the estimation sample).

From these data we drop wholesalers' exports (NACE codes 51 and 52). We also proceed to a basic cleaning of the dataset. We drop observations with missing information on unit value or turnover per worker. We also exclude flows for which the unit value is below 0.01 or above 100 times the median observed among Belgian exporters for each HS6 product-year. We end up with a dataset counting more than 2 millions flows and nearly 10,000 firms per year. Table A-1 in the Appendix provides some basic descriptive statistics.

2.2 Stylized facts

We present here some stylized facts about the bi-exporters that will inspire our theoretical model.

2.2.1 *Stylized fact 1:* bi-exporting is a rare activity, but it accounts for an important share of overall goods exports.

In our sample, we observe that during the 1997 to 2005 period, only 6.9% of firm-product-destination goods export flows are associated with firm-level services exports. In terms of number of firms, bi-exporters represent only 10.3% of goods exporters. To provide a benchmark, we can compare the number of bi-exporting firms with the number of firms that export more than one product (i.e. multi-product exporters). In our data, we observe that 68.1% of goods exporters provide more than one product in foreign markets and 85.6% of the firm-product-destination goods flows originate from them. Therefore, bi-exporting is a very rare activity across firms as compared to multi-product exporting. Considering that 86.9% of bi-exporters are also multi-product exporters, they look like an even more selected sample of firms as compared to the already selected group of multi-product exporters.

Despite being a quite unfrequent activity, bi-exporting represents a substantial share of the value of goods exports. Over the period, flows of goods associated with services represent 22.1% of overall goods exports and bi-exporters account for 47.6% of the value of overall goods exports. Therefore, almost half of overall manufacturing exports in our sample are in the hands of 10.3% of firms exporting both goods and services.

2.2.2 *Stylized fact 2:* bi-exporters export services mostly along with goods.

We focus now on the relation between services and goods within the firm. We aim at understanding how frequently goods and services are observed exported alone versus together and at measuring the share of services in overall bi-exporters' foreign sales.

In terms of frequency, bi-exporters offer services alone in only 14.9% of the destinations they serve on average (median equal to 0), while they export goods alone in 59.5% of the destinations where they are present (median equal to 75.0%). Hence, whenever bi-exporters offer services, they do it in destinations in which they also export goods. Instead, goods are frequently exported by firms in destinations where they do not provide services. Far from being a formal test, this suggests that services have some value for bi-exporters only when associated with goods.

Focusing on bi-exporters that export goods to several destinations, we observe that bi-exporting occurs in only 26.3% of the destinations where the bi-exporter sells goods. Multi-product exporters instead sell more than one product in 46.3% of the destinations they serve.[5] Hence, bi-exporting is much less frequent than multi-product exporting not only across firms but also within firms.

In terms of export shares, when firms export both goods and services in a destination, services represent on average 38.1% of bi-exporters' overall exports in that destination. If we consider total exports of bi-exporters (across all destinations), services

[5]When we compute the frequency of bi-exporting and multi-product exporting at the firm-product level, these shares rise to 39.4% and 91.1% respectively. This rise reflects the fact that not all the products in the export portfolio of a firm are sold together with services or with other goods.

represent on average 33.2% of overall firm-level foreign sales.[6] Hence, goods remain on average the primary activity of bi-exporters.

Overall, these figures show that an asymmetry exists in the relation between goods and services: services look like they are complementary to goods but there is no descriptive evidence of the opposite. This suggests that for bi-exporters, services can be sold only if provided with goods. We discuss more extensively this pattern in section 3.

2.2.3 *Stylized fact 3:* Bi-exporters' exports of services follow gravity and their composition differs from "pure" services export flows

We now investigate whether the markets where bi-exporters provide services exhibit specific characteristics as compared to the destinations where they only export goods.

To answer this question, we analyze the probability of bi-exporting in a gravity setting. We focus on firms that export services to at least one destination in a given year, and on destinations where these firms export goods. Our dependent variable is equal to 1 when firm f provides services in destination d at time t and zero when it provides goods only. This variable is regressed on firm-year fixed effects and on gravity covariates taken from the GeoDist Dataset of CEPII.[7]

Results in Table 1 show that the provision of services by bi-exporters follows the gravity law. Among the destinations where they exports goods, bi-exporters provide services in bigger, richer and less distant markets. Exports of services together with goods are also more likely in destinations which share a common border, a common language or former colonial linkages with Belgium. These results are conditional on exporting goods, and they should not be seen as a way to assess how much services exports follow gravity as compared to goods. In section 3 we show that this gravity pattern of bi-exporting is not as intuitive as it might seem and we discuss the conditions under which it can be theoretically rationalized.

Regarding the composition of bi-exporters' services exports, it differs from the composition of "pure" services export flows. We compute the share of each service category (1-digit level of the Balance of Payments classification) in bi-exporting flows and in "pure" services flows (both in terms of number of flows and value of exports). Statistics in Table 2 show that when firms sell goods together with their services in a destination, communication, construction, finance, computer, royalties and business services account for a higher share of exported flows and/or exported values as compared to

[6] The median equals 27.5% and 10.7% respectively.

[7] Available at `http://www.cepii.fr/cepii/en/bdd_modele/presentation.asp?id=6`

Table 1: Market determinants of the probability to be a bi-exporter

Dep. Var.	Dummy Export Services$_{fdt}$	
	(1)	(2)
Log Population$_{dt}$	0.036^{a}	0.032^{a}
	(0.002)	(0.002))
Log GDP per capita$_{dt}$	0.037^{a}	0.037^{a}
	(0.002)	(0.002)
Log Distance$_{dt}$	-0.059^{a}	-0.027^{a}
	(0.004)	(0.003)
Contiguity$_{dt}$		0.175^{a}
		(0.014)
Common Language$_{dt}$		0.007^{a}
		(0.005)
Colony$_{dt}$		0.101^{a}
		(0.0138)
Firm-Year FE	Yes	Yes
Observations	158,420	158,420
R-squared	0.339	0.356

Note: Linear probability model. Standard errors clustered at the destination-year level in parentheses. ^{a} p<0.01, ^{b} p<0.05, ^{c} p<0.1

firm-level flows involving services only. On the opposite, transport, travel and insurance services are less represented. This shows that the services provided by bi-exporters do not just mirror the activities of "pure" service exporters: there is something specific in providing services together with goods.

If we look at the share of bi-exporting flows at the industry-level, aircraft and spacecraft (HS88), railway et al. (HS86), ores, slag and ash (HS26), fertilizers (HS31) and inorganic chemicals (HS28) are the industries in which we observe the highest share of trade flows associating services with goods. At the product-level, many goods from the transportation, chemical and machinery/electrical industries exhibit above-the-average shares of bi-exporting flows.

2.2.4 *Stylized fact 4:* bi-exporting is associated with better goods export performance both across and within firms

The fact that Bi-exporting accounts for a small number of firms but a substantial share of exports suggests that bi-exporters are bigger than other exporters. To analyze this feature more in depth, we compare the export performance of bi-exporters with respect to multi-product and single-product goods exporters. We regress various firm-level performance indicators on dummies identifying bi-exporters and multi-product exporters,

Table 2: Composition of services exports (%)

	"Pure" service export flows		Bi-exporting flows	
	Overall value	# flows	Overall value	# flows
Transport	38.23%	28.49%	26.16%	16.92%
Travel	16.61%	7.24%	2.54%	4.95%
Communication	3.78%	2.78%	14.09%	6.54%
Construction	3.90%	5.02%	8.67%	9.34%
Insurance	2.09%	5.27%	0.13%	1.82%
Finance	7.49%	5.14%	2.39%	10.10%
Computer	5.15%	7.37%	13.32%	8.38%
Royalties	1.09%	1.37%	8.36%	3.47%
Business	20.23%	34.21%	23.77%	36.76%
Personal and Cultural	1.18%	2.86%	0.47%	1.52%
Government	0.24%	0.23%	0.10%	0.20%

Table 3: Bi-Exporters' Characteristics

	Goods Exports	# of Destinations	# of Products	# of Employees	Turnover	Turnover per Employee	Affiliates Abroad	Foreign Owned
Bi-Exporter	1.900^a	0.637^a	0.513^a	1.316^a	1.519^a	0.203^a	0.046^a	0.031^a
	(0.024)	(0.011)	(0.010)	(0.018)	(0.018)	(0.011)	(0.002)	(0.002)
Multi-Product	3.166^a	1.185^a	1.676^a	0.740^a	1.011^a	0.270^a	0.012^a	0.008^a
	(0.017)	(0.005)	(0.004)	(0.011)	(0.011)	(0.007)	(0.001)	(0.001)
Observations	98,454	98,454	98,454	98,454	98,454	98,454	98,454	98,454
R-squared	0.497	0.448	0.575	0.264	0.260	0.198	0.032	0.030

Note: Robust standard errors in parentheses. All regressions include industry (NACE 2-digit)-year fixed effects. ^{a} p<0.01, ^{b} p<0.05, ^{c} p<0.1

controlling for industry (NACE 2-digit)-year fixed effects. The reference category in this setting is represented by single-product goods exporters. Since 90% of bi-exporters are multi-product exporters, the coefficient on the bi-exporter dummy should be interpreted as a premium coming on the top of the one accruing to multi-product firms. Table 3 shows that multi-product exporters outperform single-product exporters in all dimensions: they export more, have a wider portfolio in terms of products and destinations, they are bigger in terms of employees and sales, more productive and more likely to have affiliates abroad and to be foreign-owned firms. In all of these dimensions, bi-exporters have an even bigger premium as compared to multi-product firms. Therefore, bi-exporters are superstars among the already exclusive club of multi-product and "happy few" exporting firms (Mayer and Ottaviano, 2007).

To go further in the assessment of the bi-exporters' success we compare goods export flows associated with services to flows without services within the same product-destination-year by means of the following regression:

Table 4: Bi-Exporters Premia

	Panel (a): Across Firms			Panel (b): Within Firm		
	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Var.	**Log Exp**$_{fkdt}$	**Log Q**$_{fkdt}$	**Log P**$_{fkdt}$	**Log Exp**$_{fkdt}$	**Log Q**$_{fkdt}$	**Log P**$_{fkdt}$
Serv$_{fdt}$	0.582^a	0.582^a	-0.000	0.268^a	0.273^a	-0.005
	(0.025)	(0.027)	(0.009)	(0.020)	(0.019)	(0.006)
Log # Products$_{fdt}$	-0.475^a	-0.539^a	0.064^a	0.706^a	0.737^a	-0.031^a
	(0.005)	(0.006)	(0.002)	(0.006)	(0.006)	(0.002)
Log Turnover/L$_{ft}$	0.296^a	0.345^a	-0.049^a			
	(0.006)	(0.007)	(0.002)			
Market Experience$_{fkdt}$	1.491^a	1.561^a	-0.070^a	0.962^a	0.969^a	-0.007^a
	(0.005)	(0.006)	(0.002)	(0.005)	(0.005)	(0.002)
MNE$_{ft}$	0.464^a	0.477^a	-0.014^a			
	(0.012)	(0.013)	(0.005)			
AFF$_{fdt}$	0.392^a	0.446^a	-0.054^a	0.294^a	0.327^a	-0.033^a
	(0.026)	(0.028)	(0.009)	(0.023)	(0.021)	(0.008)
PAR$_{fdt}$	0.150^a	0.206^a	-0.056^a	0.202^a	0.210^a	-0.008
	(0.034)	(0.039)	(0.016)	(0.032)	(0.030)	(0.011)
Service Industry$_{ft}$	-0.398^a	-0.507^a	0.109^a			
	(0.014)	(0.016)	(0.006)			
Product-Destination-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Product-Year FE	No	No	No	Yes	Yes	Yes
Observations	2,106,302	2,106,302	2,106,302	1,652,189	1,652,189	1,652,189
R-squared	0.482	0.609	0.730	0.801	0.865	0.922

Note: Standard errors clustered at the firm-destination-year level in parentheses. ^{a} p<0.01, ^{b} p<0.05, ^{c} p<0.1

$$\mathrm{y}_{fkdt} = \alpha_0 + \alpha_1 \mathrm{serv}_{fdt} + \alpha_2 \mathrm{X}_{f(kd)t} + \lambda_{kdt} + \epsilon_{fkdt} \quad (1)$$

where y_{fkdt} represents successively three outcome variables as a measure for export performance: exported value, exported quantity and unit value of firm f for product k in country d and year t. Among the explanatory variables, serv_{fdt} is a dummy variable equal to 1 when firm f also exports services in destination d at time t. λ_{kdt} are product-destination-year fixed effects, and the vector $\mathrm{X}_{f(kd)t}$ contains firm-year and firm-product-destination-year covariates. In particular, we control for the log number of products exported by firm f in destination d, the experience of firm f with product k in country d [8] and the log turnover per worker of firm f as a measure of the average productivity of the firm at time t. We also identify multinational firms thanks to a dummy MNE_{ft}, as well as the destinations where they have foreign affiliates (AFF_{fdt}) and/or parent firms (PAR_{fdt}). Finally, we control for a dummy equal to 1 if the firm belongs to the service sector.

Results are presented in Panel (a) of Table 4. In column (1), the dummy identifying bi-exporting (Serv_{fdt}) is positive and significant: for a given product in a given destination market, we find that bi-exporters sell on average 58% more than normal

[8] We proxy experience with the log number of consecutive years of presence of firm f and product k in country d at time t. We also use trade data for years 1995 and 1996 to compute this proxy.

goods exporters (i.e. than firms that only provide goods). When decomposing this premium into quantity and price in columns (2) and (3), we observe that it is mostly driven by quantity. There is no significant difference in terms of unit value between bi-exporters and normal good exporters in a given market. Control variables have the expected sign: more productive, more experienced and multinational firms sell greater quantities at a lower price, and still exhibit higher sales in value. On the contrary, firms which declare a service sector as their main activity charge a higher price but sell less of their goods both in quantity and in value; this is consistent with the idea that their competitive advantage certainly does not lie in manufacturing activities. Finally, in this specification, the higher the number of products sold by a firm in a market, the lower its sales and the higher the price it charges on average for each product.

