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How frequently firms export? Evidence from France

Gábor Békés[a], Lionel Fontagné[b], Balázs Muraközy[a], Vincent Vicard[c,*]

[a]*Institute of Economics, CERS-HAS - Hungary*
[b]*PSE-Paris 1, EUI, Banque de France and CEPII - France*
[c]*Banque de France - France*

Abstract

This paper proposes studying export frequency as an additional margin of international trade. While extensive margins of products and destination define the scope of firm's export, export shipment frequency is determined by sale method choice and cost structure of the trade technology. We define export shipment frequency as the per annum number of shipments of a given product, by a firm to a given destination. In order to more deeply understand the trade cost structure and sale methods, we estimate gravity models on export frequency and other margins of trade using monthly firm-product-destination level export data from France. We show that in key predictions of the model are validated. During the recent trade collapse, we also find a great deal of stability in shipment frequency with a modest adjustment to declining GDP.

Keywords: Keywords: Gravity, transport costs, frequency of trade, Baumol-Tobin model, France, customs data
JEL classification: D40, F12, R40

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*Corresponding author: Békés: bekes@econ.core.hu, Institute of Economics, CERS-HAS, Budaörsi út 45, Budapest, Hungary. The authors gratefully acknowledge financial assistance from the European Firms in a Global Economy: Internal policies for external competitiveness (EFIGE), a collaborative project funded by the European Commission's Seventh Framework Programme (contract number 225551). Békés thanks the hospitality of CEPII. This paper represents the views of the authors and should not be interpreted as reflecting those of Banque de France or the European Central Bank. The entire responsibility for errors and omissions remains on us.

1. Introduction

Exporters optimize the frequency of international trade transactions to save on costs and gain maximum exposure to clients. Their decisions can be related to a more general problem á la Baumol (1952), where the choice is about the optimal number of transactions in presence of a fixed cost and variable transportation costs. This opens an additional margin of trade: the number of shipments of a firm to a given market in a year. In this paper empirical evidence on this margin is provided by firm level trade at the monthly frequency.

Addressing the issue of frequency of trade flows at the exporter level sheds new light on export decision. International trade theory and most empirical works are interested in whether a firm serves a market or not; we are interested in how they serve the market. Shipment size and frequency are the simultaneous decision variables. Hence, exporters jointly decide about quantity and timing of export. While these decisions may be taken at once, our focus is on the question of how frequently to trade given demand for the firm's product.

The literature in international trade has emphasized the importance of exporters' heterogeneity and defined the extensive margin of trade, as the number of firms as well as the scope of exporters[1]. The extensive margin of trade has been accordingly decomposed into the number of firms exporting and the products and destinations served by firms. But not every exporter is exporting every month a given product to a given destination. This paper proposes studying the behavior of an additional margin, that of export frequency. While extensive margins of products and destination define the scope of firm's export, export shipment frequency is determined by sale method choice and trade technology[2].

Indeed, one reason why we care about the shipment frequency margin is because it enables understanding trade technology better. Understanding the cost structure may help in better microeconomic modeling of trade. It may also facilitate the explanation of such curiosities as small and erratic exporters. Properly understanding it can also help in predicting the impact of shocks or change in market structure of transportation. In the presence of per shipment fixed costs (e.g. Alessandria et al. (2011)), the decision on the number of transactions is a major source of the observed variation in exports at the aggregate level.

The transaction margin has already been observed in the trade literature. Eaton et al. (2008) analyze the transaction margin with real transaction-level data from Colombia, defined as the number of transactions per firm-destination. They show that the distribution of number of transaction per firm is highly skewed, and that the transaction margin defined this way contributes to total trade significantly. In Colombia,

[1]For instance, see Eaton et al. (2004), Bernard et al. (2007), Mayer and Ottaviano (2008).

[2]On explicit modeling of trade technology, see Behrens and Picard (2011) or Kleinert and Spies (2011).

35% of firms exported only one shipment over the covered period. At the same time, for most firms exporting to multiple markets, the average time between shipments is less than one month. Ariu (2011) also decomposes trade using the number of transactions using monthly trade data for Belgium and finds the transaction margin to be important at both the firm-level and country level decompositions. He also finds that the effect of distance on transactions is very large[3].

This paper both presents a framework to think about shipment frequency and analyzes its behavior on French data. We argue that shipment frequency is an additional extensive margin of trade. However, it is different in nature from the number and scope of exporters. Even though the decision on serving a market and the number of shipment is simultaneous, the determinants of these two decisions differ. The decision on serving a market falls on the beach-head cost, distance and matching between exporter's product characteristics and foreign demand idiosyncrasies. In contrast, given the decision to export and the anticipated demand, the decision on the number of shipments is guided by the trade technology. This also contrasts with the decision on the modalities of entry in a foreign market (export versus direct investment) opposing sunk versus per period fixed costs. Our aim is to quantify the prevalence of this additional margin, study the responsiveness of export frequency to trade cost and demand.

Trade technology refers to the cost structure regarding shipments: transport and storage technology, cost of inventories, and eventually uncertainty regarding the timing of individual transaction with foreign clients. The cost of shipping goods abroad has several components for firms, including the fixed cost of selling a product in a destination market, the variable cost of transporting goods or the per shipment fixed cost related to administration or distribution or even filling a container. The relative importance of such costs will shape the shipment behavior of companies. For instance, in case of a very large sunk cost of trade only the very productive firms will export, while high iceberg costs will affect trade volume and prices. Furthermore, the structure of costs will affect the typical shipment size that is best being shipped and as a result, determine how many shipments a firm will do.

Trade technology depends on the route: air, land, maritime. According to Hummels (2009), three-quarters of world trade involves countries that do not share a border and involves mostly maritime transport. Hence, we propose a simple framework based on the cost structure of sea trade. In the simplest case, the cost of a shipment consists of a fixed cost related the transportation and a variable cost related to the number of items (e.g. containers) on a certain nautical distance at a certain speed.

It is instructive to have a rough idea of the relative importance of total transport

[3]Interestingly, there are additional margins that cannot be directly observed even with a real-transaction database, such as the number of containers, the size of the containers and the speed of the vessel(e.g. two options are offered on the North-Atlantic route: 14 days or 17 days from Netherlands to the US). The corresponding adjustments (number and size of containers per transaction) fall on the intensive margin of trade.

costs. The mean cost of shipping as a percentage of the value of imports (all exporters) is in the range of 5% to 10% for an American importer. It is noticeably lower in the US 4.5% according to Hummels (2009) calculations, than in smaller countries like Ecuador (9.2%). Part of the difference is due to the non-freight costs (e.g. insurance, warehouses), that represent only 15% of the total for the US but 55% for Ecuador.

The shipment fixed cost may be thought of as administrative cost such as filling in customs documents - an important issue for a great deal of countries. Variable cost of shipments which include per container transportation fees as well as the cost of waiting can be also highly non-linear and lead to lumpiness of trade. The total cost (USD 2,035) for shipping a typical container (45'high cube dry container) filled with computers shipped from Rotterdam to New York includes: rental of container USD 620; shipment USD 500. The handling of a container is USD 250, and the rest will come a number of smaller items to take into account at arrival, like administrative fees for customs clearance and technical control, or customs broker fees. The World bank Doing Business, based on the methodology developed by Djankov et al. (2010) estimates that the sum of all administrative related costs add another USD 1,065 to the cost of handling a container, in a typical US port[4]. This calculus excludes the cost, in terms of working capital, of the customs clearance time, which is 5 days. Insurance (2.7% of the value of the shipment) is also to be added to this cost[5].

Consequently, and in contrast to a convenient assumption in the trade literature, the transport technology is hardly of an iceberg type. The importance of per shipment trade costs or, in other words, fixed transaction costs has recently been emphasized by Alessandria et al. (2011). They argue that per shipment costs lead to the lumpiness of trade transactions: firms economize on these costs by shipping products infrequently and in large shipments and maintaining large inventory holdings. Domestic goods are purchased much more frequently as imported one in the US[6]. Per shipment costs cause frictions of a substantial magnitude (20% tariff equivalent). Hummels and Skiba (2004) analyze this on a rich panel data set, with results that are consistent with the presence of

[4]This amount is the sum of all the fees associated with completing the procedures to import: costs for documents, administrative fees for customs clearance and technical control, customs broker fees, terminal handling charges and inland transport. Customs tariffs and duties or costs related to ocean transport are not included. This is for a 20-foot container, thus introducing a small underestimation.

[5]We use Maersk line charges in March 2012 for a 17 days trip of a vessel consuming 0.02074 metric tons of fuel/day and cruising at 8 knots. This quotation is much below the pre-crisis levels as we explain below. Notice that quotations are systematically adjusted by a factor correcting for trade imbalance (backhaul of empty vessels, see Blonigen and Wilson (2008) ; on this route, the coefficient is just 1.1 (1.5 from China to the US Pacific coast). Freight insurance on line rates come from Carex shipping and correspond to all risk coverage for computers and electronics shipped by ocean cargo. Distances are from Sea.rates.com. Handling and customs clearance are from Clark et al. (2004) and correspond to the US average. Rental of the container is for 6 months (minimum rental), quotation available on internet.

[6]Data comes from US steel wholesalers from 1997 to 2006.

per shipment costs. Beyond the presence of fixed costs of transportation, the transport cost is largely determined on a unit basis rather than on an ad valorem basis. Martin (2012) shows individual firms ship higher quality goods as transport cost increase. This is not consistent with the usual mill pricing assumption but consistent with a per unit transport cost. Finally, transport costs are partially endogenous as the decision on the transport technology is determined by the volume of trade between countries: more trade will lead to more efficient infrastructure and larger vessels (Kleinert and Spies (2011)).

We define export shipment frequency as the number of shipments of a product per annum by a firm to a given destination. In most firm level datasets, this margin is not directly measurable, but may be approximated by the number of months a firm is active at the export market - a strategy we follow[7]. Our data covers monthly exports by French firms during the 2003-2009 period; exports are disaggregated at firm-destination-product level for every month.

As argued, this new extensive margin of trade is of a different nature as it is not about the decision to export, but the choice of trade technology. We rely on insights from the transactions demand for cash model of Baumol (1952) and Tobin (1956) to analyze the frequency of shipments. Owing to the presence of both transaction fixed cost and variable cost depending on the transaction size and distance, a decision on how frequently to export can be contrasted on the issue of how frequently withdraw cash from the bank. Furthermore, export decision is complicated by uncertainty and the complexity of buyer-seller relationships.

The Baumol-Tobin model transposed to our case describes how firms optimize shipments for a given revenue in a product at a market. Exporters consider the demand for their products on each destination market. The perceived demand depends on the distance to destination (the variable cost of transport), a one dollar local sale is not equally worth in close and remote markets. So the demand considered is net of variable transport costs. On the one hand, a firm pays a fixed cost of shipment but on the other, it has an inventory cost for unsold goods depending on the time period it stays in a warehouse at destination. This inventory cost may also be affected by taste of consumers. Inventory holding related expenses include any cost related to not immediately selling the good. In the case of just in time manufacturing, final good producers will require timely shipment of smaller batches of goods. In fashion, rapidly changing taste makes room for frequent shipment of modified varieties of a good. As for perishable goods, preference for freshness may determine the frequency of trade. Finally, the cost of not selling is also related to the discount rate a particular firm has to apply to revenues from a particular market. And for a given category of product, tastes may differ across countries and so does the optimal policy of inventory.

[7]This restriction has an immediate consequence: a reduction in the number of shipments per month will fall on the intensive margin. But as noted above, even a real transaction database would suffer similar limitation, as the number and size of containers per shipment could not be observed.

This simple model based on the transactions demand for money (due to lack of synchronization between payments and receipts) may be extended by other approaches highlighting the precautionary motive for money demand. Instead of relying on a (totally) deterministic framework, Miller and Orr (1966) emphasize the (by assumption completely) stochastic nature of the cash flows. The related model of shipment management assumes that in presence of random walk uncertainty, firms set trigger points to send another shipment if inventory drops to below a level. In this model, the increase in uncertainty (the variance of the random walk process) leads to an increase both in the size of shipments and its frequency.

As a result, two factors have to be considered when looking at possible shocks. On the one hand there is a drop in demand in foreign markets that leads to a reduction in the number of shipments. On the other hand, there is an increase in uncertainty and in the expected variance of sales, leading firms to increase both their inventories and increase the number of shipments necessary to serve a given amount of demand.

There are other models related to our exercise. In Hornok and Koren (2011), consumers have heterogeneous preferences for the arrival time of a non-storable product and firms compete by selecting the time of their shipment. Per shipment costs reduce shipment frequency and increase the shipment size and the product price. The preferred shipment time of the consumer also contribute to inventory costs. Larger demand leads to larger shipment size, but the relationship is non-linear, as stronger competition will dampen an increase in frequency. Here again, uncertainty will impact the inventory policy. In case of demand uncertainty, a firm may sell some amount with doing another shipment if and only if the first batch is sold. With a more steady flow, firms may decide upon the quantity and base the decision of frequency on trade costs only. In Békés and Muraközy (2012), firms may choose between two trading technologies, one with a sunk cost and cheaper variable cost and another one without sunk cost but higher variable cost. As a result some firms will chose the former, invest in a trade relationship and export at a stable fashion. In such a setup, firms which can sell in large markets and at a cheaper transport cost are more likely to invest and export permanently. These firms are also likely to trade more frequently within a year.

Our approach in this paper describes trade frequency as an equilibrium phenomenon. Controlling for distance to destination (i.e. variable transport cost), the optimal number of shipments is positively affected by demand and inventory costs and negatively affected by the fixed cost of shipment. To analyze trade frequency as an equilibrium phenomenon, we firstly use a cross section to assess the impact of the various determinants of the trade technology (of the number and size of shipments) in a deterministic setting. The cross-section gives equilibrium relationships between the number of shipments, demand size, inventory costs, and fixed costs of shipment. For this, we estimate gravity models in cross sections of monthly firm-product-destination level export data from France. Unlike some earlier papers on margin comparison (e.g. Lawless (2010)) we run firm-product-destination level regressions. Accordingly, we control for the composition effect as firms endogenously choose destinations and products to ship.

Out of the equilibrium, we use the 2008-2009 trade collapse as a natural experiment that helps identifying the determinants of shipment frequency. For this, we use time series data for the period 2007-2009. The Baumol model suggests that a large drop in demand should ceteris paribus lead to a drop in the number of transactions. With an income elasticity of 0.5, the simplest version of the Baumol model suggests that a 10% drop in demand will lead to 5% drop in shipment frequency. We however already noticed that the variance of sales must be considered, and not only the mean sales, in line with Miller and Orr (1966). Thus a lower elasticity should be expected as the frequency of shipments will increase for a given amount of demand, thus dampening the need for fewer shipments[8].