In Panel (b) of Table 4 we further control for firm-product-year fixed effects (κ_{fkt}). In this way, we can wash away any firm-product-year determinant of export performance (i.e. unobserved firm-product productivity or firm-product appeal for example) that is correlated with the provision of services. The estimation amounts now to a differences-in-differences, where we compare in two different destinations firms that never export services with their product to firms that export services in one destination but not in the other. In this more demanding specification, bi-exporting is still associated with a premium in terms of goods exported value and quantity. It is however considerably reduced and equal to nearly 27% (columns (4) and (5)). The coefficient for unit values remains insignificant (column (6)). The lower premia in Panel (b) as compared to Panel (a) suggest that bi-exporters have unobserved characteristics that make them able to sell more of their product on average than their competitors; however, controlling for this, they still outperform the other exporters in the destinations where they bi-export.

Regarding the other controls, the main changes are observed for the number of products exported by a firm in a destination, for which the patterns are now completely reversed: once we control for firm-product-year fixed effects, it appears that a wider product scope in a given destination is associated with a slightly lower price and much bigger sales. The reason why the across-firm specification offers a different picture is that a firm-level product portfolio is generally composed of one or a few "main" products and several "fringe" products; multi-product firms might perform less for these fringe products as compared to firms for which these products are the main activity. The within-firm specification controls for the product-specific ability of the firm and thus neutralizes this unobserved ability effect.

Overall, the results in Table 4 show that the provision of services is robustly associated with greater firm-level sales of goods in a destination. This premium in terms of goods sales is not explained by a lower price charged for the good when associated with services. This rather suggests that varieties of goods that are provided with services face higher demand. This remains true even when controlling for firm-product-country and country-product-year fixed effects. This strategy relies on the comparison between firms that switch from exporting only goods to also offering services with firms that do not for the same product-country pair. This means that only the time variation participates to identification. Despite the very demanding specification, the sales and quantity premia remain positive and significant (Table A-2 in the Appendix). Since the timing between goods and services sales is not obvious for several services like technical assistance, maintenance or repair, we prefer to stick to the cross-sectional approach in the rest of the paper. This means that an analysis of entry into and exit from bi-exporting is beyond the scope of this paper.

Before turning to the model, we run three additional exercises to qualify these firm-product-destination regularities. First, we divide the service dummy into ten different types of services following the Balance of Payments nomenclature. We observe in Table A-3 in Appendix that the relationship between the provision of services and firm-level sales of goods is positive and highly significant for Transport, Financial, Computer and Business services mainly. These services comprise in particular firm-level loans for the purchase of their goods, the IT services related to the installation and exploitation of communication systems, the maintenance, repair, consultancy and assistance with the use of manufacturing goods. This heterogeneity is thus in line with the idea that the services that are correlated with a higher demand for goods are indeed complementary to them. On the goods side, Table A-4 shows that the premia associated with the service provision are much stronger for the core product than for the fringe products of the firm. This is again suggestive of demand complementarity between manufacturing and services activities at the firm-level, since the positive association between service provision and goods sales arises mostly for the main product of the firm. Finally, as mentioned in section 2.1, there might be some noise in the identification of bi-exporting flows due to the fact that we do not directly observe transactions for goods and services such as in seller-buyer data. This noise should be reduced for the goods that are most frequently associated with services in our data. We thus develop an algorithm to identify the goods that are "regularly" associated with services, based on the frequency at which an H6-good is exported with services among overall firm-level Belgian export flows for that good over the period. The details of this algorithm are provided in Appendix A. The results in Table A-5 show that there is no significant heterogeneity in the correlation between services provision and goods export performance for the goods that are most often associated with services. We can thus safely conclude that measurement errors in the identification of bi-exporting flows are not likely.

So far, our results show that firms that provide services together with their goods exhibit better export performance for goods than "normal" goods exporters. However, event though we control for a bunch of supply- and demand-side determinants of goods export performance, a causal relationship between the two is not yet established. It could be the case that firms that are more likely to be bi-exporters face specific demand shocks or behave differently in the markets where they provide services due to some characteristics of these markets and not to the provision of services *per se*. In the next section, we thus provide a model that rationalizes the stylized facts and regularities we have just highlighted. The model will help us identify the mechanisms at play and the possible sources of endogeneity. Guided by the model, we will then propose in section 4 an IV strategy to go further in the assessment of the causal effect of the provision of services on firm-level goods export performance.

3 A model of bi-exporting with one-way complementarity

In this section we develop a model of imperfect competition in which goods and service are one-way essential complements. In the words of Chen and Nalebuff (2006), this means that their relations is such that the good is essential to the use of the service but not vice-versa. The economy involves a continuum of industries so that each firm, even if it is large in its sector, does not have a direct impact on national income (Neary, 2016). Labor is the sole factor of production and is perfectly mobile across industries.

3.1 Preferences

The economy of destination d features a continuum of consumers who share the same preferences. Each consumer derives her utility from a Cobb-Douglas function over different goods $k \in \mathcal{K}$

$$\mathcal{U} := \int_{\mathcal{K}_d} \alpha_k \ln\left(\mathcal{C}_{kd}\right) dk$$

where the income shares sum up to one:

$$\int_{\mathcal{K}_d} \alpha_k dk = 1$$

$\mathcal{C}_{kd}$ is the ideal consumption index of good k in destination d and is defined as the aggregation of the $\mathcal{C}_{fkd}$ consumption indices which are specific to the variety of product k supplied by firm f in destination d.

$$\mathcal{C}_{kd} := \left(\int_{f \in \Omega_{kd}} \mathcal{C}_{fkd}^{\frac{\sigma_k - 1}{\sigma_k}} df \right)^{\frac{\sigma_k}{\sigma_k - 1}}$$

The set of varieties of product k available in d is defined by Ω_{kd}. The elasticity of substitution across varieties is equal to σ_k. These varieties may be consumed with or without a service. We denote hereafter by g_{fkd} the total consumption of variety kf in destination d. The amount consumed *with* a service is denoted by $g^S_{fkd} \leq g_{fkd}$. Consumption of the complementary service is denoted by s_{fkd}.

One-way complementarity Firm f's product k consumption index in country d is defined by

$$\mathcal{C}_{fkd} = \left(\left(g_{fkd} - g^s_{fkd}\right)^{\frac{\sigma_k - 1}{\sigma_k}} + \min\left(g^s_{fkd}, s_{fkd}\right)^{\frac{\sigma_k - 1}{\sigma_k}} \right)^{\frac{\sigma_k}{\sigma_k - 1}}$$

where $\min\left(g^s_{fkd}, s_{fkd}\right)$ is a Leontief aggregator.

This specification implies that the consumption s_{fkd} of the service itself does not raise the utility of the consumer unless she consumes at least $g^s_{fkd} \geq s_{fkd}$ units of the good with it. This means that the good is essential while the service is optional. The CES aggregation of the consumption of the good alone and the bundle implies that the consumer perceives a good and its service-augmented version as two different varieties.[9]

A continuum of L_d consumers own an equal share of the firms in their economy as in Chaney (2008) that comes on top of their labor income. Total income amounts to I_d

[9]This implies that consumers have a positive demand for both. While it might appear more realistic to assume heterogeneous consumers, CES preferences can also be seen as a reduced form for a richer model featuring consumer heterogeneity (see section 5).

These preferences can also easily accommodate vertical differentiation between the two varieties through the introduction of a demand shifter β_k such that $\mathcal{C}_{fkd} = \left(\left(g_{fkd} - g^s_{fkd}\right)^{\frac{\sigma_k - 1}{\sigma_k}} + \left(\beta_k \min\left(g^s_{fkd}, s_{fkd}\right)^{\frac{\sigma_k - 1}{\sigma_k}}\right) \right)^{\frac{\sigma_k}{\sigma_k - 1}}$. Since it does not affect any of the predictions, we omit it without any loss of generality.

and the budget constraint reads as

$$\int_{\mathcal{K}_d} \mathcal{P}_{kd}\mathcal{C}_{kd}dk \leq I_d$$

where $\mathcal{P}_{kd}$ is the ideal price-index of product k in destination d:

$$\mathcal{P}_{kd} := \left(\int_{\Omega_{kd}} \mathcal{P}_{fkd}^{1-\sigma_k} df\right)^{\frac{1}{1-\sigma_k}}$$

The firm-product-destination specific price-index aggregates the price of the good alone and the price of the bundled good. The latter is the sum of the price of the good and the price of the service $p_{fk} + p_{fk}^s$:

$$\mathcal{P}_{fkd} := \left(p_{fkd}^{1-\sigma_k} + \left(p_{fkd} + p_{fkd}^s\right)^{1-\sigma_k}\right)^{\frac{1}{1-\sigma_k}}$$

Demand Utility maximization implies $g_{fk}^S = s_{fk}$ and yields the direct demand functions of the good and the service:

$$d \quad \left[p_{fkd}, p_{fkd}^s; \mathcal{P}_{kd}\right] = \quad \alpha_k \cdot I_d \cdot \mathcal{P}_{kd}^{\sigma_k - 1} \cdot \left(p_{fkd}^{-\sigma_k} + \left(p_{fkd} + p_{fkd}^s\right)^{-\sigma_k}\right) \tag{2}$$

$$d^s \quad \left[p_{fkd} + p_{fkd}^s; \mathcal{P}_{kd}\right] = \quad \alpha_k \cdot I_d \cdot \mathcal{P}_{kd}^{\sigma_k - 1} \cdot \left(p_{fkd} + p_{fkd}^s\right)^{-\sigma_k} \tag{3}$$

so that total expenditures on good fk and its complementary service are given by

$$E_{fkd} := \alpha_k \cdot I_d \cdot \left(\frac{\mathcal{P}_{fkd}}{\mathcal{P}_{kd}}\right)^{1-\sigma_k} \tag{4}$$

3.2 Firm technology

In the following, we carry out the analysis at the firm level. We take the perspective of a domestic firm which decides whether or not to export to destination d and, if so, whether to export a service or not with its good. All workers in the home country supply one efficiency unit of labor and their wages are normalized to one. Let c_{fk} and c_{fk}^s be respectively firm f's marginal costs of production of good k and its complementary service. Corresponding trade costs are denoted by τ_{kd} and τ_{kd}^s. These costs are product-country specific: for instance, the cost of supplying communication services includes trade costs related to the linguistic distance and the good category with which it is bundled. For the sake of simplicity, we assume further that all firms supplying good k face the same cost increment when deciding to supply a service together with their good.[10] Last, trade costs to destination d for the goods and services are assumed to differ up to a product-specific multiplicative term. Taken together these assumptions allow us to work with a product-specific cost-increment which is inclusive of trade costs: $\omega_k := 1 + \frac{\tau^s_{kd} c^s_{fk}}{\tau_{kd} c_{fk}}$.

In the absence of fixed cost, since consumers' reservation price for any variety is infinite, all firms would find it profitable to serve all countries and would all provide services with their goods at any cost. We introduce instead two types of fixed costs: first, firms must pay a fixed cost F to enter the foreign market. Second, they may decide to incur an additional fixed cost F^b in order to export a service with their good. The subset of firms which export a service with their variety of good k in destination d is denoted by Ω^b_{kd}.

Exporters' profits in destination d are given by:

$$\begin{aligned}\pi_{fkd} :=& \left(p_{fkd} - \tau_{kd} c_{fk}\right) L_d \cdot d\left[p_{fkd}, p^s_{fkd}; \mathcal{P}_{kd}\right] + \\ & \left(p^s_{fkd} - \tau^s_{kd} c^s_{fk}\right) L_d \cdot d^s\left[p_{fkd} + p^s_{fkd}; \mathcal{P}_{kd}\right] \cdot \mathbf{1}_{\Omega^b_{kd}}[f] \quad \forall f \in \Omega_{kd}\end{aligned} \tag{5}$$

For a bi-exporter i.e. $\mathbf{1}_{\Omega^b_{kd}}[f] = 1$, the maximization problem boils down to one of a two-product firm whose core competence is the good to be consumed alone while its side product is made of the good to be consumed with the service. Producing and shipping the former requires a constant marginal cost $\tau_{kd} c_{fk}$ while the bundle requires $\tau_{kd} c_{fk} + \tau^s_{kd} c^s_{fk}$.

3.3 Firm behavior under monopolistic competition

We consider successively two kinds of market structures: our benchmark model is monopolistic competition which is the focus of this subsection. Since all varieties enter the utility function symmetrically and since each firm may supply only one good and one service complementary to this good - hence a discrete number of "products" - assuming that the variety space consists of a continuum of products washes away cannibalization effects within the firm. We relax this assumption in the next subsection when we turn to oligopolistic competition. In both cases, we do not model how firms initially enter the Belgian market before they start exporting. We focus only on their export decision, in line with our empirical exercise which is centered on the set of Belgian exporters.

[10]This is close in spirit to the multi-product firm model by Mayer et al. (2014) where firms born with a different productivity for their core product face the same increase in marginal cost as they expand their product portfolio.

Under monopolistic competition, firms are price-index takers. Note that $\mathcal{P}_{kd}$ summarizes the demand linkages between goods: because the impact of the price of any individual variety on this aggregate is negligible, there are no direct demand linkages between the good consumed alone on the one-hand and its service-augmented version on the other. In other words, under monopolistic competition, the optimal pricing rule is independent on whether the firm is supplying a service or not. Importantly enough, this is not an artifact of the iso-elastic demand considered. *Whatever the demand system is, a monopolistically competitive firm chooses independently the prices of the good alone and the good-service bundle.*

3.3.1 Prices, quantities and sales

The first-order conditions with respect to p_{fkd} is identical to the one obtained in a standard model of monopolistic competition featuring standard exporters. Now, CES preferences imply that the same markup is charged for the service. The markup $\mathcal{M}_k$ charged by any firm selling product k is given by

$$\mathcal{M}_{kd} := p_{fkd}/\left(\tau_{kd} c_{fk}\right) = p^s_{fkd}/\left(\tau^s_{kd} c^s_{fk}\right) = \frac{\sigma_k}{\sigma_k - 1} \tag{6}$$

Under monopolistic competition, bundling a service has no impact on the markup charged for the good.

Plugging the optimal prices into the demand functions leads to the good and service output chosen by a bi-exporting firm:

$$g_{fkd} = \alpha_k \cdot I_d \cdot \mathcal{P}_{kd}^{\sigma_k - 1} \cdot \mathcal{M}_k^{-\sigma_k} \cdot \tau_{kd} \cdot c_{fk}^{-\sigma_k} \cdot \left(1 + \omega_k^{-\sigma_k} \cdot \mathbf{1}_{\Omega^b_{kd}}[f]\right) \tag{7}$$

$$s_{fkd} = \alpha_k \cdot I_d \cdot \mathcal{P}_{kd}^{\sigma_k - 1} \cdot \mathcal{M}_k^{-\sigma_k} \cdot \tau_{kd} \cdot c_{fk}^{-\sigma_k} \cdot \omega_k^{-\sigma_k} \cdot \mathbf{1}_{\Omega^b_{kd}}[f] \tag{8}$$

Inspecting (7) shows that supplying a service i.e. $\mathbf{1}_{\Omega^b_{kd}}[f] = 1$ yields a positive effect on output. This stems from the multiplicative term $\left(1 + \omega_k^{-\sigma_{kd}}\right)$ which results from consumers' tastes for variety together with the assumption of one-way complementarity. Consumers taste for variety implies that firms face a positive demand for the bundled good which increases demand for the good overall through one-way complementarity with the service.

Under the assumption of monopolistic competition and CES demand, goods' sales are proportional to output:

$$r_{fkd} := \alpha_k \cdot I_d \cdot \mathcal{P}_{kd}^{\sigma_k - 1} \cdot \mathcal{M}_k^{1-\sigma_k} \cdot \tau_{kd} \cdot c_{fk}^{-\sigma_k} \cdot \left(1 + \omega_k^{-\sigma_k} \cdot \mathbf{1}_{\Omega_{kd}^b}[f]\right) \tag{9}$$

The cost-index of variety fk supplied by a bi-exporter can be defined as follows:

$$\Gamma_{fk} := c_{fk}\left(1 + \omega_k^{1-\sigma_k}\right)^{\frac{1}{1-\sigma_k}}$$

Setting $\omega_k = +\infty$, the cost-index boils down to $\Gamma_{fk} \equiv c_{fk}$. A bi-exporter exhibits a higher efficiency $\Gamma_{fk} < c_{fk}$. In other words, bundling a service to its good boosts the overall efficiency of a firm.

Firms' profits, net of fixed costs, are given by

$$\pi_{fkd} := \left(\frac{\alpha_k \cdot I_d \cdot \mathcal{P}_{kd}^{\sigma_k-1} \cdot \mathcal{M}_k^{1-\sigma_k}}{\sigma_k} \cdot (\tau_{kd} c_{fk})^{1-\sigma_k} \cdot \left(1 + \omega_k^{1-\sigma_k} \cdot \mathbf{1}_{\Omega_{kd}^b}[f]\right) - F\right) \cdot \mathbf{1}_{\Omega_k}[f] - F^b \cdot \mathbf{1}_{\Omega_{kd}^b}[f]$$

This shows that the returns to bundling a service are increasing in a bi-exporter's initial productivity $1/c_{fk}$. Consequently, only the most efficient good's producers self select into bi-exporting.

3.3.2 Cost dispersion and firm selection

In order to discuss the patterns of firm selection into bi-exporting we need to make two further assumptions on the cost increment ω_k and the distribution of firm goods productivity respectively

(A1) We assume that a firm that is not efficient enough to enter with its good alone cannot enter directly as a bi-exporter[11] i.e. $\omega_k > \left(\frac{F}{F_b}\right)^{\frac{1}{\sigma_k - 1}}$.

(A2) Denoting the distribution of $1/c_{fk}$ with a c.d.f. $G[.]$ (with survival function $\bar{G} = 1 - G[.]$), we assume that the function $x \to x.\frac{\bar{G}'[x]}{\bar{G}[x]}$ (i.e. the elasticity of the survival function) is strictly decreasing. It is constant for the Pareto case but it is verified for lognormal distributions. We come back to this point below.

Marginal cost cutoffs A firm f enters market d as soon as the following condition: is verified

$$c_{fk} < \bar{c}_{kd} := \frac{\sigma_k - 1}{\sigma_k} \cdot \left(\frac{\alpha_k \cdot I_d}{\sigma_k \cdot F}\right)^{\frac{1}{\sigma_k - 1}} \frac{\mathcal{P}_{kd}}{\tau_{kd}} \tag{10}$$

[11] This is consistent with the evidence in subsection 2.2. that only a subset of firms are bi-exporters and that their primary activity consists in selling goods.

Condition (10) requires that a standard exporter should be efficient enough to break even when incurring a fixed cost of exporting. Now firm f will supply a service together with good k if:

$$c_{fk} < \bar{c}^b_{kd} := \frac{1}{\omega_k}\frac{\sigma_k - 1}{\sigma_k} \cdot \left(\frac{\alpha_k \cdot I_d}{\sigma_k \cdot F_b}\right)^{\frac{1}{\sigma_k - 1}} \frac{\mathcal{P}_{kd}}{\tau_{kd}} \tag{11}$$

Under **(A1)**, we have $\bar{c}^b_{kd} < \bar{c}_{kd}$ so within market d, only the most performing goods exporters will supply a service with their good. This means that supplying a service magnifies size differences across firms. Everything else being equal, a firm that would be larger as a standard exporter will turn out to be even larger when supplying a service.

The probability of entering a market as a bi-exporter The above expressions show that the decision to enter a given market - as a standard or a bi-exporter - is entirely determined by the variations across markets of the cutoffs and thereby the destination specific aggregate $\frac{\mathcal{P}_{kd}}{\tau_{kd}} I_d^{\frac{1}{\sigma_k - 1}}$. Ceteris paribus, the larger the market (high I_d) or the higher the price-index (high $\mathcal{P}_{kd}$), the higher the probability of entering market d and supplying a service.

Turning to the probability of exporting a service conditional on being an exporter, this is given by $\frac{\bar{G}[1/\bar{c}^b_{kd}]}{\bar{G}[1/\bar{c}_{kd}]}$. Whether this ratio increases in the size of the destination market (*ceteris paribus*) depends on the properties of G. Would $G[.]$ be a Pareto c.d.f., this ratio would simply not depend upon market characteristics. Not only does this turn out to be a theoretical knife-edge case but, more importantly, it is at odds with our previous findings: indeed, the conditional probability of exporting a service turns out be quite well explained by standard gravity variables (see section 2.2). Under **(A2)** however, this conditional probability is increasing in market size I_d and decreasing in distance captured by τ_{kd}. Now is **(A2)** reasonable? In the appendix, we show that this condition is verified when the distribution of $(c_{kd})^{-1}$ is lognormal. This implies lognormal sales for standard exporters, which seems quite reasonable looking at our data (see Figure C-1 in Appendix).[12] Note however that even if we assume an underlying lognormal distribution for $1/c_{fk}$, the implied distribution of standard and bi-exporters pooled together is not lognormal. This is because the largest firms are the bi-exporters and this magnifies underlying productivity differences across firms.

[12]This has already been documented extensively by Head et al. (2014) for French firms exports sales.

3.3.3 Bi-exporters premia

We now turn to the premia in terms of prices, output and sales which come from bi-exporting. Our model allows to express these premia exactly as in our empirical specification for firm-product-destination stylized facts. We can construct tetradic premia by comparing in two different destinations a firm that never exports services with its product to another firm that exports services in one destination but not in the other. Specifically, for the sales premium, we compare the ratio of a bi-exporter f goods' sales relative to a standard exporter f' between two markets d and d' when the bi-exporter supplies a service only in destination d. Setting $\mathbf{1}_{\Omega^b_{kd'}}[f] = \mathbf{1}_{\Omega^b_{kd}}[f'] = \mathbf{1}_{\Omega^b_{kd'}}[f'] = 0$ and $\mathbf{1}_{\Omega^b_{kd}}[f] = 1$ in (9), we get:

$$\ln\left[\frac{r_{fkd} \cdot r_{f'kd'}}{r_{fkd'} \cdot r_{f'kd}}\right] = \ln\left[1 + \omega_k^{-\sigma_k}\right] \tag{12}$$

Under monopolistic competition, we have shown that the impact of a service channels only through an increase in output, so that the premia in terms of sales, output and KSW demand shifters (as defined in (4.4)) are identical. The latter has an important implication: even if firms face the same demand curve for their good, a bi-exporter will display a higher perceived quality as measured by the KSW index.

3.4 From monopolistic to oligopolistic competition

We study now "small" deviations from the monopolistically competitive benchmark in the sense that the number of firms within a product sector is still large but discrete. We denote firms' market shares by $\mathcal{S}_{fkd} := \left(\frac{\mathcal{P}_{fkd}}{\mathcal{P}_{kd}}\right)^{1-\sigma_k}$. Note that $\mathcal{S}_{fkd}$ is different from the market share that could be measured in the data since this one *includes* services sales. This is simply because the model implies that the relevant market does not resume to the market for good k.

When the number of firms is large enough, the cutoff condition (10) remains a reasonable approximation. Precisely, we assume for simplicity that the pricing behavior of the marginal exporter follows a constant markup rule. Any other exporter however exploits its strategic market power i.e. arising from oligopolistic behavior which is the object of the following section.[13].

[13]Under oligopoly, self-selection into bi-exporting is not guaranteed on the whole range of market shares. Studying "small" deviations from the monopolistic competition benchmark requires the tacit condition that the distribution of firm productivities $G[.]$ has a bounded support which caps the market share of the largest firm.

3.4.1 Prices, quantities and sales under oligopoly

Firms' f profit function for product k in destination d is unchanged and given by (5). Since each product accounts for a non-negligible share of the market, firms internalize the demand linkages between the good and its service-augmented version. To be concrete, if a large bi-exporter were to cut the price of the service, this would not only impact the demand for the good-service bundle but also the demand for the good alone, an effect that does not show up in the benchmark model under monopolistic competition.

Firms compete à la Bertrand[14] so they take into account their impact on the price-index $\mathcal{P}_{kd}$, conjecturing accurately the prices of their competitors at equilibrium. This leads to a deviation from the constant markup pricing rule under oligopoly, which has been recognized at least since Yang and Heijdra (1993). The first-order conditions with respect to p_{fkd} and p^s_{fkd} lead to the new optimal markup:

$$\mathcal{M}_{fkd} = \mathcal{M}_k[\mathcal{S}_{fkd}] := 1 + \frac{1}{(\sigma_k - 1)(1 - \mathcal{S}_{fkd})}$$

A monopolistically competitive firm with a negligible market share i.e. $\mathcal{S}_{fkd} \approx 0$ would charge a constant markup over price. Instead, oligopolistic firms charge a markup that is a convex function of their market share.

Using (7) and (8) leads to the implicit definition of an oligopolistic firm's market share:

$$\mathcal{P}_{kd}^{\sigma_k - 1} \cdot (\tau_{kd} \cdot c_{fk})^{1-\sigma_k} \cdot \left(1 + \omega_k^{1-\sigma_k} \cdot \mathbf{1}_{\Omega^b_{kd}}\right) = \mathcal{S}_{fkd} \cdot \mathcal{M}_k[\mathcal{S}_{fkd}]^{\sigma_k - 1} \tag{13}$$

Now contrary to the monopolistically competitive market structure, firms which display a higher efficiency in the production of the good or the service charge higher markups, higher market shares being translated into higher market power.

Everything else being equal, bundling a service i.e. $\mathbf{1}_{\Omega^b_{kd}} = 1$ boosts the market share of firm f. This, in turn, increases firm's market power and thereby markups. This is in contrast with the monopolistic competition benchmark where adding a service only led to a larger output. Turning to output, inspecting (7) again shows that this increase in markup comes with a decline of the volume sold. Theoretically, the stronger the price effect, the lower the quantity effect.

[14]The type of competition is irrelevant for the set of predictions we are interested in, all results hold under Cournot competition.

3.4.2 Putting market power into the services premia

In constrast with the monopolistic competition benchmark, adding a service for the most efficient exporters generates a premium on prices. Using tetrads again, we get

$$\ln\left[\frac{p_{fkd}\cdot p_{f'kd'}}{p_{f'kd}\cdot p_{fkd'}}\right]=\ln\left[\frac{\mathcal{M}_{fkd}}{\mathcal{M}^0_{fkd}}\right]+\ln\left[\frac{\mathcal{M}^0_{fkd}}{\mathcal{M}_{f'kd}}\cdot\frac{\mathcal{M}_{f'kd'}}{\mathcal{M}_{fkd'}}\right] \tag{14}$$

with

$$\mathcal{M}^0_{fkd}=1+\frac{1}{(\sigma_k-1)\left(1-\mathcal{S}^0_{fkd}\right)}\quad\text{where}\quad \mathcal{S}^0_{fkd}\cdot\mathcal{M}_k[\mathcal{S}^0_{fkd}]^{\sigma_k-1}=\mathcal{P}^{\sigma_k-1}_{kd}\cdot(\tau_{kd}\cdot c_{fk})^{1-\sigma_k}$$

By $\mathcal{M}^0_{fkd}$, we denote the markup that firm f would have charged for good k in destination d without a service. We see that the relative price premium includes both a markup premium stemming from services as well as a second term which is a function of $\mathcal{M}^0_{fkd}$ and the observed markups of firms f and f' in markets d and d'. This is due to the non-linear nature of the firm-level pricing strategy (in logs) under oligopolistic competition. This has important implications for the empirical estimation of the bi-exporter premium: the fixed effects estimator (firm-product and destination-product fixed effects) is now biased. Furthermore the model can inform us on the expected sign of this second term. Indeed, the question comes down to whether the dispersion in markups can vary across markets. In appendix C.3 we show that the ratio of markups between any pair of standard exporters f and f' (with f more productive that f') is lower in more competitive markets[15]: all firm reduce their markups in more competitive markets but more productive firms do it to a larger extent than less productive ones. Then, everything else being equal, if larger markets (higher I_d) feature tougher competition (lower $\mathcal{P}_{kd}$) such that the probability of bi-exporting is higher (i.e. $I_d\mathcal{P}^{\sigma_k-1}_{kd}$ is larger[16]), a direct estimation of the service price premium within firm across markets is biased downwards. Indeed, altogether these conditions imply that, conditional on exporting to that destination, (more productive) firms are more likely to supply services in larger markets where competition is tougher hence where they would normally charge a lower markup $\mathcal{M}^0_{fkd}$ relative to the markup of less productive firms $\mathcal{M}_{f'kd}$. Theoretically, the question of whether larger markets are more competitive is reminiscent of Melitz and Ottaviano (2008). In our current model and at this level of generality i.e. without specifying neither the firm entry process nor the functional form of the productivity

[15]See appendix C.4 for the Cournot case.