In the equilibrium, our results confirm the positive impact of perceived demand on the number of shipments and conversely for fixed transport costs. In crisis times, the reduction in the perceived demand is dampened by the endogenous decrease in variable transportation costs and this contributes to cushioning the drop in shipments frequency. We conclude that the technology of trade has been profoundly reshaped to cope with the collapse of world trade.

The paper is organized as follows. Data and stylized facts on this new margin are presented in Section 2. How to use insights from Baumol and other models to explain what shapes frequency is discussed in Section 3. The determinants of this margin are examined with a cross-sectional gravity equation in Section 4. We finally rely on a panel in Section 5 and ask how the number of shipments has responded to the crisis. Section 6 concludes.

2. Data & descriptive statistics

We use detailed firm export data from the French Customs, providing monthly firm export data by destination and product category up to end 2009. Products are aggregated at the 4-digit HS level[9].

Two different thresholds apply to the collection of French exports, depending on their country of destination. All extra EU export shipments over 1000 Euros are to be declared to the French Customs whereas for exports to other EU Member states the declaration is compulsory if the yearly cumulated value of exports to the other 26 EU Member states taken together is larger than 150,000 Euros. To control for the potential

[8]Hornok and Koren (2011) setup also suggests, that as demand drops during the crisis, shipment frequency will fall less than demand as the intensity of competition decreases as well. Khan and Thomas (2007) similarly develop a quantitative general equilibrium model of endogenous inventory investment. They show that inventory accumulation is pro-cyclical and more volatile than sales. Thus inventories decrease during recessions and dampen the reduction in the frequency of the shipments induced by the drop in demand.

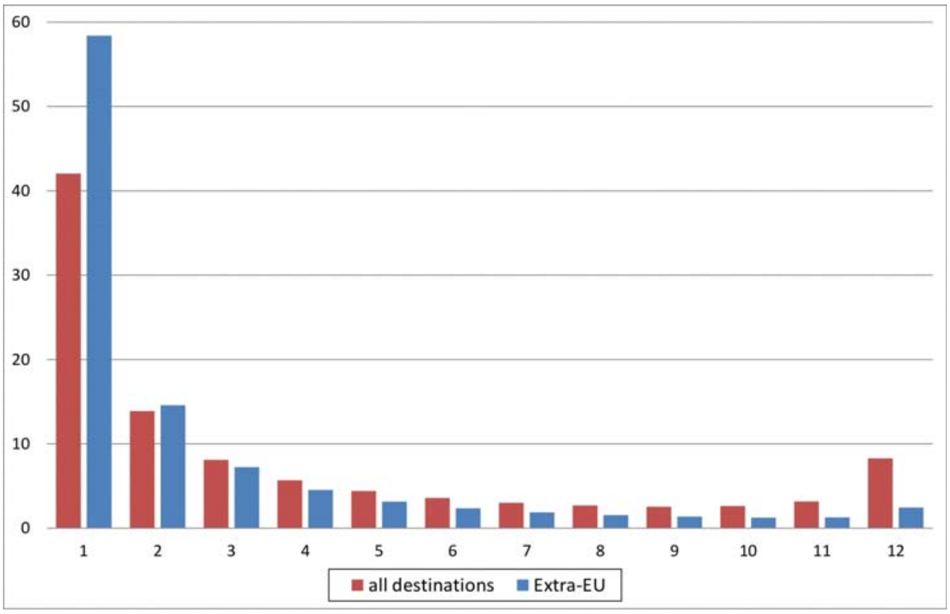
[9]We excluded Ships and Aircraft (HS 2 digits 88 & 89) because these items are not exported through usual transport technology but by through self-propulsion (This does not change results).

bias related to the different thresholds, we restrict our sample to extra-EU exports in most of the analysis; results using the whole sample are presented for robustness. Descriptive data unless noted otherwise refers to 2007.

Shipment frequency, N_{ikc} is defined as the number of months a firm i has non-zero exports in product k to a destination country c within a given year t, and hence, N_{ikct}=[1,2,...12]. As a result, there is an inherent bias in our results as we do not differentiate between those who trade only 12 times versus those who sell 120 times a year. We will discuss censoring as well as robustness of results.

The histogram of shipment frequency, i.e. numbers of months exported in shown in Figure 1. Most firms export just once a year and about 8% of firms export every month. On average, firms export in 5.4 months a year, the median number of months being 3. Of course larger firms ship more frequently, pushing weighted mean of the number of months to 11.6. When looking at the firm-destination-product level, the mean drops to 3.6, the median to 2 and weighted average falls to 9.9 - still quite high. These figures are quite stable over time, rising just marginally between 2000 and 2008.

Figure 1: Frequency of shipments, number of months, 2007



Notes: firm-destination-product (HS4) level. Source: French Customs, authors' calculation.

The distribution is censored at 12 (months): export frequency of 12 months of course captures firms with at least 12 shipments. Other data sources suggest that larger firms may ship several dozen or even several hundreds of time per year[10]. We will discuss the effect of this censoring in Section 3.

[10]See Eaton et al. (2008) on Colombian data.

3. What affects shipment frequency?

Methodology

Our methodology is based on transposing the Baumol-Tobin cash in advance model to a case when a firm sells goods for a total of Y euros and can decide on how frequently to ship. It is assumed that all shipments are of the same size[11]. The alternative to a shipment is savings of capital spent on transport as well as costs of inventory, I overseas. Each transaction (shipment) has a (per-shipment) cost, F, and this cost is independent of the shipment size. Let N denote the number of shipments (in the original model on cash disbursement, one must assume that the initial transaction is costly, in our case, this comes naturally). The inventory cost must be paid over shipments assuming that all goods that are sold will be consumed (no return of unsold goods).

In this setup, the total shipment transport costs are $N * F$ plus inventory cost $I * V$ on the value of goods sold at one occasion[12]. In our case V is the (average) value of exports per product and destination. The firm will minimize $NF + IV$. It is assumed that goods will be depleted linearly and hence, average value of goods kept abroad is $Y/2$ with 1 transaction, and $V = Y/2N$ for N shipments. Thus, total cost is: $NF + YI/2N$. We can get the optimal shipment frequency by differentiating this expression with respect to N, thus solving for N^*.

In our case, for a given revenue Y_{ikc} for firm i in product k to a destination country c with F being a fixed cost of shipment and I standing for inventory cost of unsold goods, the optimal number of shipments, N^*_{ikc}:

$$N^*_{ikc} = (Y_{ikc} I_{ikc} / 2F_{ikc})^{1/2} \tag{1}$$

Also, we can get the average value of goods sold at once, as $V_{ikc} = (F_{ikc} Y_{ikc} / 2I_{ikc})^{1/2}$.

As in the Baumol-Tobin model, the basic channel for demand is that larger volume offers a relatively lower weight of costs. The prediction of the model is that demand will have a 0.5 elasticity on frequency. However, there is another channel, as larger market also means larger number of consumers or intermediaries so products may be sold at different dates thus increasing the number of shipments. This latter factor may be only related to the number of consumers rather than per capita income, and it shall raise the size demand elasticity of shipment frequency in a cross section.