[16]As we show in the appendix, this remains true under oligopoly

distribution, the theoretical problem is generally inconclusive. Nevertheless, we show in appendix C.5. that two asymmetric small open economies d and d' with identical market access (i.e. same bilateral trade costs w.r.t. rest of the world) but with different GDP at equilibrium such that $I_{d'} > I_d$ will necessarily verify $\mathcal{P}_{kd'} > \mathcal{P}_{kd}$ and $I_d \mathcal{P}_{kd'}^{\sigma_k - 1} < I_d \mathcal{P}_{kd}^{\sigma_k - 1}$.

3.4.3 The quantity and sales premium revisited

Under oligopoly, services may impact firms sales not only through output but also through prices. We have also seen that these two channels are substitutable: the higher the price effect, the lower the output effect. Using (2) again allows us to rewrite the output and sales premia as follows:

$$\ln\left[\frac{g_{fkd} \cdot g_{f'kd'}}{g_{f'kd} \cdot g_{fkd'}}\right] = \ln\left[1 + \omega_k^{-\sigma_k}\right] - \sigma_k \ln\left[\frac{p_{fkd} \cdot p_{f'kd'}}{p_{f'kd} \cdot p_{fkd'}}\right] \tag{15}$$

$$\ln\left[\frac{r_{fkd} \cdot r_{f'kd'}}{r_{f'kd} \cdot r_{fkd'}}\right] = \ln\left[1 + \omega_k^{-\sigma_k}\right] - (\sigma_k - 1) \ln\left[\frac{p_{fkd} \cdot p_{f'kd'}}{p_{f'kd} \cdot p_{fkd'}}\right] \tag{16}$$

If the price premium is underestimated and demand is negatively related to price, the fixed effect estimation of the output premium is instead over-estimated.

Last, using equation (4.4), the KSW demand shifter premium is obtained as a linear combination of (14) and (15):

$$\ln\left[\frac{KSW_{fkd} \cdot KSW_{f'kd'}}{KSW_{f'kd} \cdot KSW_{fkd'}}\right] = \ln\left[1 + \omega_k^{-\sigma_k}\right] \tag{17}$$

Since it takes into account, by definition, the price effect of bundling, the KSW demand shifter premium coincides under oligopolistic competition with the sales premium under monopolistic competition. Everything else being equal, bundling a service with a good still raises the perceived quality of the good.

To wrap up, whatever the market structure, the provision of services acts as a demand shifter for the goods exported by a firm. However, depending on the market structure, the impact of services on goods' sales may channel through a higher output and/or a higher price. When accounting for the presence of large firms and thus departing from the monopolistic competition benchmark model, the price channel gains in importance. This second channel is potentially all the more important that we have shown in section 2.2 that bi-exporters are found among the very big firms.

4 Revisiting the bi-exporters' premia

We now use the features of the model to analyze the possible sources of bias when assessing the causal effect of the provision of services on firm-level goods export performance, and we propose an IV strategy to tackle them.

4.1 Sources of bias

There are several reasons why the positive correlation between the provision of services and firm-level goods export performance might not be causal.

First, as shown in our model, the marginal cost of production c_{fk} of firm f for good k governs the selection into both exporting goods (equation (10)) and services (equation (11)). This means that bi-exporters are found among the best-performing goods exporters. Since more efficient firms sell more at a lower price, not controlling adequately for the firm-product productivity induces an upward bias in the estimation of the sales premium and a downward bias for the price premium. In terms of our model, under monopolistic competition and assuming that the efficiency of the firm for a given product does not vary across destinations, this issue is solved by the tetrad defined in equation (12). The bi-exporters' premium is then estimated comparing the goods export performance of the firm-product dyads across destinations in a given year. This diff-in-diff strategy is exactly the one implemented in the panel (b) of Table 4.

The oligopolistic version of our model shows that the problem is in reality more involved. In this case, markups are variable and non linear in most of their arguments: market conditions interact with firm-level characteristics to determine individual markups. Firm-product-year and product-destination-year fixed effects are then insufficient to control for firm- and market- determinants of firm-level goods export performance. This is formalized in the expression of the premia in equation (14) of the model, where we can see that the tetrad underlying the diff-in-diff estimator does not allow to entirely wash away the firm- and market- determinants of goods export performance. The stylized facts in section 2.2 and the model allow us to determine the direction of the bias. We know that under oligopolistic competition, firms charge lower markups in the markets where bi-exporting is more likely (i.e. closer and larger markets). Moreover, in such competitive markets, more productive firms (i.e. bi-exporters) reduce their markups more than less productive ones (i.e. normal goods exporters). Therefore, by comparing bi-exporters with normal goods exporters in the same destination markets, we are likely to underestimate the price premium and to overestimate the quantity premium of bi-exporters.

Second, one could easily extend our benchmark model and assume, besides services, the existence of firm-product-destination-year demand shifters $\mathcal{A}_{fkdt}$. di Comite et al. (2014) show that such idiosyncratic tastes might be important to explain the firm-level patterns of trade across countries. In such a framework, all else equal, high $\mathcal{A}_{fkdt}$-firms sell more of their goods and are thus more likely to export services since it is easier for them to cover the fixed export cost for services. The diff-in-diff estimator of the bi-exporters' premium in terms of sales is thus likely to be upward biased. The extent of the bias for quantities and prices depends on how idiosyncratic demand shifters affect prices, which itself depends on the market structure we assume.

In the framework of our model, the last two sources of bias can be seen as a remaining correlation in the diff-in-diff estimation between the dummy that identifies bi-exporting flows and the unobserved firm-specific market share $\mathcal{S}^0_{fkdt}$ that entirely determines the markup charged by a firm. In the next subsection we propose an IV strategy to solve this issue.

4.2 Estimation strategy

From an empirical perspective, we aim at recovering an unbiased estimator of the coefficient α_1 in the following regression we already estimated for the stylized facts:

$$\mathrm{y}_{fkdt} = \alpha_1 \mathrm{serv}_{fdt} + \alpha_2 \mathrm{X}_{fkdt} + \lambda_{kdt} + \kappa_{fkt} + \epsilon_{fkdt} \tag{18}$$

where y_{fkdt} represents alternatively log export values ($\ln \mathrm{Exp}_{fkdt}$), log export quantities ($\ln \mathrm{Q}_{fkdt}$) and log unit values ($\ln \mathrm{P}_{fkdt}$); X_{fkdt} stands for firm-product-destination-year covariates, λ_{kdt} is a product-destination-year fixed effect and κ_{fkt} a firm-product-year fixed effect. serv_{fdt} is a dummy equal to 1 if firm f exports services in destination d at time t and we assume that:

$$\mathrm{serv}_{fdt} = \begin{cases} 1 & \text{if } \theta X_{fdt} + \mu_{dt} + \xi_{fdt} \geq 0 \\ 0 & \text{if } \theta X_{fdt} + \mu_{dt} + \xi_{fdt} < 0 \end{cases}$$

where X_{fdt} is a vector of firm- and firm- destination characteristics, μ_{dt} is a destination fixed effect and ξ_{fdt} is the error term. It is clear that given X_{fdt} and μ_{dt}, firms with high ξ_{fdt} will have a higher probability to export services in destination d at time t. If ξ_{fdt} and ϵ_{fkdt} are correlated, we face an endogeneity issue when estimating equation (18): this is likely to be the case when ξ_{fdt} and ϵ_{fkdt} both systematically vary with the firm-product-destination specific market share $\mathcal{S}^0_{fkdt}$.

To solve this endogeneity issue, 2SLS are commonly used. In the case of an endogenous dummy variable, this amounts to running a linear probability model in the first stage. However, this strategy does not guarantee that the predicted probabilities for the endogenous variable lie in the [0,1] interval. In our case, more than 25% of the predicted probabilities actually lie outside this interval, which is often the case when the sample is very unbalanced in terms of 0/1 values for the dependent variable. This undermines the efficiency of the IV estimator. We thus follow Wooldridge (2002) and implement a more efficient estimator based on a two-step procedure.[17] We first estimate a probit model where the endogenous dummy serv_{fdt} is regressed on both excluded and included variables. Second, we obtain the fitted probabilities from the probit and we use them as an instrument for serv_{fdt} in a standard IV regression. Wooldridge (2002) argues that this procedure has several advantages in the case of an endogenous dummy variable. First, the 2SLS standard errors and test statistics are asymptotically valid: we do not need to adjust the standard errors to account for the fact that our instrument is an estimated variable. Second, this estimator has nice robustness properties; in particular, as long as the fitted probabilities are significantly correlated with the endogenous variable, the probit used to build the instrument does not need to be correctly specified.[18]

Note that in principle, since the fitted probabilities $\widehat{\text{serv}}_{fdt}$ are a non linear function of the included variables, this model can also work without an excluded variable. However, the identification only comes from the non linearity of the function used to build the instrument in this case, thus limiting its explanatory power and the precision of the IV estimates. This is why we propose two excluded variables for the probit.

Our first excluded variable relies on the idea that not all the products are equally likely to be associated with services. Depending on both technology and preferences, some products are certainly more "bundleable" with services than others. For example, parts of aircrafts or data-processing machines are exported frequently with many services such as installation, maintenance and repairing. Instead, some vegetable and textile products are never associated with services. In our data, we can compute for each product k its "bundleability index" as the average share of transactions that are bundled with services computed across all of the Belgian exporters of product k over the period under study. The average number of Belgian exporters active in a given HS6

[17]Chapter 18, section 18.4.1, pp. 621-624.

[18]As shown by Imbens and Wooldridge (2007), the robustness of the IV procedure to the specification of the probit function is also a nice feature of this estimator as compared to a control function approach, where we would use a probit model in the first stage, compute the inverse Mills ratio based on the residuals of the probit and introduce this inverse Mills ratio as a regressor in the second stage estimation.

over the period is equal to 82 and the median to 36; we are thus confident that one single firm cannot directly affect the "bundleability index" at the product-level. We then average this index across all the products in the portfolio $\mathcal{K}_{ft}$ of firm f in year t. The resulting variable BI_{ft} should be positively correlated with the probability of bi-exporting.

However, our endogenous variable serv_{fdt} is firm-destination-year specific. We thus also use BI_{ft} interacted with the log of overall imports of services by country d at time t SI_{dt} (excluding Belgium from the trade partners) as second excluded variable.[19] Since both BI_{ft} and SI_{dt} are built using product and/or country specific information, we can reasonably assume that they are not directly correlated with the unobserved firm-product-destination specific market share $\mathcal{S}^0_{fkdt}$. In other words, our excluded variables are such that two identical firms, one being a bi-exporter and the other not, selling the same products in the same market will have the same predicted probability of exporting a service. This ensures that in the end, our instrument is not correlated with unobserved elements that affect both the bi-exporter status and the goods export performance.

4.3 IV Results

The results of the first-stage probit are displayed in Table A-6. As expected, we observe that BI_{ft} is positively correlated with the likelihood of bi-exporting. This means that firms with a product portfolio composed of goods that are more likely to be associated with services have a higher probability of being bi-exporters. The interaction of BI_{ft} with SI_{dt} is negative and significant.[20] All the other variables have the expected sign. More productive, multinational and service industry firms are more likely to export services in the destinations where they already export goods.[21] These results echo the selection of best-performing firms into bi-exporting predicted by the model. Providing a service is also more likely in destinations where multinational firms have foreign affiliates or parent firms. Finally, our results show that the higher the number of exported products and the more experienced a firm in a given market, the more likely

[19]This information comes from the Francois and Pindyuk (2013) trade in services database. This interacted variable takes into account the demand for services in country d, which is itself a function of the barriers to trade in services and the comparative advantage of d in the production of services. Note that since our specification includes destination-year fixed effects, we do not need to include this variable alone in the probit.

[20]We refrain from any interpretation because the coefficient of an interacted variable in a probit setting cannot be directly discussed (Ai and Norton, 2003).

[21]Note that in the second stage these variables will be absorbed by the fixed effect η_{fkt}. For computational reasons, we cannot include firm-year fixed effects in the probit; due to the incidental parameter problem, the predicted probability of bi-exporting would then be hard to compute.

it is to be a bi-exporter in that destination.[22] From this specification we can retrieve the predicted probability of being a bi-exporter $\widehat{\text{serv}}_{fdt}$ and use it as an instrument for the serv_{fdt} dummy.

The results of this IV strategy appear in the first three columns of Table 5. We observe in column (1) that bi-exporting has still a positive and significant effect on the goods export values. Relative to their competitors, bi-exporters export on average 50% more of their goods in destinations where they provide services than in destinations where they do not. The magnitude of this effect is bigger but not statistically different from the correlation presented in Panel (b) of Table 4. However, the mechanisms behind this effect are different from what we observed in the stylized facts. More specifically, when decomposing the effect into a quantity and a price channel, we observe that the sales premium is mostly driven by the latter (columns (2) and (3) of Table 5). The higher coefficient in the price regression suggests that the difference in markups between bi-exporters and "normal" goods exporters is smaller (and thus the difference in prices larger in absolute value) in destinations where firms are more likely to provide services together with their goods. This is exactly what our model predicts under oligopoly and it should not come as a surprise given the big size of bi-exporters.[23]

Table 5: IV results

	Panel (a): IV for Serv_{fdt}			Panel (b): IV for Serv_{fdt} & Log # Products_{fdt}		
	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Var.	**Log Exp**$_{fkdt}$	**Log Q**$_{fkdt}$	**Log P**$_{fkdt}$	**Log Exp**$_{fkdt}$	**Log Q**$_{fkdt}$	**Log P**$_{fkdt}$
Serv_{fdt}	0.504^a	0.052	0.452^a	0.789^a	0.373^a	0.416^a
	(0.135)	(0.122)	(0.049)	(0.140)	(0.126)	(0.049)
Log # Products_{fdt}	0.716^a	0.759^a	-0.043^a	0.645^a	0.679^a	-0.034^a
	(0.007)	(0.006)	(0.002)	(0.011)	(0.012)	(0.004)
Market Experience_{fkdt}	0.975^a	0.984^a	-0.009^a	0.990^a	1.001^a	-0.010^a
	(0.005)	(0.005)	(0.002)	(0.005)	(0.006)	(0.002)
AFF_{fdt}	0.281^a	0.333^a	-0.052^a	0.285^a	0.337^a	-0.052^a
	(0.023)	(0.020)	(0.010)	(0.024)	(0.021)	(0.009)
PAR_{fdt}	0.180^a	0.220^a	-0.040^a	0.174^a	0.213^a	-0.039^a
	(0.031)	(0.030)	(0.011)	(0.031)	(0.030)	(0.011)
Observations	1,587,271	1,587,271	1,587,271	1,587,271	1,587,271	1,587,271
R-squared	0.803	0.865	0.920	0.802	0.865	0.921
Kleinbergen-Paap F-Stat		138.964^a			214.591^a	

Note: Product-destination-year and firm-product-year dummies are present in all the regressions. Standard errors clustered at the firm-destination-year level in parentheses. ^{a} p<0.01, ^{b} p<0.05, ^{c} p<0.1

In columns (4) to (6), we also pay attention to the possible endogeneity of the measure of product scope of firm f in destination d at time t. Indeed, the one-way

[22] For market experience, we use here the maximum of years of presence observed across all products exported by firm f in destination d at time t.

[23] The fact that size matters to understand how firms behave is also in line with recent evidence provided in other contexts such as the adjustment of firm-level exports to exchange rates shocks for example (e.g. Berman et al., 2012; Amiti et al., 2014).

demand complementarity we model in our theory might not solely apply to services and can also be seen as a theoretical mircrofoundation for demand complementarities between goods such as the iPad and its cover or the coffee and the cup. Product scope is thus subject in our regressions to the same endogeneity concerns as the provision of services.[24]

As for services, we thus need to account for the firm-product-destination unobserved components that can affect both the number of products exported and the performance of the firm for a specific product in a given destination market. To tackle this issue, we propose the following instrument. For each HS6 product k, we calculate the average total number of products exported across all destinations and all years by the firms exporting k. We then average this variable across all the products exported by firm f in country d at time t. This provides us with a predicted measure of the product scope of firm f in destination d at time t. Since it is based on a technological parameter attached to each of the products in the firm-destination level portfolio, it should not be directly correlated with the unobserved firm-product-destination market share $\mathcal{S}^0_{fkdt}$.

The results in column (4) of Table 5 confirm those in column (1): similar to services, the product scope also has a positive effect on the export values, even though the coefficient is slightly reduced as compared to the specification where only the service dummy is instrumented. However, the mechanism is quite different. The positive effect of product scope on sales entirely channels through quantities (columns (5) and (6) of Table 5). Note that instrumenting product scope tends to boost the sales premium stemming from the provision of services, and bi-exporting seems now to be associated with both a quantity and a price premium. Overall, these results confirm that the demand-enhancing effect of bi-exporting is at least partly capitalized into prices, while providing several products mainly allows firms to sell more of each of them, which is rather in line with the monopolistic competition version of our model. Again, this might not come as a surprise since multi-product exporting happens much more often than bi-exporting and bi-exporters have been shown to be much bigger than multi-product exporters.

We provide in Appendix D three robustness checks. First, we use a different exclusion restriction and we interact the BI_{ft} index with the share of services in the overall imports of the destination d at time t taken from the Comtrade dataset. Second, we exclude from the estimation sample potential outliers by dropping those firms for which the share of services in overall exports is above 50%. Third, we exclude destinations in

[24]Please, note that the identification of the goods that are actually one-way complements is beyond the scope of this paper.

which a multinational has either an affiliate or a parent firm to dissolve any remaining concern about the behavior of multinationals in countries that are part of their business structure.[25] In all three cases all the results remain confirmed (Tables D-1, D-2 and D-3).

4.4 Understanding the effect on product appeal

Table 5 clearly shows that bi-exporting has a positive effect on prices without harming the quantities exported. This means that the association of services undoubtedly influences the perceived vertical differentiation of the product. Instead, the scope of the product portfolio increases the sales of each product due to greater quantities, the effect on prices (unconditional on quantity) being slightly negative.

In order to understand and quantify how services and product scope participate to the appeal of a given variety, i.e. how it affects firms' ability to sell given their price, we perform two exercises. In the first one, we run the price regression in column (6) of Table 5 adding the quantities sold as a regressor. This way of proceeding is similar to the one proposed by Bernard et al. (2012) and it measures by how much firms can increase their price without harming demand when they provide services and additional products together with their goods.[26]

In the second exercise, we use the same strategy as in column (6) of Table 5 but we use a direct measure of firm-product-destination demand shifter as the dependent variable. In this way, we can circumvent the endogeneity of quantities to prices. As in Khandelwal et al. (2013), we directly derive the demand-shifter from our model by taking the log of our demand function (equation 2) and estimating the following regression:

$$\log(q_{fkdt}) + \sigma_{kd}\log(uv_{fkdt}) = \text{FE}_{kdt} + \epsilon_{fkdt}$$

where q_{fkdt} and uv_{fkdt} are the quantity and price charged by firm f for product k sold to country d at time t and FE_{kdt} is a product-destination-year fixed effect. We use the product-destination specific elasticity of substitution (σ_{kd}) estimated by Broda et al. (2006). Under the assumption of CES preferences, the estimated demand shifter is $\frac{\hat{\epsilon}_{fkdt}}{\sigma_{kd}-1}$. This measure has the advantage of directly accounting for the product-

[25] Remember that in the main specification intra-firm services trade is already removed from the estimation sample and we control in the regressions for the fact that a firm has affiliates and/or parent firms in the destinations where it exports goods.

[26] As in their work, providing a full IV strategy to account for the endogeneity of quantities in such a specification goes beyond the scope of this paper.

destination specific price-elasticity of demand σ_{kd} and it measures the ability of a firm to sell its product in a given market conditioning on price. Equivalently, it can be considered as a measure of export appeal or perceived quality.

Several remarks are in order here. First, the definition of the KSW demand shifter relies on the assumption of CES preferences but is independent of the market structure we assume. Indeed, for the definition of the KSW demand shifter to hold, we need the elasticity of substitution between varieties to be constant. When preferences are CES, this is the case both under monopolistic and oligopolistic competition. What depends on the market structure is the price-elasticity of demand, which does not enter the definition of the KSW demand shifter.[27] The interpretation of this index directly stems from our model. For a given equilibrium and thus a given price index (absorbed empirically by the product-destination-year fixed effect), it is obtained by comparing the quantities and prices of the Belgian firms active in a given market, fixing the elasticity of substitution between the varieties; it has a cross-sectional interpretation and it provides a direct measure of the firm-product-destination-year demand shifter, putting some structure on the preferences of consumers. Second, the procedure implemented by Broda et al. (2006) to estimate the elasticities of substitution relies on the estimation of price-elasticities of import market shares, differencing both market shares and prices across imported varieties (unit values being taken as proxies for prices) and assuming CES preferences. It is thus perfectly in line with our framework here.

The results of these two exercises are presented in Table 6. In the first column, we can see that once we control for quantities, both services provision and product scope positively affect firm-level unit values. This confirms that services and goods are two distinct vectors of vertical differentiation, allowing bi-exporters to raise their price without harming demand.[28] This is further corroborated by the results in column (2) of Table 6 which show that services exports and product scope both positively affect the KSW demand shifter.

To get a sense of the economic magnitude of these effects, we transform them into

[27] In the monopolistic competition case, the price-elasticity is constant and equal to the elasticity of substitution. On the opposite, in the oligopolistic competition framework, it does vary for each firm so that markups are variable.

[28] Our positive coefficient on the number of products exported by the firm in a given destination is in line with the results emphasized in Bernard et al. (2012). However, a direct comparison of the magnitude of the effects we obtain is impossible, since they work with a restricted sample of firms for which they also have production data. We do not need such information for our purpose here, we thus work with a larger sample of exporting firms. Moreover, they also limit their analysis to the destinations outside Europe, in line with their IV strategy based on tariff variations. Our IV strategy is different and we prefer keeping all the destinations since we would lose many of the bi-exporting flows by dropping European countries.

Table 6: Demand shifter - IV results

	IV for Serv_{fdt} & Log # Products_{fdt}	
	(1)	(2)
Dep. Var.	**Log P**$_{fkdt}$	**KSW**$_{fkdt}$
Serv_{fdt}	0.459^a	0.632^a
	(0.053)	(0.109)
Log # Products_{fdt}	0.043^a	0.252^a
	(0.004)	(0.010)
Market Experience_{fkdt}	0.104^a	0.474^a
	(0.002)	(0.005)
AFF_{fdt}	-0.014	0.068^a
	(0.010)	(0.020)
PAR_{fdt}	-0.015	0.089^a
	(0.011)	(0.025)
Log Q_{fkdt}	-0.114^a	
	(0.001)	
Observations	1,587,271	1,252,510
R-squared	0.927	0.604
Kleinbergen-Paap F-Stat	138.892^a	121.385^a

Note: Product-destination-year and firm-product-year dummies are present in all the regressions. Standard errors clustered at the firm-destination-year level in parentheses. ^{a} p<0.01, ^{b} p<0.05, ^{c} p<0.1

standardized coefficients.[29] We find that a one standard-deviation increase in the probability of exporting services together with goods is associated with a 0.09 standard-deviation increase in the KSW demand shifter, vs 0.11 for a one-standard deviation increase in the size of the product scope. Both effects are thus very close in magnitude and sizeable, equal to half of the effect of market experience.

4.5 Services provision and product price dispersion

We have shown that the provision of services allows bi-exporters to raise the price of their products, especially in those destinations where they would charge lower markups in the absence of services. There exists a huge literature on price dispersion and the low of one price which investigates the extent and the determinants of price dispersion both across firms/within markets and within firms/across markets (see, e.g. Goldberg and Verboven, 2001; Imbs et al., 2005; Manova and Zhang, 2012; Cavallo et al., 2014; Simonovska, 2015). In a last empirical exercise, we thus want to assess how much the provision of services participates to the price dispersion observed for a given firm and a given product.

[29] Put differently, we calculate the effect of one standard-deviation of each explanatory variable x as a share of a one standard-deviation of the dependent variable y: $\frac{\beta_x \times \text{sd}_x}{\text{sd}_y}$.

In order to have enough observations when we compute price dispersion, we focus on firm-product-year triplets for which we observe at least four export flows in our estimation sample (i.e. four destinations). We use two measures of price dispersion: the inter-quartile ratio and the coefficient of variation of unit values within firm-product-year (and thus across destinations). For the bi-exporters, we consider two types of unit values: the actual one observed in the data, and the one we would observe in the absence of services provision.[30] For the firm-product-year triplets for which we never observe services, the median interquartile ratio of unit values is equal to 1.59 and the coefficient of variation to 0.41. For the firm-product-year triplets that are observed with services in at least one destination, these figures are respectively equal to 1.62 and 0.44. If we shut down the services channels, the interquartile ratio and the coefficient of variations rise to 1.77 and 0.48, i.e. by nearly 25% and 10% respectively. In the absence of services, bi-exporters would exhibit much more price dispersion across destination than standard exporters. The provision of services thus reduces the observed price dispersion of manufacturing goods exports across destinations. This is perfectly in line with our model which shows that the provision of services is a way for bi-exporting firms to restore their market power in the most competitive markets where they are present.

5 Alternative interpretations and robustness

Heterogeneous consumers and market segmentation.

In our model, aggregate demand is obtained by assuming that all consumers are identical and have CES preferences. The same demand system can be obtained assuming that a unit mass of heterogeneous consumers decides first to allocate $\alpha_k I_d$ to each good k and then decide which variety to buy according subject to her idiosyncratic taste. Their second-stage indirect utility for variety fkd is then

$$\mathcal{V}_{fkd} = \ln \alpha_k + \ln I_d - \ln p_{fkd} + \varepsilon_{fkd}$$

when consumed alone or

$$\mathcal{V}^b_{fkd} = \ln \alpha_k + \ln I_d - \ln \left[p_{fkd} + p^s_{fkd}\right] + \varepsilon^b_{fkd}$$

[30]We calculate the latter based on the results presented in column 6 of Table 5 : uv_bis=$e^{\ln(\text{uv})-0.47\times\ln(\text{uv})}$

when bundled with a service. Under the assumption that $\left(\varepsilon_{fkd}, \varepsilon^b_{fkd}\right)$ are drawn identically and independently from a Gumbel distribution with standard deviation $\frac{\pi}{\sqrt{6}(\sigma_k - 1)}$, aggregating consumers' demand for their preferred variety leads back to ** ** see also Thisse and Ushchev 2016 for further discussions.

In this setting, supplying the good-service bundle allows firms to segment the market for product k between high and low-valuation consumers and thus to extract more surplus overall. Interestingly enough, the presence of high-valuation of consumers decrease the surplus of low-valuation consumers. We leave the distributional implications of services trade liberalization for future research.

One-way complementarity.

Our baseline model relies on the assumption of one-way complementarity between goods and services to explain the patterns we find in the data. We now review alternative explanations.

Alternative model 1: the good as a firm's core competence, and the service as a peripheral product. There are two types of models within this literature: those which assume a monopolistically competitive market structure and those which assume oligopolistic competition.

In the first category (i.e. Manova and Zhang (2012) or Mayer et al. (2014)), a firms' product marginal cost increases with its distance to the firm's core competence. The existence of trade costs typically implies that exported products are a subset of firm's scopes: only the ones close to the core competence are profitable enough to overcome trade barriers. Now, when comparing a firm's scope across markets, it could well be the case that a firm systematically sells more products to larger markets in larger quantities. In our case, this would imply again a positive correlation between the service dummy (as a peripheral product) and the sales of the good (as the core competence).

However, these models assume that multi-product firms compete under monopolistic competition and behave as a set of single-product firms in the sense that they maximize their profits independently for each product. This implies that controlling for both firm-product ability and specific destination-product common shocks, the sales of the core product should not be correlated with the decision of exporting a peripheral product.

In the second category (Eckel and Neary, 2010), firm's decisions for each product are interconnected again through a cannibalization effect. This is a model that could capture for instance a firm selling a printer and also renting it. Everything else being equal however, selling two substitutable goods implies lower sales compared to the case where only one is sold.

This type of models are thus unable to replicate the positive association between goods and services we find with our diff-in-diff setting in the data.

Alternative model 2: goods and services as complements. In the previous model, goods and services are one-way complements so that the consumption of various varieties is aggregated through a utility function that features imperfect substitutability only between the good alone and the good with the service. One could instead consider that goods and services are two-way complements. Everything else being equal however, while bundling the two increases the sales of both, it tends to also decrease the prices of both (Belleflamme and Peitz, 2010), a prediction at odds with our results.