The model is simple and its key predictions that shipment frequency will depend on sales (demand), fixed costs and inventory costs are not unique. A similar demand effect is posited by other models such as Hornok and Koren (2011) which also suggests a less than proportional impact of market size. Békés and Muraközy (2012) compare

[11] In the Miller-Orr model, transaction size may differ. We will drop this assumption in the empirical section, too.

[12] In the original model, this bit is IV and refers to lost interest due to cash holding, where V is the average cash amount held over one period.

temporary and permanent trade at an annual level and argue that firms will invest into a costly trade technology when returns from a stable trade relationship warrant it. This model suggests that larger markets and more distant markets will make it more profitable for firms to invest into trade.

Regarding the estimation, revenue of a firm is determined by classic gravity variables, GDP, distance and firm fixed effects.

Per shipment fixed costs may include per container costs, administrative cost at the border, insurance and distribution. Here per shipment fixed cost F is proxied by World Bank index of doing business to match administrative costs[13]. Furthermore, fixed costs are likely to be affected by traditional cost proxy variables such as distance, contiguity and common language.

Inventory cost / preferences are hard to measure. We add product fixed effects to pick up warehouse costs that are shaped by size and weight, specific conditions for perishable goods, etc. Furthermore we add firm fixed effects to control for financial strength that may affect the discount rate - this is the closest to the original Baumol idea[14].

There is a potential addition to the model, denoted C_k that reflect destination market uncertainty which may lead to more frequent shipments[15]. This demand uncertainty is measured as standard deviation of monthly sales by all French export to a given market.

Taking logs, and assuming the revenue is function of total demand and variable transport cost being a function of distance we estimate at firm-product-destination level yields:

$$logN_{ijk} = \alpha + \beta_1 logY_k + \beta_2 logI_k + \beta_1 logF_k + C_{\bar{j}k} + \epsilon_{ijk} \tag{2}$$

$$logN_{ijk} = \alpha + \beta_1 logY_k + \beta_2 log\bar{I}_k + \beta_1 logF_k + C_{\bar{j}k} + \theta_{ij} + \epsilon_{ijk} \tag{3}$$

Equation (2) is estimated by OLS but (3) includes product-firm fixed effects to control for composition effects. This is really important as more productive firms self-

[13]Data on trade administrative costs come from the Doing Business Survey, undertaken by the World Bank every year (for details, see Djankov et al. (2010). Distance and other data come from CEPII Trade database / Gravity Dataset. For details, see `http://www.cepii.fr/anglaisgraph/bdd/gravity.htm`. Annual GDP data is from the World Bank.

[14]It may be assumed that inventory cost is related to revenues. It is considered an adjustment cost by Cooper and Haltiwanger (2006), one that is related to revenues. Alessandria et al. (2011) follows this approach when focusing on the importers choice to pay the cost of new imports or not import - assuming no possible resale. A consequence is that firms with high revenue stream will incur large adjustment costs: hence, they adjust only when current inventories hit a sufficiently low level. As a consequence, reaction to a decline in demand is non-linear. We will actually make no direct assumptions regarding I and Y.

[15]A generalization of Baumol-Tobin and Miller-Orr models is Frenkel and Jovanovic (1980).

select into different countries, as they are the ones that can pay the sunk of exports to harder markets (Mayer and Ottaviano (2011), Arkolakis (2010)). Furthermore, Békés and Muraközy (2012) argue that more productive firms will more likely export at a permanent (and hence, more frequent) fashion. In both (2) and (3), we cluster standard errors by destinations to handle the fact that error terms may be correlated at the country level. We run the same two regressions on the frequency of shipments and the average shipment size, too.

Most of results will be presented excluding EU countries as per shipment costs to EU countries are likely to be different for two reasons. First, the EU is a single economic market and goods and service may flow freely. This is especially true for countries that member of the Schengen zone of free movement of people and the common currency. In the EU, special trade documents and other costs associated with international trade are negligible, most costs are either fixed (i.e. translation for the first time) or pure variable cost related to transportation. Second, trade technology within European Union and outside it, especially overseas, is very different. Hummels (2009) shows that manufactured goods are shipped mostly via oceans (99% in weight terms) but high-unit value goods are increasingly transported by air. Within-EU trade is different as only 44% of the value of EU27 exports is shipped via seas, 25% on air and 26% via rail and road, and 5% via other means[16]. We treat this problem in two ways. First, we use data for all destinations and add a dummy for EU. Second, we exclude EU destinations. Given the importance of small shipments, we focus most of empirical efforts on extra EU destinations.

Results

Table 1 presents results for our baseline regressions for OLS as well as firm-product fixed effects regressions for extra EU countries (col 1 and 2) and all destinations (col 5 and 6). Columns 3 and 4 show the OLS and FE estimates of log mean value (per firm, destination, product).

Demand has a positive effect on frequency of transport and in line with the Baumol-Tobin model, demand has similar effect on shipment frequency and average shipment value, each accounting for about half the total.

As for cost variables, the plain OLS estimates are not significant. This is a consequence of a massive selection bias, i.e. larger firms and more common products are sold at different types of markets. Indeed, adding firm-product fixed effects not only control for inventory costs but any other important features. FE results show the expected negative sign of distance, cost of doing business and positive sign of a common language.

The inclusion of EU countries seems to blur the effect of cost variables, hence the

[16]Furthermore, for EU countries, the threshold to get into the sample is very different (see Section 2).

difference between results for all destination and all but EU destinations. Importantly, the cost of exports in terms of filling in documents etc, has no impact on trade frequency within the EU.

We extend the analysis including the uncertainty variable. Table 2 presents extended results for both the number of shipments and the mean value. Uncertainty has a substantial negative impact on total shipment volume, in line with evidence on the gross cost of uncertainty. However, this negative impact comes through mostly on shipment frequency and has no significant effect on average shipment. This is at odds with a suggestion from option theory based model a la Miller and Orr that would suggest that shipment to volatile countries has the option value of sale at no future cost.

Table 1: OLS and FE regressions for transaction frequency and shipment size

	(1)	(2)	(3)	(4)	(5)	(6)
		Extra EU			All destinations	
Variables	log # shipments		log mean value		log # shipments	
Fixed effects	-	firm/product	-	firm/product	-	firm/product
log GDP	0.028***	0.114***	0.056**	0.151***	0.040***	0.122***
	(0.007)	(0.007)	(0.025)	(0.012)	(0.008)	(0.008)
log distance	-0.044	-0.091***	0.029	-0.074	-0.036*	-0.065***
	(0.029)	(0.029)	(0.156)	(0.059)	(0.021)	(0.024)
log cost of importing	-0.028*	-0.065***	0.022	-0.014	-0.002	-0.011
	(0.016)	(0.025)	(0.073)	(0.040)	(0.018)	(0.027)
Contiguity dum.	0.033	0.032	-0.274	-0.293**	0.090***	0.167***
	(0.056)	(0.067)	(0.305)	(0.132)	(0.028)	(0.040)
Common language dum.	-0.103**	0.153***	0.010	0.180*	-0.034	0.188***
	(0.048)	(0.046)	(0.245)	(0.099)	(0.053)	(0.052)
EU-27 dum.					0.515***	0.511***
					(0.058)	(0.067)
Constant	0.409	-1.296***	7.044***	5.590***	-0.165	-2.173***
	(0.369)	(0.350)	(1.659)	(0.698)	(0.372)	(0.385)
Observations	619,912	619,912	619,912	619,912	1,361,428	1,361,428
R-squared	0.017	0.089	0.011	0.046	0.136	0.201
Number of id		301,883		301,883		448,581

Note: Robust standard errors clustered by destination in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

To reflect the potential inconsistency resulting from heteroscedasticity in data, we use Poisson pseudo maximum likelihood estimator proposed by Santos Silva and Tenreyro (2006). This methodology is consistent with average value of shipment estimation and the number of shipments proxied by the number of non-zero monthly exports - at the firm-destination-product level.