Alternative model 3: the provision of services is driven by the supply side. Under monopolistic competition, without any demand-side explanation, reconciling larger sales of the good with a higher price is simply not possible as it contradicts the law of demand.
However, sticking to monopolistic competition, we could assume that preferences feature one-way complementarity while the price effects, instead of arising from oligopoly, are driven by the supply side. For the price of the good to be higher when a service is jointly exported, it would have to be that the marginal cost of production of that good goes up when bundled with a service i.e. decreasing returns to scope. Now for the overall sales of the good to go up as observed, it would have to be that the sales of the bundle do more than offsetting this decline. Under certain parameter restrictions this is perfectly reasonable and would replicate comparisons within countries across firms. However, it sounds much less convincing when coming to within-firm across-country comparisons where replicating our results would require that decreasing scope economies are destination specific i.e. producing a good would be costlier in a destination when bundled with a service to be shipped to that same destination.

Alternative model 4: Our theoretical framework abstracts from the possibility of getting the service from service suppliers in the destination country. Their presence would provide consumers with three choices: i) consume the good alone; ii) consume the good with the service supplied by an external supplier; iii) consume the good with the service provided by the same firm. Under monopolistic competition, under the assumption that the complementarity service-good is the same regardless of who is providing the service, we would observe a higher prices of the good in case ii. Therefore, comparing the price of the good in cases ii and iii we should observe a negative correlation (and no correlation comparing iii and i). Obviously, in this scenario we would observe less firms associating the service to the good because they can get the complementarity kick from the external suppliers. When looking at the data, we can only compare iii with i and ii together and we actually find a positive correlation (i.e. on average the price in iii is higher than the price in i and ii). Therefore, there is no evidence of external suppliers playing a significant role. Moreover, the presence of external suppliers would lead us to underestimate the complementarity of services when they are supplied by the same firm providing the good.

Empirics: tracking services exports. On the empirical front, one might worry that we do not observe all the transactions for services in the data and that services might sometimes be directly charged with the good. We think that this should not be too often the case since generally the provision of services (warranties, maintenance, assistance, consultancy etc.) are the object of a separate transaction or a separate line in the contract so that they must be declared by firms separately. However, should it be the case, this means that we might identify among "normal" goods exporters firms that are in reality bi-exporters, which should drive downwards the price, sales and quantity premia.

Overall, we are thus quite confident in the fact that we have identified here a new mechanism relating manufacturing and services activities within the firm through demand complementarities between the two.

6 Conclusion

While the servitization of our economies is often seen as going hand in hand with deindustrialization, our work provides a different perspective on these two phenomena. By documenting that the very best goods exporters also export services in some of the destinations they serve, we show that both activities are not necessarily antagonistic. Moreover, by means of an instrumentation strategy to infer causation, we argue that the provision of services might actually boost the demand for goods, allowing firms to charge higher prices without harming the demand for their goods. This can be rationalized in a model with oligopolistic competition where services are one-way complements to goods and consumers love variety. By attracting a bigger share of the market, firms that export services together with their goods can increase their markups. Services act as a demand-shifter for goods, and thus as a vector of perceived vertical differentiation. Therefore, services are a determinant of firm-level differences in export performance. Finally, our results suggest that the liberalization of trade in services, which is at stake in many bilateral negotiations such as those between the EU and the US for the TTIP or those with the UK for Brexit, might have also important consequences for trade in goods in general and for the biggest firms that are bi-exporter in particular. Considering goods and services separately in the negotiation of trade agreements is thus likely to miss part of the business and welfare gains and losses related to these treaties.

References

Ai, C. and Norton, E. C. (2003). Interaction Terms in Logit and Probit Models. *Economics Letters*, 80:123–129.

Amiti, M., Itskhoki, O., and Konings, J. (2014). Importers, Exporters, and Exchange Rate Disconnect. *American Economic Review*, 104(7):1942–78.

Ariu, A. (2016). Crisis-Proof Services: Why Trade in Services Did Not Suffer During the 2008-2009 Collapse. *Journal of International Economics*, 98(C):138–149.

Ariu, A., Breinlich, H., Corcos, G., and Mion, G. (2016). Interconnections Between Services and Goods Trade at the Firm Level. Technical report, Mimeo.

Belleflamme, P. and Peitz, M. (2010). Platform competition and seller investment incentives. *European Economic Review*, 54(8):1059–1076.

Berlingieri, G. (2014). Outsourcing and the Shift From Manufacturing to Services. CentrePiece - The Magazine for Economic Performance 413, Centre for Economic Performance, LSE.

Berman, N., Martin, P., and Mayer, T. (2012). How do Different Exporters React to Exchange Rate Changes? *The Quarterly Journal of Economics*, 127(1):437–492.

Bernard, A. B., Blanchard, E., van Beveren, I., and Vandenbussche, H. (2012). Carry-Along Trade. CEPR Discussion Papers 9067, C.E.P.R. Discussion Papers.

Bernard, A. B. and Fort, T. C. (2015). Factoryless Goods Producing Firms. *American Economic Review*, 105(5):518–23.

Bernard, A. B., Redding, S. J., and Schott, P. K. (2011). Multiproduct Firms and Trade Liberalization. *The Quarterly Journal of Economics*, 126(3):1271–1318.

Bernard, A. B., Smeets, V., and Warzynski, F. (2014). Rethinking Deindustrialization. Economics Working Papers 2014-14, Department of Economics and Business Economics, Aarhus University.

Breinlich, H., Soderbery, A., and Wright, G. C. (2014). From Selling Goods to Selling Services: Firm Responses to Trade Liberalization. CEP Discussion Papers dp1303, Centre for Economic Performance, LSE.

Broda, C., Greenfield, J., and Weinstein, D. (2006). From Groundnuts to Globalization: A Structural Estimate of Trade and Growth. NBER Working Papers 12512, National Bureau of Economic Research, Inc.

Cavallo, A., Neiman, B., and Rigobon, R. (2014). Currency Unions, Product Introductions, and the Real Exchange Rate. *The Quarterly Journal of Economics*, 129(2):529–595.

Chaney, T. (2008). Distorted Gravity: The Intensive and Extensive Margins of International Trade. *American Economic Review*, 98(4):1707–21.

Chen, M. K. and Nalebuff, B. J. (2006). One-Way Essential Complements. Cowles Foundation Discussion Papers 1588, Cowles Foundation for Research in Economics, Yale University.

Crozet, M., Head, K., and Mayer, T. (2012). Quality Sorting and Trade: Firm-level Evidence for French Wine. *Review of Economic Studies*, 79(2):609–644.

Crozet, M. and Milet, E. (2015). Should Everybody be in Services? The Effect of Servitization on Manufacturing Firm Performance. Working Papers 2015-19, CEPII research center.

Dhingra, S. (2013). Trading Away Wide Brands for Cheap Brands. *American Economic Review*, 103(6):2554–84.

di Comite, F., Thisse, J., and Vandenbussche, H. (2014). Verti-zontal Differentiation in Export Markets. *Journal of International Economics*, 93(1):50–66.

Eaton, J., Kortum, S. S., and Sotelo, S. (2012). International Trade: Linking Micro and Macro. NBER Working Papers 17864, National Bureau of Economic Research, Inc.

Eckel, C. and Neary, J. P. (2010). Multi-Product Firms and Flexible Manufacturing in the Global Economy. *Review of Economic Studies*, 77(1):188–217.

Francois, J. and Pindyuk, O. (2013). Consolidated Data on International Trade in Services. IIDE Discussion Papers 20130101, Institue for International and Development Economics.

Goldberg, P. K. and Verboven, F. (2001). The Evolution of Price Dispersion in the European Car Market. *Review of Economic Studies*, 68(4):811–848.

Head, K., Mayer, T., and Thoenig, M. (2014). Welfare and Trade without Pareto. *American Economic Review*, 104(5):310–16.

Hottman, C. J., Redding, S. J., and Weinstein, D. E. (2016). Quantifying the sources of firm heterogeneity. *The Quarterly Journal of Economics*, 131(3):1291–1364.

Imbens, G. and Wooldridge, J. (2007). Control Function and Related Methods in What's New In Econometrics? *NBER Lecture Note 6*.

Imbs, J., Mumtaz, H., Ravn, M. O., and Rey, H. (2005). PPP Strikes Back: Aggregation And the Real Exchange Rate. *The Quarterly Journal of Economics*, 120(1):1–43.

Khandelwal, A. K., Schott, P. K., and Wei, S.-J. (2013). Trade Liberalization and Embedded Institutional Reform: Evidence from Chinese Exporters. *American Economic Review*, 103(6):2169–95.

Loecker, J. D. and Warzynski, F. (2012). Markups and Firm-Level Export Status. *American Economic Review*, 102(6):2437–71.

Manova, K. and Zhang, Z. (2012). Export Prices Across Firms and Destinations. *The Quarterly Journal of Economics*, 127(1):379–436.

Mayer, T., Melitz, M. J., and Ottaviano, G. I. P. (2014). Market Size, Competition, and the Product Mix of Exporters. *American Economic Review*, 104(2):495–536.

Mayer, T. and Ottaviano, G. I. P. (2007). *The Happy Few: the Internationalisation of European Firms*, volume 3. Brussels: Bruegel Blueprint Series.

Melitz, M. J. and Ottaviano, G. I. P. (2008). Market Size, Trade, and Productivity. *Review of Economic Studies*, 75(1):295–316.

Neary, P. (2016). International Trade in General Oligopolistic Equilibrium. *Review of International Economics*, 24(4):669–698.

Nocke, V. and Yeaple, S. (2014). Globalization and Multiproduct Firms. *International Economic Review*, 55:993–1018.

Pierce, J. R. and Schott, P. K. (2016). The Surprisingly Swift Decline of US Manufacturing Employment. *American Economic Review*, 106(7):1632–62.

Simonovska, I. (2015). Income Differences and Prices of Tradables: Insights from an Online Retailer. *The Review of Economic Studies*, 82(4):1612–1656.

Wooldridge, J. M. (2002). *Econometric Analysis of Cross-Section and Panel Data*. MIT Press.

Appendix

A Further Tables

Table A-1: Descriptive statistics on firm-product-destination flows

Variable	Obs	Mean	Std. Dev.	Min	Max
Exports of Goods (firm-product-destination-year, million euros)	2,576,339	0.30	4.53	0.00	3703.40
Weight (firm-product-destination-year, tons)	2,576,339	354,486.30	1.24×10^{7}	1	1.34×10^{10}
Service Dummy (firm-product-destination-year)	2,576,339	0.07	0.25	0	1
# years of presence in the market (firm-product-destination-year)	2,576,339	3.09	2.55	1	11
Turnover/Employment (firm-year, million euros)	98,900	0.81	12.82	0.00	1995.76
Service Industry Dummy (firm-year)	98,900	0.44	0.50	0	1
Multinational Firm Dummy (firm-year)	98,900	0.08	0.26	0	1

Note: This table presents some descriptive statistics of the variables used.

Table A-2: Bi-Exporters Premia, firm-product-country and country-product-year FE

	(1)	(2)	(3)
Dep. Var.	**Log Exp**$_{fkdt}$	**Log Q**$_{fkdt}$	**Log P**$_{fkdt}$
Serv$_{fdt}$	0.067^{a}	0.074^{a}	-0.008
	(0.014)	(0.014)	(0.007)
Log # Products$_{fdt}$	0.466^{a}	0.477^{a}	-0.011^{a}
	(0.007)	(0.007)	(0.002)
Market Experience$_{fkdt}$	0.322^{a}	0.320^{a}	0.002
	(0.006)	(0.006)	(0.002)
AFF$_{fdt}$	0.113^{a}	0.134^{a}	-0.020^{b}
	(0.021)	(0.023)	(0.009)
PAR$_{fdt}$	0.023	0.002	0.021
	(0.035)	(0.033)	(0.014)
Product-Destination-Year FE	Yes	Yes	Yes
Firm-Product-Destination FE	Yes	Yes	Yes
Observations	1,652,189	1,652,189	1,652,189
R-squared	0.896	0.928	0.937

Note: Standard errors clustered at the firm-destination-year level in parentheses. ^{a} p<0.01, ^{b} p<0.05, ^{c} p<0.1

Table A-3: Bi-Exporters Premia by service type

Dep. Var.	(1) ln $\mathbf{Exp}_{fkdt}$	(2) ln $\mathbf{Q}_{fkdt}$	(3) ln $\mathbf{P}_{fkdt}$
Transport	0.106^a	0.130^a	-0.024
	(0.040)	(0.037)	(0.015)
Travel	0.094	0.125^b	-0.031^c
	(0.064)	(0.061)	(0.019)
Communication	-0.101	-0.064	-0.037^b
	(0.062)	(0.061)	(0.016)
Construction	-0.031	-0.030	-0.000
	(0.058)	(0.056)	(0.020)
Insurance	0.010	-0.007	0.017
	(0.080)	(0.069)	(0.024)
Financial	0.306^a	0.293^a	0.013
	(0.041)	(0.038)	(0.012)
Computer	0.118^b	0.089^c	0.029
	(0.052)	(0.048)	(0.023)
Royaties	-0.032	-0.001	-0.031^b
	(0.045)	(0.044)	(0.015)
Business	0.219^a	0.224^a	-0.005
	(0.028)	(0.027)	(0.009)
Personal and Cultural	0.393^a	0.407^a	-0.013
	(0.107)	(0.111)	(0.036)
Government	0.235	0.012	0.222^b
	(0.249)	(0.195)	(0.112)
Log # Products_{fdt}	0.707^a	0.738^a	-0.030^a
	(0.006)	(0.006)	(0.002)
Market Experience_{fkdt}	0.963^a	0.970^a	-0.007^a
	(0.005)	(0.005)	(0.002)
AFF_{ft}	0.301^a	0.334^a	-0.033^a
	(0.023)	(0.021)	0.008)
PAR_{ft}	0.190^a	0.197^a	-0.007
	(0.032)	(0.030)	(0.011)
Observations	1,652,189	1,652,189	1,652,189
R-squared	0.801	0.865	0.922

Note: Product-destination-year and firm-product-year dummies are present in all the regressions. Standard errors clustered at the firm-destination-year level in parentheses. [a] p<0.01, [b] p<0.05, [c] p<0.1

Algorithm

The algorithm we propose to identify "truly" bundled goods works as follows. For each hs6 product, we consider as truly associated those goods that are above the 25^{th} percentile in terms of simultaneously:

- the bundling frequency, i.e. how many times that product is bundled with a specific services over the total number of times in which the product is exported by a Belgian firm
- the number of firms exporting that couple, i.e. how many firms export that product with the specific service over the total number of firms that export that product.
- the number of markets in which we observe the association

Table A-4: Bi-Exporters Premia - Core product

	(1)	(2)	(3)
Dep. Var.	**ln Exp**$_{fkdt}$	**ln Q**$_{fkdt}$	**ln P**$_{fkdt}$
Serv$_{fdt}$	0.145^a	0.148^a	-0.003
	(0.023)	(0.022)	(0.007)
Serv$_{fdt}$*Core product$_{ft}$	0.878^a	0.892^a	-0.014
	(0.030)	(0.030)	(0.010)
Log # Products$_{fdt}$	0.705^a	0.736^a	-0.031^a
	(0.006)	(0.006)	(0.002)
Market Experience$_{fkdt}$	0.961^a	0.969^a	-0.007^a
	(0.005)	(0.005)	(0.002)
AFF$_{ft}$	0.297^a	0.330^a	-0.033^a
	(0.023)	(0.021)	(0.008)
PAR$_{ft}$	0.205^a	0.213^a	-0.008
	(0.032)	(0.030)	(0.011)
Observations	1,652,189	1,652,189	1,652,189
R-squared	0.801	0.865	0.922

Note: Product-destination-year and firm-product-year dummies are present in all the regressions. Standard errors clustered at the firm-destination-year level in parentheses. ^{a} p<0.01, ^{b} p<0.05, ^{c} p<0.1

- the number of years the service-product is observed as associated
- the share of exports associated with services (in value) in the total exports of that product.