Poisson PML results in Table 3 offer even starker evidence on the impact these variables; negative impact of distance and fixed cost of importing and positive impact of GDP when composition effects are taken into account (firm∗product fixed effects).

Table 2: OLS and FE regressions for transactions and shipment size (extended)

Variables	(1)	(2)	(3)	(4)
	log mean value		log # shipments	
	-	firm/product	-	firm/product
log GDP	0.030	0.135***	0.019***	0.100***
	(0.023)	(0.012)	(0.007)	(0.011)
log distance	-0.141***	-0.143***	-0.007	-0.053***
	(0.052)	(0.038)	(0.010)	(0.014)
log cost of importing	0.079	0.016	-0.016	-0.045*
	(0.056)	(0.036)	(0.014)	(0.023)
Contiguity dum.	-0.559***	-0.426***	0.100***	0.109**
	(0.144)	(0.091)	(0.030)	(0.051)
Common language dum.	-0.282***	0.046	-0.092***	0.147***
	(0.070)	(0.062)	(0.026)	(0.036)
Uncertainty (Volatility)	-0.060	-0.071	-0.108***	-0.150***
	(0.067)	(0.043)	(0.024)	(0.035)
Constant	8.992***	6.562***	0.352	-1.242***
	(0.847)	(0.579)	(0.220)	(0.316)
Observations	601,494	601,494	601,494	601,494
R-squared	0.019	0.050	0.017	0.097
Log Lik	-1.057e+06	-714257	-683752	-420537
Number of id		293,701		293,701

Note: Robust standard errors clustered by destination in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Robustness

One of our concerns is that the number of months is a noisy proxy of the number of shipments in a given year. While it is a reliable approximation for low frequency exports, it may be biased for frequent exporters. To handle this problem, we run censored regressions of equation (1) using a Tobit model, and also restrict the dataset to infrequent exporters.

Columns (1) and (4) reproduce the baseline results from Table 1 with and without firm-product fixed effects. Columns (2) and (5) show results when we re-run the model only for observations when the number of months is lower than 9, hence it is likely to reflect the number of shipments relatively well. The results show that this restricted sample leads to massive endogenous sample selection, and produces insignificant results. In columns (3) and (6) we present results with a Tobit model, in which all observations with more than 8 months are treated as censored[17]. The results without firm-product fixed effects are practically identical with OLS and Tobit. When including fixed effects, the results are also similar to the baseline estimates, but the point estimates are somewhat lower in absolute value. Interestingly, the sign of the contiguity dummy reverses between the two specifications.

All in all, OLS and fixed effects results are quite similar to Tobit models. This suggests that censoring does not influence the results qualitatively, so one can rely on

[17] Changing the censoring limit to 6 or 10 months does not change the results importantly.

Table 3: Poisson PML on extra EU exports

	(1)	(2)	(3)	(4)
Variables	log mean value		log # shipments	
Fixed effects	-	firm/product	-	firm/product
log GDP	0.213***	0.475***	0.043***	0.137***
	(0.015)	(0.025)	(0.010)	(0.001)
log distance	-0.139*	-0.370***	-0.067*	-0.120***
	(0.081)	(0.039)	(0.039)	(0.003)
log cost of importing	-0.071	-0.155***	-0.043*	-0.078***
	(0.107)	(0.057)	(0.023)	(0.003)
Contiguity dum.	-0.374*	-0.477***	0.041	0.023***
	(0.202)	(0.111)	(0.076)	(0.009)
Common language dum.	-0.384***	0.294***	-0.142**	0.158***
	(0.120)	(0.046)	(0.066)	(0.005)
Constant	8.261***		0.689	
	(1.052)		(0.500)	
Observations	1,361,428	1,085,615	619,912	399,417
Log Lik	-3.753e+06	-1.999e+06	-1.400e+06	-607205
Number of id		172,768		81,388

Note: Robust standard errors clustered by destination in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

those results when considering the determinants of shipment frequency.

4. Comparison of margins

We argued that trade frequency is another margin of trade, but one that is affected by a different set of factors. Still, the gravity like structure of our model enables us to compare and quantify the importance of various margins. In order to more deeply understand the trade cost structure, we follow Lawless (2010) and estimate a cross section gravity model on different margins of export. We extend the Bernard et al. (2007) analysis of gravity and aggregate exports to the new extensive margin of export frequency and the remaining intensive margin of export shipment size.

The extensive and intensive margins of export have been shown theoretically and empirically to react differently to fixed and variable costs of export. The variable costs are proportional to the quantity/value exported while the fixed costs do not depend on the amount exported. Distinguishing these two components allows identifying the determinants of different extensive margins.

In what follows we extend earlier margin decomposition exercises. Lawless (2010) looked at US exports and decomposed exports into the number of exporting firms (the extensive margin) and average export sales (the intensive margin) and showed that trade costs have a different impact and for instance, the effect of distance is considerably larger for the extensive margin. Eaton et al. (2008) regressed number of shipments and average value also a sector-destination level panel data and find similar elasticities with respect to distance while the elasticity of number of firms is somewhat lower. Unlike Lawless and Eaton, in addition to destinations we will use the firm level as well.

Table 4: **Censoring: Tobit estimator (threshold = 8 months)**

	(1)	(2)	(3)	(4)	(5)	(6)
Estimator	(Benchmark)	(# trans<9)	(Tobit)	(Benchmark)	(# trans<9)	(Tobit)
Variables	log # shipments		log mean value		log # shipments	
Fixed effects				firm/product		
log GDP	0.028***	0.002*	0.029***	0.114***	0.016***	0.065***
	(0.007)	(0.001)	(0.007)	(0.001)	(0.000)	(0.001)
log distance	-0.044	-0.004	-0.044	-0.091***	-0.008***	-0.078***
	(0.029)	(0.004)	(0.029)	(0.002)	(0.001)	(0.001)
log cost of importing	-0.028*	-0.002	-0.028*	-0.065***	-0.007***	-0.047***
	(0.016)	(0.003)	(0.016)	(0.003)	(0.001)	(0.002)
Contiguity dum.	0.033	0.006	0.033	0.032***	0.003	-0.043***
	(0.056)	(0.008)	(0.057)	(0.008)	(0.004)	(0.005)
Common language dum.	-0.103**	-0.014**	-0.105**	0.153***	0.034***	0.071***
	(0.048)	(0.007)	(0.049)	(0.004)	(0.002)	(0.003)
Constant	0.409	0.135**	0.414	-1.296***	-0.165***	-0.372***
	(0.369)	(0.057)	(0.376)	(0.035)	(0.018)	(0.023)
Observations	619,912	452,040	619,912	619,912	452,040	619,912
R-squared	0.017	0.001		0.089	0.009	
Number of id				301,883	271,025	301,883

Note: Robust standard errors clustered by destination in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

We take the standard gravity regression and estimate from a destination (Table 5, columns 5,6) and a destination-firm (columns 1-4) point of view. As for destinations, we look at how gravity variables affect the number of firms and the mean value of a firm's total shipment to a destination (extra-EU). As for destination-product pairs, we consider the number of firms, selling the same product at the same destination as well as a firm shipments total value. This way, earlier results on number of shipments a firm does in a product to a destination and the average shipment value can be directly compared to these other margins. These results can be directly compared to earlier results on transport frequency (Table 1).

First we can compare the two extensive margins. Regarding the number of products per market/firm and number of transactions, it can be generally observed that demand (GDP) and fixed cost of importing are more relevant to the intensive margins. In regards to export frequency, firms ship more frequently to markets closer to the exporter. This is similar to other extensive margin estimations (Lawless (2010), Bernard et al. (2007)). Our data suggest that 10% increase in GDP would raise the number of firms exporting by 6.6%, the number of products by 0.7% (Table 5) and the frequency of shipments by 1.1% (Table 1).

An interesting result here is that when looking at the impact of transport costs, proxied by distance, selection effects is not important - unlike for the transaction level.

5. Evidence from 2008/09 crisis

The financial crisis of 2008/2009 and the consecutive drop in world demand have led to a world trade collapse; export volumes fell by 15-25% in 2009. Evidence to date (e.g.

Table 5: Gravity of margins of export (extra EU)

	(1)	(2)	(3)	(4)	(5)	(6)
	Extra EU					
	by firm/dest				by destination	
Variables	log mean value		log # product		log mean value	log # firm
Fixed effect	(-)	(firm)	(-)	(firm)	(-)	(-)
log GDP	0.085***	0.222***	0.019***	0.073***	0.322***	0.664***
	(0.021)	(0.012)	(0.006)	(0.009)	(0.028)	(0.038)
log distance	-0.149***	-0.205***	-0.045***	-0.063***	-0.220***	-0.724***
	(0.049)	(0.042)	(0.017)	(0.018)	(0.080)	(0.115)
log cost of importing	0.047	-0.038	-0.018	-0.051***	0.099	-0.463***
	(0.052)	(0.042)	(0.015)	(0.018)	(0.082)	(0.107)
Contiguity dum.	-0.409***	-0.409***	-0.086**	-0.023	-0.730***	-1.610***
	(0.149)	(0.103)	(0.039)	(0.055)	(0.256)	(0.347)
Common language dum.	-0.358***	0.238***	0.056	0.206***	-0.161	2.128***
	(0.059)	(0.077)	(0.041)	(0.050)	(0.098)	(0.184)
Constant	8.467***	5.730***	0.376	-0.716*	5.495***	-0.175
	(0.858)	(0.634)	(0.297)	(0.384)	(1.106)	(1.750)
Observations	305,781	305,781	305,781	305,781	146	146
R-squared	0.027	0.075	0.007	0.070	0.680	0.854
Pseudo R2	.	.	.	.	.	.
Log Lik	-606163	-489963	-295380	-202867	-117.2	-167.0
Number of id		86,164		86,164		

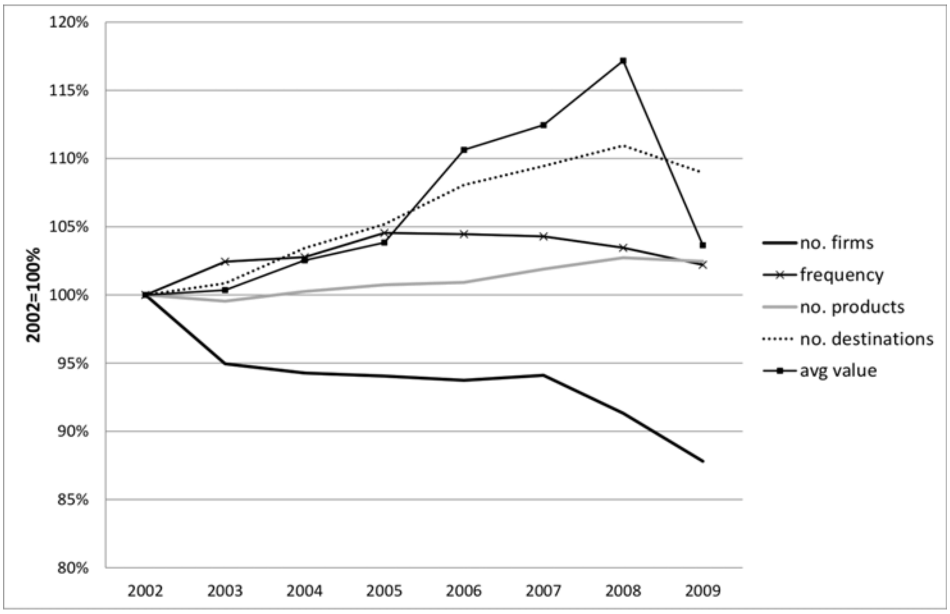
Note: Robust standard errors clustered by destination in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Bricongne et al. (2012)) suggests that the extensive margin explains only a fraction of the observed drop. It was mainly the value of flows by stable exporters that declined. This overall decline was mainly driven by composition and demand effects (Eaton et al. (2011)). As demand is one of the major determinants of the number of shipments, we can use the 2008-09 crisis as an experiment to assess the impact demand on export behavior. As before, composition effects will be controlled by firm-product fixed effects. Note that the crisis has been also associated with a marked increase in uncertainty.

Even during the crisis, the decision is basically about the number of shipments, and hence about the value of each shipment given a certain amount of demand. Conditional on perceived demand for a certain product from a certain destination country, we argued that the optimal number of shipments for a firm is decreasing in the fixed cost of shipment, increasing in the inventory cost, and increasing in demand. How these determinants were affected by the trade collapse is not straightforward. As a first approximation however, it is not too risky to consider the fixed cost of shipment as constant. One can hardly think of the crisis reducing the paperwork. The inventory cost are likely to have been reduced due to the crisis as both property prices and warehouse rents fell in crisis hit regions. A drop in interest rates in most countries also reduced inventory costs. A reduction in the inventory cost should reduce the number of shipments and thus reinforce the negative impact of the drop in demand.

In Figure 2 we show the evolution of various margins between 2002 and 2009. The graph shows that it was the average shipment value that fell the most, number of exporting firms fell but the export portfolio of firms as well as the shipment frequency were rather stable.

Figure 2: Intensive and extensive margin over time



Source: French customs. Authors' calculation.

To get a more precise understanding, we decompose trade. In Table 6 we provide the full disaggregation of French exports into its different margins, and their evolution over time between 2002 and 2009. We firstly decompose the total value in the number of observed flows (N_{flows}) and the mean value per flow (Avg_{value}) as follows:

$$Value = Avg_{value} * N_{flows} \tag{4}$$

We then provide characterize the changes in the number of firms, the average number of products per firm and destination, and the average number of shipments per destination and product, using the following decomposition:

$$N_{flows} = N_{fimrs} * N_{dest} * N_{prod} * N_{ship} \tag{5}$$

where N_{firms} is the number of firms, N_{dest} is the average number of destination per firm, N_{prod} is the average number of product per firm and destination, N_{ship} is the average number of shipments per firm and destination and product.