Moreover, using information on imports we impose that the product-service couple we consider is also imported at least once by a firm during the 1997-2005 period.

Table A-5: Bi-Exporters Premia - Algorithm

	(1)	(2)	(3)
Dep. Var.	**ln Exp**$_{fkdt}$	**ln Q**$_{fkdt}$	**ln P**$_{fkdt}$
Serv$_{fdt}$	0.304^a	0.311^a	-0.007
	(0.040)	(0.040)	(0.011)
Serv$_{fdt}$*Bundled good$_d$	-0.038	-0.040	0.002
	(0.043)	(0.043)	(0.012)
Log # Products$_{fdt}$	0.706^a	0.737^a	-0.031^a
	(0.006)	(0.006)	(0.002)
Market Experience$_{fkdt}$	0.962^a	0.969^a	-0.007^a
	(0.005)	(0.005)	(0.002)
AFF$_{ft}$	0.294^a	0.327^a	-0.033^a
	(0.023)	(0.021)	(0.008)
PAR$_{ft}$	0.202^a	0.210^a	-0.008
	(0.032)	(0.030)	(0.011)
Observations	1,652,189	1,652,189	1,652,189
R-squared	0.801	0.865	0.922

Note: Product-destination-year and firm-product-year dummies are present in all the regressions. Standard errors clustered at the firm-destination-year level in parentheses. ^{a} p<0.01, ^{b} p<0.05, ^{c} p<0.1

Table A-6: Determinants of the probability of bi-exporting

Dep. Var.	Serv_{fdt}
BI_{ft}	14.730^a
	(1.346)
$\text{BI}_{ft} \times \text{SI}_{dt}$	-0.311^b
	(0.123)
Log Turnover/L_{ft}	0.049^a
	(0.004)
MNE_{ft}	0.402^a
	(0.012)
AFF_{fdt}	0.244^a
	(0.019)
PAR_{fdt}	0.263^a
	(0.029)
Service industry dummy_{ft}	0.612^a
	(0.018)
Log # Products_{fdt}	0.143^a
	(0.007)
Market Experience_{fdt}	0.040^a
	(0.007)
Destination-year FE	Yes
Observations	503,728

Note: Probit model. Standard errors clustered at the destination-year level in parentheses. [a] p<0.01, [b] p<0.05, [c] p<0.1

C Theoretical appendix

C.1 Characterizing gravity for bi-exporters

The conditional probability of bi-exporting is given by

$$\frac{\bar{G}\left[1/\bar{c}^{b}_{kd}\right]}{\bar{G}\left[1/\bar{c}_{kd}\right]} \equiv \frac{\bar{G}\left[\omega_k \left(\frac{F}{F_b}\right)^{\frac{1}{1-\sigma_k}} \cdot (1/\bar{c}_{kd})\right]}{\bar{G}\left[1/\bar{c}_{kd}\right]}$$

where $\omega_k \left(\frac{F}{F_b}\right)^{\frac{1}{1-\sigma_k}} > 1$ by assumption **(A1).**

Whether this ratio increases or decreases with $\bar{c}_{kd}$ depends on the elasticity of the survival function $\bar{G}[.]$:

$$\mathcal{E}_{\bar{G},x} = \frac{x \cdot \bar{G}'(x)}{\bar{G}(x)}$$

Indeed, differentiating the conditional probability of bi-exporting w.r.t. to $\bar{c}_{kd}$ leads to

$$\frac{1}{\bar{c}_{kd}} \cdot \frac{\bar{G}' \left[1/\bar{c}_{kd}\right] - \omega_k \left(\frac{F}{F_b}\right)^{\frac{1}{1-\sigma_k}} (1/\bar{c}_{kd}) \cdot G' \left[\omega_k \left(\frac{F}{F_b}\right)^{\frac{1}{1-\sigma_k}} \cdot (1/\bar{c}_{kd})\right]}{\bar{G}\left[1/\bar{c}_{kd}\right]}$$

A necessary and sufficient condition for the above term to be positive for any $\omega_k \left(\frac{F}{F_b}\right)^{\frac{1}{1-\sigma_k}} > 1$ is $\mathcal{E}'_{\bar{G},x} < 0$.

When $\bar{G}$ is a power function e.g. a Pareto survival function, then it is constant.

When G is a standard lognormal $\mathcal{LN}(0, s)$ then the hazard rate is given by

$$h(x) = \frac{1}{sx} \frac{\phi\left[\frac{\ln x}{s}\right]}{1 - \Phi\left[\frac{\ln x}{s}\right]}$$

where Φ (resp. φ) is the cumulative (resp. probability) distribution of a standard gaussian. Noticing that

$$\mathcal{E}_{\bar{G},x} = -x \cdot h(x)$$

we get that

$$\mathcal{E}_{\bar{G},x} = -\frac{1}{s} \cdot \frac{\phi\left[\frac{\ln x}{s}\right]}{1 - \Phi\left[\frac{\ln x}{s}\right]}$$

which is proportional to the inverse Mills ratio of a Gaussian variable evaluated at $\frac{\ln x}{s}$. The elasticity $\mathcal{E}_{\bar{G},x}$ is therefore decreasing in x.

To conclude, a decreasing $\mathcal{E}_{\bar{G},x}$ implies that in bigger markets (conditional on the price-index) or when competition is softer (conditional on market size), the probability of exporting a service conditional on exporting to that destination is higher.

C.2 Prices under Cournot competition

Inverse demands are now given by

$$p \quad \left[x_{fkd}, x^s_{fkd}; \Lambda_{kd}\right] = \Lambda_{kd} \left(x_{fkd} - x^s_{fkd}\right)^{-\frac{1}{\sigma_k}} \tag{19}$$

$$p\left[x_{fkd}, x^s_{fkd}; \Lambda_{kd}\right] + p^s \quad \left[x_{fkd}, x^s_{fkd}; \Lambda_{kd}\right] = \Lambda_{kd} {x^s_{fkd}}^{-\frac{1}{\sigma_k}} \tag{20}$$

where

$$\Lambda_{kd} := \frac{\alpha_k I_d}{\mathcal{C}_{kd}^{\frac{\sigma_k - 1}{\sigma_k}}}$$

Profits read as:

$$\pi_{fkd} := \left(p_{fkd} - \tau_{fkd} c_{fkd}\right) L \cdot \left(x_{fkd} - x^s_{fkd}\right) + \left(p_{fkd} + p^s_{fkd} - \tau_{fkd} c_{fkd} - \tau^s_{fkd} c^s_{fkd}\right) L \cdot x^s_{fkd} \cdot \mathbf{1}_{\Omega^b_{kd}}[f] \quad \forall f \in \Omega_{kd}$$

Maximizing with respect to $\{x_{fkd} - x^s_{fkd}\}$ and x^s_{fkd} leads to the price:

$$p_{fkd}/\tau_{fkd} = \frac{\sigma_k}{\sigma_k - 1}\frac{c_{fkd}}{1 - \mathcal{S}_{fkd}}$$

C.3 Markup dispersion under Bertrand competition.

First, we use the implicit definition of firms' market share i.e. $\mathcal{P}_{kd}^{\sigma_k - 1} \cdot (\tau_{kd} \cdot c_{fk})^{1-\sigma_k} \cdot \left(1 + \omega_k^{1-\sigma_k} \cdot \mathbf{1}_{\Omega^b_{kd}}[f]\right) = \mathcal{S}_{fkd} \cdot \mathcal{M}_k[\mathcal{S}_{fkd}]^{\sigma_k - 1}$ in markets d and d' for two firms f and f'.

When $\mathbf{1}_{\Omega^b_{kd}}[f] = \mathbf{1}_{\Omega^b_{kd}}[f']$ and $\mathbf{1}_{\Omega^b_{kd'}}[f] = \mathbf{1}_{\Omega^b_{kd'}}[f']$ or when $\mathbf{1}_{\Omega^b_{kd}}[f'] = \mathbf{1}_{\Omega^b_{kd'}}[f']$ and $\mathbf{1}_{\Omega^b_{kd}}[f] = \mathbf{1}_{\Omega^b_{kd'}}[f]$, we have the following identity:

$$0 = \ln\left(\frac{\mathcal{S}_{fkd}}{\mathcal{S}_{f'kd}}\frac{\mathcal{S}_{f'kd}}{\mathcal{S}_{fkd'}}\right) + (\sigma_k - 1)\ln\left(\frac{\mathcal{M}_k[\mathcal{S}_{fkd}]}{\mathcal{M}_k[\mathcal{S}_{f'kd}]}\frac{\mathcal{M}_k[\mathcal{S}_{f'kd'}]}{\mathcal{M}_k[\mathcal{S}_{fkd'}]}\right)$$

Since $\sigma_k > 1$, this identity implies that in markets where the market share differential of firms is higher, the markup differential is lower.

Now we can show that in markets that are more competitive i.e. low $\mathcal{P}_{kd}$, firm markups are not only lower but less dispersed.

Denoting by

$$\Theta_{fkd} := \mathcal{P}_{kd}^{\sigma_k - 1} \cdot (\tau_{kd} \cdot c_{fk})^{1-\sigma_k} \cdot \left(1 + \omega_k^{1-\sigma_k} \cdot \mathbf{1}_{\Omega^b_{kd}}[f]\right) \tag{21}$$

we have

$$\Theta_{fkd} = \mathcal{S}\left[\Theta_{fkd}\right] \cdot \left(1 + \frac{1}{(\sigma_k - 1)\left(1 - \mathcal{S}\left[\Theta_{fkd}\right]\right)}\right)^{\sigma_k - 1}$$

Taking the derivative w.r.t. Θ_{fkd} leads to

$$1 = \mathcal{S}'\left[\Theta_{fkd}\right] \cdot (\mathcal{M}_{fkd})^{\sigma_k - 1} + (\sigma_k - 1)\,\mathcal{S}\left[\Theta_{fkd}\right] \cdot (\mathcal{M}_{fkd})^{\sigma_k - 2}\left(\frac{\mathcal{S}'\left[\Theta_{fkd}\right]}{(\sigma_k - 1)^2\left(1 - \mathcal{S}\left[\Theta_{fkd}\right]\right)^2}\right)$$

where $\mathcal{M}_{fkd} = \mathcal{M}_k[\mathcal{S}_{fkd}]$.

The above expression can be rearranged into

$$1 = \mathcal{S}'\left[\Theta_{fkd}\right](\mathcal{M}_{fkd})^{\sigma_k - 1}\left(1 + \frac{\mathcal{S}\left[\Theta_{fkd}\right]}{\mathcal{M}_{fkd}\,(\sigma_k - 1)\left(1 - \mathcal{S}\left[\Theta_{fkd}\right]\right)^2}\right)$$

Using the following identity:

$$\left(1 - \mathcal{S}\left[\Theta_{fkd}\right]\right)\left(1 + \frac{1}{(\sigma_k - 1)\left(1 - \mathcal{S}\left[\Theta_{fkd}\right]\right)}\right) = \left(1 - \mathcal{S}\left[\Theta_{fkd}\right]\right) + \frac{1}{\sigma_k - 1}$$

we get

$$1 = \mathcal{S}'\left[\Theta_{fkd}\right]\left(\mathcal{M}_{fkd}\right)^{\sigma_k - 1}\left(1 + \frac{\frac{\mathcal{S}\left[\Theta_{fkd}\right]}{1-\mathcal{S}\left[\Theta_{fkd}\right]}}{\sigma_k\left(1 - \mathcal{S}\left[\Theta_{fkd}\right]\right) + \mathcal{S}\left[\Theta_{fkd}\right]}\right)$$

and therefore

$$1 = \frac{\mathcal{S}'\left[\Theta_{fkd}\right]\Theta_{fkd}}{\mathcal{S}\left[\Theta_{fkd}\right]}\left(1 + \frac{\frac{\mathcal{S}\left[\Theta_{fkd}\right]}{1-\mathcal{S}\left[\Theta_{fkd}\right]}}{\sigma_k\left(1 - \mathcal{S}\left[\Theta_{fkd}\right]\right) + \mathcal{S}\left[\Theta_{fkd}\right]}\right)$$

The proportional change in market shares is therefore given by

$$\frac{\Theta_{fkd}\mathcal{S}'\left[\Theta_{fkd}\right]}{\mathcal{S}\left[\Theta_{fkd}\right]} = \frac{1}{1 + \frac{\frac{\mathcal{S}\left[\Theta_{fkd}\right]}{1-\mathcal{S}\left[\Theta_{fkd}\right]}}{\sigma_k\left(1-\mathcal{S}\left[\Theta_{fkd}\right]\right)+\mathcal{S}\left[\Theta_{fkd}\right]}}$$

The denominator increases unambiguously with the market share $\mathcal{S}\left[\Theta_{fkd}\right]$ which is itself an increasing function of Θ_{fkd}. From the definition of (21) we conclude that in more competitive markets (i.e. featuring a lower price-index), the market share ratio is lower and the markup ratio larger.