Export value declined by 17.6% during the crisis (2009). As already emphasized by Bricongne et al. (2012), the bulk of the trade collapse (73%) is accounted for by the intensive margin of trade, i.e. the drop in the average value per flow. We confirm that disaggregating the extensive margin further into the number of shipment per firm∗destination∗product does not change the picture: the average number of shipment remain constant during the crisis, as is the case for the average number of product per

Table 6: The margins of French exports (2002/2009)

	Total exports		Avg value by shipments		Number of flows			
2002	3.24E+11		6.93E+04		4673323			
2003	3.17E+11	-2.2%	6.86E+04	-1.1%	4622499	-1.1%		
2004	3.33E+11	5.0%	6.83E+04	-0.4%	4874088	5.4%		
2005	3.50E+11	5.1%	6.86E+04	0.4%	5104448	4.7%		
2006	3.82E+11	9.1%	7.21E+04	5.2%	5295700	3.7%		
2007	3.98E+11	4.2%	7.24E+04	0.4%	5494620	3.8%		
2008	4.08E+11	2.5%	7.46E+04	3.0%	5469678	-5.0%		
2009	3.36E+11	-17.6%	6.49E+04	-13.0%	5175279	-5.4%		
	Number of firms		Avg number of destination		Avg number of prod/dest		Avg number of ship/dest*prod	
2002	104064		5.03837		2.53		3.53	
2003	98811	-5.0%	5.08106	0.8%	2.53	0.1%	3.64	3.2%
2004	98108	-0.7%	5.21135	2.6%	2.6	2.8%	3.67	0.8%
2005	97871	-0.2%	5.29932	1.7%	2.62	0.9%	3.75	2.3%
2006	97554	-0.3%	5.44456	2.7%	2.63	0.4%	3.79	1.0%
2007	97927	0.4%	5.51432	1.3%	2.69	2.0%	3.79	0.0%
2008	95036	-3.0%	5.58972	1.4%	2.71	0.8%	3.8044	0.4%
2009	91369	-3.9%	5.49007	-1.8%	2.71	0.1%	3.8066	0.1%

firm∗destination. The bulk of the drop in the number of flows (-5.4%) is accounted by the drop in the number of French exporters (-3.9%), with mainly small exporters exiting. The exit of small exporters may however bias upwards the other components of the extensive margin during the trade collapse because of composition effects, as already noticed.

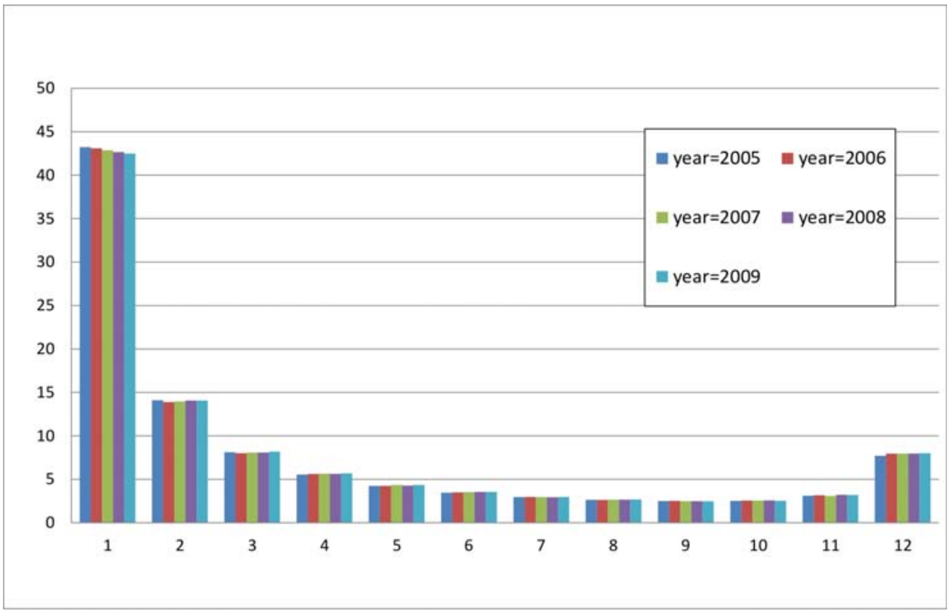
All in all, the network of French exports did remain stable throughout to the crisis, whatever the degree of disaggregation of export flows taken in the data. Our results point to a strong resilience of export flows despite the drop in demand, which was mainly absorbed at the intensive margin. This is supported by Figure 3 that repeats the frequency of exports (of Figure 1) for five consecutive years and shows very little change in headline frequency.

To sum up, all these results suggest that during the crisis, the average trade shipment frequency hardly changed despite a drop in demand and a multitude of shocks. How could this be the case?

First note that there is a composition effect in the data. As Table 6 showed, the number of flows dropped (-5.4%) mainly as the number of French exporters (-3.9%) declined. As mainly small exporters exited, the average frequency may have declined. In addition, a decline among large exporters, doing more than 12 deals a year is also undetected. (In our gravity regressions, we will control for these bias.)

These issues keep the main finding, the stability of trade frequency unaffected. Our main question is how the behavior of trade transactions has adjusted. Most of the adjustment took place at the value shipped, not by reducing the frequency. And as most of the adjustment fell on quantities rather than prices for manufacturing products during the crisis, we can conclude that on average firms managed to keep the frequency of their shipments but reduced the quantity shipped.

Figure 3: Frequency of shipments, number of months, 2005-2009, all destinations



Source: French customs. Authors' calculation.

As the fixed cost of shipping remained stable, and the inventory cost can only have contributed to the reduction in the number of shipments, it is the *perceived* demand that must have remained stable during the crisis[18]. Perceived demand is simply final demand less variable cost. We know GDP dropped, but what about variable cost? The drop in variable trade costs can be easily documented. As the majority of the worldwide fleet of container vessels is operated from Germany (or by German companies), and to a large extent brokered by brokers based in Hamburg, it makes sense to rely on German data to observe the mean variable cost of shipping containers[19]. We use the Hamburg Shipbrokers' Association index. It is computed on the base of 20 to 30 Hamburg freight brokers, and is known for mirroring correctly the evolution of prices in the market.

We show in Figure 4 the evolution of freight rates for three very common categories of vessels shipping containers[20]. The variable cost of shipping a container fell extremely sharply during the crisis, as a result of increased supply (new vessels ordered before the crisis were delivered) and weakened demand of transport. In 2007, a 11.4% increase in demand matched a 11.8% increase in supply; in 2008 a 10.8 increase in supply exceeded

[18]Or uncertainty could have risen. While the increase in uncertainty is evident, it is difficult to give a precise measurement of it in crisis using hour data.

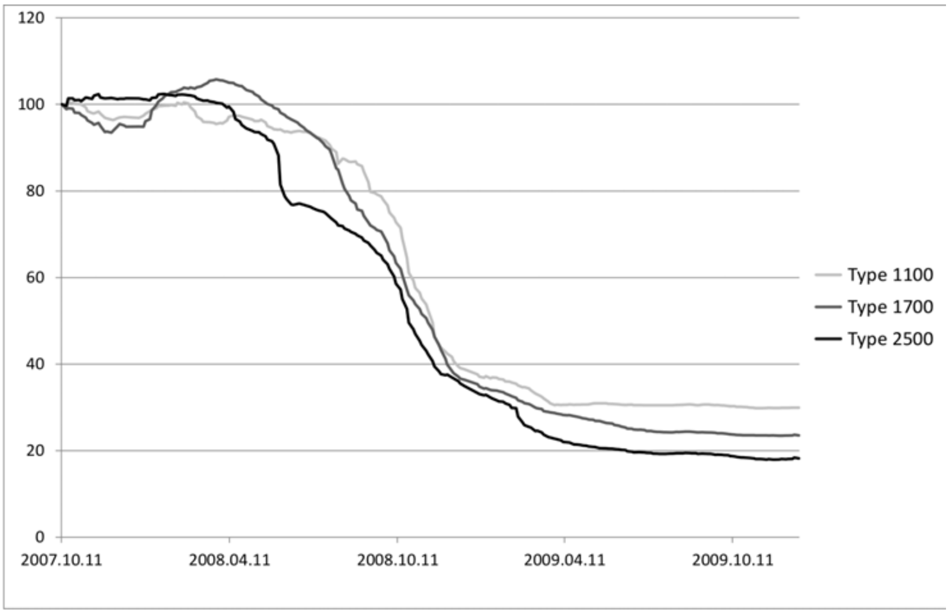
[19]Brokers operating in Hamburg control three-quarters of all container tonnage traded on the free market. We use data from the Vereinigung Hamburger Schiffsmakler und Schiffsagenten E.V. (Hamburg Shipbrokers' Association).

[20]Another possible indicator of declining trade cost is the Baltic Dry Index, which measures the average maritime freight cost. The BDI fell more than 50% in 2009 compared to 2008. However, this index is less representative for trade in manufactured products.

the 4.2% increase in supply; and in 2009 the -9.0% decrease in demand was coincident with a 4.9% increase in supply (UNCTAD, 2011)[21]. Interestingly the drop has been smoothed for the smallest vessels, suggesting that clients maintained the number of shipments but reduced the number of containers per shipment[22].

To sum up, we observe during the crisis a drop in the variable cost of shipping, due to excess capacity and weakened demand. The demand for contained shipping recorded a -9.0% decrease in volume, contrasting with the 15-25% decrease in world trade. Hence, half of the burden of adjustment was placed on the transport industry, exporters maintaining their shipment frequency, but shipping fewer containers per shipment.

Figure 4: Price index for three types of containers (Oct. 2007- May 2010)



Note: The smallest category (1100 TEU) corresponds to 150m long vessels of 10,000 tons (gross tonnage). Source: Hamburg Shipbrokers' Association.

We now run estimations on panel data to analyze the effect of the crisis[23]. As we noticed above that composition effects may have played a big role during the crisis (concentration of shipments on the largest exporters) we introduce firm-product-year fixed effects in the regressions. We stick to extra-EU trade relationships whereby ocean transport is dominant. The dataset includes five years 2004-2009, with a time dummy for 2005, 2006, 2007, 2008 and the crisis year of 2009. The crisis dummy of 2009 is not significant for the shipment frequency confirming the overall stability once perceived

[21]See UNCTAD (2011), p.76, based on Clarkson Container Intelligence Unit.

[22]Notice that using monthly shipment may bias the results if exporters simply manage to ship less often within a month. But the whole distribution of frequency is affected similarly, suggesting that this bias is limited.

[23]Firm exit is not modeled at this stage.

demand is taken into account.

In Table 7, column (1) we observe that the value of exports is driven by demand and that our argument linking the frequency of shipments to demand holds. What data show is that demand had a similar impact on both the average value and the shipment frequency. Interestingly, it is just as it was predicted by Baumol, where the revenue elasticity of frequency is 0.5.

During the crisis, this elasticity is significantly lower, however confirming that shipments less than reacts to the drop in demand, and here again half of the adjustment is falling on the number of shipments. As expected, there is no additional impact of the fixed cost of importing ("cost of importing" in the Table) on the adjustment of the frequency of shipments during the crisis. Lastly, as firms are considering the demand net of transport costs, we do not observe an additional impact of the transport cost (the distance) during the crisis. As transport costs decreased, as we have shown, all markets were affected in proportion to their distance to the exporter, and this impact is already captured by the distance variable. Consequently, interacting distance and crisis, we do not observe any impact.

Table 7: Panel estimation of total, average value and frequency of shipments (Extra EU countries)

	(1)	(2)	(3)
Variables	Log value	Log mean value	Log # shipments
Fixed effects		by firm*product*year	
log GDP	0.265***	0.152***	0.113***
	(0.015)	(0.012)	(0.008)
Crisis*log GDP	-0.008***	-0.005**	-0.003***
	(0.003)	(0.002)	(0.001)
log distance	-0.155***	-0.061	-0.094***
	(0.047)	(0.065)	(0.032)
Crisis*log distance	0.007	0.010	-0.003
	(0.008)	(0.008)	(0.003)
log cost of importing	-0.092*	-0.027	-0.064**
	(0.051)	(0.041)	(0.025)
Crisis*log cost of importing	-0.013	-0.006	-0.007
	(0.020)	(0.015)	(0.009)
Contiguity dum.	-0.251**	-0.282*	0.031
	(0.123)	(0.150)	(0.073)
Common language dum.	0.363***	0.216**	0.147***
	(0.096)	(0.108)	(0.048)
Constant	4.370***	5.556***	-1.186***
	(0.724)	(0.760)	(0.376)
Observations	1,810,519	1,810,519	1,810,519
R-squared	0.079	0.044	0.086
Number of id2	876,517	876,517	876,517

Note: Robust standard errors clustered by destination in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Overall these results show that, even in the face of a large and unexpected economic shock, empirical evidence is not conflicting with the simple Baumol-Tobin type approach we referred to above. In the presence of transaction fixed costs, a drop in demand (net of transport costs) will, ceteris paribus, lead to less frequent transactions. But the uncertainty increased and transport cost fell sharply, cushioning the drop in demand.

6. Conclusion

Exporters optimize the frequency of international trade transactions to save on costs and gain maximum exposure to clients. This decision comes in addition to decisions studied widely in international trade literature such as starting to export or product mix of exports. In this decision, transportation technology is key, lower per shipment costs allowed exporters to reach consumers more frequently and hence, save on inventory costs.

This paper presented the case for a new margin of trade, that of transaction frequency. We showed that in a simple setup in the spirit of Baumol and Tobin, demand, inventory costs and fixed costs of shipment should explain the behavior of this margin. Realizing that this leads to an extended gravity estimation, we compared this margin with other margins of trade and found that frequency of shipment behaves similarly to other margins. In all our econometric endeavors, we used product-firm fixed effects to control for the composition effect caused by potentially different behavior of larger firms or more important products. Indeed, the composition effect proved to be important.

We confronted these two sets of predictions to the data. In the equilibrium, our results confirm the positive impact of perceived demand on the number of shipments and conversely for fixed transport costs. This is supported by results in fixed effect, Poisson and tobit estimations.

We looked at the behavior of shipment frequency throughout the 2008/09 crisis. In contrast to our prior of a decline, average shipment frequency was very stable over time, with the transaction level intensive margin (ie. average shipment size) taking most of the hit. Within firm shipment frequency fall marginally as demand declined, but other factors mitigated this decline. We acknowledge that this is just a first step in understanding how firms decide on organizing the transportation of their goods and what features of transport industry and economic conditions may affect the decision. Clearly, understanding the muted reaction during the crisis need more research.

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