C.4 Markup dispersion under Cournot competition.

The market share definition is unchanged but markups are now given by

$$\mathcal{M}_{fkd} := \mathcal{M}_k\left[\mathcal{S}_{fkd}\right] := \frac{\sigma_k}{\sigma_k - 1}\frac{1}{1 - \mathcal{S}_{fkd}} \tag{22}$$

Using again that $\Theta_{fkd} = \mathcal{S}\left[\Theta_{fkd}\right]\mathcal{M}_{fkd}^{1-\sigma_k}$, we get

$$\Theta_{fkd} = \mathcal{S}\left[\Theta_{fkd}\right] \cdot \left(\frac{\sigma_{kd}}{\sigma_{kd} - 1} \cdot \frac{1}{1 - \mathcal{S}_{fkd}\left[\Theta_{fkd}\right]}\right)^{\sigma_k - 1}$$

and thus

$$1 = \mathcal{S}'\left[\Theta_{fkd}\right]\left(\mathcal{M}_{fkd}\right)^{\sigma_k - 2}\left[\mathcal{M}_{fkd} + (\sigma_k - 1)\left(\frac{\mathcal{S}\left[\Theta_{fkd}\right]}{\left(1 - \mathcal{S}\left[\Theta_{fkd}\right]\right)^2}\right)\right]$$

Now using again

$$\Theta_{fkd} \cdot \mathcal{M}_{fkd}^{1-\sigma_k} = \mathcal{S}_{fkd}$$

we get

$$1 = \frac{\mathcal{S}'\left[\Theta_{fkd}\right]\Theta_{fkd}}{\mathcal{S}\left[\Theta_{fkd}\right]}\left[1 + \frac{(\sigma_k - 1)}{\mathcal{M}_{fkd}}\left(\frac{\mathcal{S}\left[\Theta_{fkd}\right]}{\left(1 - \mathcal{S}\left[\Theta_{fkd}\right]\right)^2}\right)\right]$$

Now using (22) again, we get

$$1 = \frac{\mathcal{S}'\left[\Theta_{fkd}\right]\Theta_{fkd}}{\mathcal{S}\left[\Theta_{fkd}\right]}\left[1 + \frac{(\sigma_k - 1)^2}{\sigma_k}\left(\frac{\mathcal{S}\left[\Theta_{fkd}\right]}{1 - \mathcal{S}\left[\Theta_{fkd}\right]}\right)\right]$$

and so

$$\frac{\mathcal{S}'\left[\Theta_{fkd}\right]\Theta_{fkd}}{\mathcal{S}\left[\Theta_{fkd}\right]} = \frac{1}{1 + \frac{(\sigma_k - 1)^2}{\sigma_k}\left(\frac{\mathcal{S}\left[\Theta_{fkd}\right]}{1 - \mathcal{S}\left[\Theta_{fkd}\right]}\right)}$$

which is decreasing again in Θ_{fkd}.

C.5 Competition, market size and the probability of bi-exporting

We consider that all country-sector pairs in the world have a number of potential firms which is a function of their GDP. Furthermore, we assume that if a firm with marginal cost c_{fk} finds it profitable to (bi-)export to d, then all firms with a lower marginal cost are also (bi-)exporters to that destination.[31]

C.5.1 Competition and market size

We now consider two small open economies d and d' with identical market access i.e. the same bilateral trade costs with respect to any destinations in $\mathcal{D}\backslash\{d, d'\}$ but which differ, at equilibrium, in their GDP I_d e.g. $I_d > I_{d'}$. This could result for instance from different population sizes but this is irrelevant for the argument below.

In what follows, we denote the markup of the cutoff firm by $\bar{\mathcal{M}}_{kd}$.

The cutoff condition for firm f to exactly break even in destination d reads as

$$\frac{\left(\bar{\mathcal{M}}_{kd} - 1\right)\bar{\mathcal{M}}_{kd}^{-\sigma_k}\bar{c}_{kd}^{1-\sigma_k}\alpha_k I_d}{\mathcal{P}_{kd}^{1-\sigma_k}} = F \tag{23}$$

Firm f from origin country o will export to market d when $\tau_{od} w_o c_{ofk} \leq \bar{c}_{kd}$ where τ_{od} are bilateral trade costs between o and d, w_o the endogenous wage in o. Now, denote by $h(.)$ the worldwide density of marginal costs inclusive of trade costs i.e. $\tau_{od} w_o c_{ofk}$.

[31] This does not only bring tractability but also isolates clearly the impact of small deviations from the monopolistic competition benchmark. This assumption is not uncommon though, see for instance Eaton et al. (2012).

It is defined on $[c_k^{min}, c_k^{max}]$ where $c_k^{min} = \min_{o,f,k}\{\tau_{od} w_o c_{ofk}\}$ and c_{max} can be chosen arbitrarily large. Last, we denote by N_W the worldwide number of potential firms. Destinations d and d' being small open economies, and indexing firms directly by their trade-cost inclusive marginal costs, the price-index in each destination reads as

$$\mathcal{P}_{kd}^{1-\sigma_k} = N_W \sum_{c_k^{min}}^{\bar{c}_{kd}} p_{kd}(c)^{1-\sigma} h(c) \quad \mathcal{P}_{kd'}^{1-\sigma_k} = N_W \sum_{c_k^{min}}^{\bar{c}_{kd'}} p_{kd'}(c)^{1-\sigma} h(c)$$

with, by definition, $\sum_{c_k^{min}}^{c_k^{max}} h(c) = 1$. In each destination, the less competitive is the last entrant, the larger is the mass of firms exporting to that market.

Now using (13), firms' markups can be written as a function of $(c/\mathcal{P}_{kd})^{1-\sigma}$only which is increasing. Denoting $\tilde{\mathcal{M}}_k[x] = \mathcal{M}_k[\mathcal{S}_k[x]]$ where $\mathcal{M}_k[\mathcal{S}_k[x]]^{\sigma_k - 1}\mathcal{S}_k[x] = x$, the price-index reads as $\mathcal{P}_{kd}[\bar{c}]^{1-\sigma} = N_W \sum_0^{\bar{c}} \tilde{\mathcal{M}}_k \left[(c/\mathcal{P}_{kd}[\bar{c}])^{1-\sigma}\right] c^{1-\sigma} h(c)$.

A direct differentiation shows that $\mathcal{P}_{kd}[\bar{c}]^{1-\sigma}$ is an increasing function of $\bar{c}$. Therefore, the higher the number of firms exporting to d, the tougher competition is in that market.

To end the argument, it is sufficient to notice that

$$\psi[x] := \left(\tilde{\mathcal{M}}_k[x] - 1\right) \tilde{\mathcal{M}}_k^{-\sigma}[x] x \tag{24}$$

is an increasing function. Indeed, by definition, we have

$$\left(\tilde{\mathcal{M}}_k[x] - 1\right) \tilde{\mathcal{M}}_k^{-\sigma}[x] x \equiv \frac{\tilde{\mathcal{M}}_k[x] - 1}{\tilde{\mathcal{M}}_k[x]} \mathcal{S}_k[x]$$

with $\mathcal{S}_k[x]$ is increasing in x.

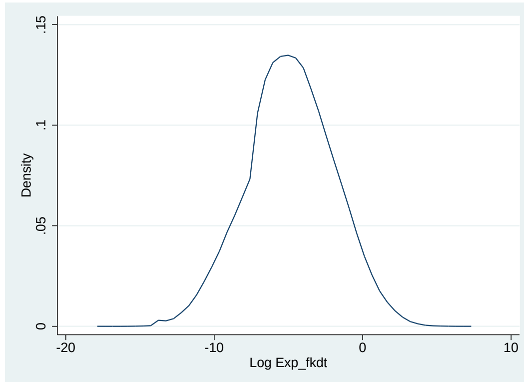
To conclude, rewrite (23) as follows:

$$\psi\left[(\bar{c}_{kd}/\mathcal{P}_{kd}[\bar{c}_{kd}])^{1-\sigma}\right] \alpha_k I_d = F$$

under this condition, if $I_d > I_{d'}$ then for (23) to be true in both d and d' it has to be that $\bar{c}_{kd} > \bar{c}_{kd'}$. This, in turn, implies that $\mathcal{P}_{kd} < \mathcal{P}_{kd'}$.

Note that this proof is slightly more general than what we need since we assume in the main text that the pricing behavior of the marginal entrant is well approximated by constant markups.

Figure C-1: Log Exports of Goods



C.5.2 Competition and the probability of bi-exporting

To see that the probability of bi-exporting is higher in more competitive markets, remember that $\bar{c}_{kd}$ is higher in larger, more competitive markets. Now, using (23) again, since $\bar{c}_{kd}^{1-\sigma} < \bar{c}_{kd'}^{1-\sigma}$, we can conclude directly that $\alpha_k I_d \mathcal{P}_{kd}^{1-\sigma} > \alpha_k I_{d'} \mathcal{P}_{kd'}^{1-\sigma}$.

D Robustness Checks IV

Table D-1: IV results, alternative instrument

Dep. Var.	(1) **Log Exp**$_{fkdt}$	(2) **Log Q**$_{fkdt}$	(3) **Log P**$_{fkdt}$	(4) **Log Exp**$_{fkdt}$	(5) **Log Q**$_{fkdt}$	(6) **Log P**$_{fkdt}$
Serv$_{fdt}$	0.553^a	0.100	0.453^a	0.819^a	0.402^a	0.417^a
	(0.131)	(0.118)	(0.0481)	(0.137)	(0.123)	(0.048)
Log # Products$_{fdt}$	0.711^a	0.754^a	-0.0437^a	0.642^a	0.676^a	-0.034^a
	(0.007)	(0.006)	(0.002)	(0.011)	(0.012)	(0.004)
Market Experience$_{fkdt}$	0.977^a	0.985^a	-0.00802^a	0.991^a	1.001^a	-0.010^a
	(0.005)	(0.005)	(0.002)	(0.006)	(0.006)	(0.002)
AFF$_{ft}$	0.277^a	0.328^a	-0.0506^a	0.281^a	0.332^a	-0.0511^a
	(0.023)	(0.020)	(0.010)	(0.024)	(0.021)	(0.009)
PAR$_{ft}$	0.179^a	0.219^a	-0.040^a	0.173^a	0.212^a	-0.039^a
	(0.031)	(0.030)	(0.011)	(0.031)	(0.030)	(0.011)
Observations	1,570,818	1,570,818	1,570,818	1,570,818	1,570,818	1,570,818
R-squared	0.803	0.866	0.920	0.802	0.866	0.921
1^{st} Stage F-Stat		266.058			146.496	

Note: Product-destination-year and firm-product-year dummies are present in all the regressions. Standard errors clustered at the firm-destination-year level in parentheses. ^{a} p<0.01, ^{b} p<0.05, ^{c} p<0.1

Table D-2: Second-stage results, Service Share<50%

Dep. Var.	(1) **Log Exp**$_{fkdt}$	(2) **Log Q**$_{fkdt}$	(3) **Log P**$_{fkdt}$	(4) **Log Exp**$_{fkdt}$	(5) **Log Q**$_{fkdt}$	(6) **Log P**$_{fkdt}$
Serv$_{fdt}$	0.587^a	0.133	0.454^a	0.868^a	0.457^a	0.411^a
	(0.141)	(0.127)	(0.051)	(0.147)	(0.132)	(0.051)
Log # Products$_{fdt}$	0.717^a	0.759^a	-0.0425^a	0.647^a	0.679^a	-0.032^a
	(0.007)	(0.007)	(0.002)	(0.011)	(0.012)	(0.004)
Market Experience$_{fkdt}$	0.978^a	0.986^a	-0.009^a	0.992^a	1.003^a	-0.011^a
	(0.005)	(0.005)	(0.002)	(0.006)	(0.006)	(0.002)
AFF$_{ft}$	0.282^a	0.333^a	-0.0513^a	0.285^a	0.337^a	-0.0517^a
	(0.024)	(0.020)	(0.010)	(0.025)	(0.021)	(0.010)
PAR$_{ft}$	0.183^a	0.223^a	-0.0393^a	0.178^a	0.216^a	-0.0385^a
	(0.031)	(0.031)	(0.011)	(0.032)	(0.031)	(0.011)
Observations	1,568,510	1,568,510	1,568,510	1,568,510	1,568,510	1,568,510
R-squared	0.803	0.865	0.920	0.803	0.865	0.921
1^{st} Stage F-Stat		230.222			127.375	

Note: Product-destination-year and firm-product-year dummies are present in all the regressions. Standard errors clustered at the firm-destination-year level in parentheses. ^{a} p<0.01, ^{b} p<0.05, ^{c} p<0.1

Table D-3: IV results - Excluding destinations with parents or affiliates

	Panel (a): IV for $Serv_{fdt}$			Panel (b): IV for $Serv_{fdt}$ & Log # $Products_{fdt}$		
	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Var.	**Log Exp**$_{fkdt}$	**Log Q**$_{fkdt}$	**Log P**$_{fkdt}$	**Log Exp**$_{fkdt}$	**Log Q**$_{fkdt}$	**Log P**$_{fkdt}$
$Serv_{fdt}$	0.494^{a}	-0.0375	0.531^{a}	0.911^{a}	0.425^{b}	0.487^{a}
	(0.179)	(0.167)	(0.0703)	(0.189)	(0.175)	(0.0708)
Log # $Products_{fdt}$	0.723^{a}	0.764^{a}	-0.0408^{a}	0.648^{a}	0.680^{a}	-0.0327^{a}
	(0.007)	(0.007)	(0.002	(0.012)	(0.012)	(0.005))
Market $Experience_{fkdt}$	0.974^{a}	0.982^{a}	-0.00835^{a}	0.989^{a}	0.999^{a}	-0.00997^{a}
	(0.00492)	(0.005)	(0.002)	(0.005)	(0.006)	(0.002)
Observations	1,387,010	1,387,010	1,387,010	1,387,010	1,387,010	1,387,010
R-squared	0.803	0.865	0.922	0.802	0.865	0.922
Kleinbergen-Paap F-Stat		185.963^{a}			99.715^{a}	

Note: Product-destination-year and firm-product-year dummies are present in all the regressions. Standard errors clustered at the firm-destination-year level in parentheses. ^{a} p<0.01, ^{b} p<0.05, ^{c} p<0.1