Firms and the global crisis: French exports in the turmoil*

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Abstract

Global trade contracted quickly and severely during the global crisis. This paper, using data on French firms, shows that most of the trade collapse is accounted by the intensive margin of large exporters but that many small exporters were forced to reduce both the number of products exported and destinations served or to stop exporting altogether. Small and large exporters suffered quantitatively proportional trade losses. Nonetheless, large firms absorbed the shock mostly by downsizing the value of exports and smaller firms by ceasing trade relationships. The differential impact of the trade collapse on firms also had a distinct sectoral dimension, with firms exporting intermediate and equipment goods suffering the worst losses. Finally, we find clear econometric evidence that the impact was greatest for financially constrained firms, in particular if they were active in the sectors of high financial dependence. These results are robust to controlling for differences in firm size and various determinants of the financial health of the firm.

Keywords:financial crisis, international trade, firms' heterogeneity, intensive and extensive margins

JEL Classification:F02, F10, G01

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1 Introduction

Trade in the last quarter of 2008 and in the first quarter of 2009 contracted in an exceptionally sudden, severe and globally synchronized fashion. This great trade collapse was unparalleled in its suddenness: the decline of world trade totaled 29% in just four months, from September 2008 to January 2009. It was also seemingly out of line with the decline of world GDP, which only contracted by less than 3% over the same period.

Beyond the fall in demand and a limited resurgence of protectionism (Baldwin and Evenett, 2009; Bussière et al., 2010), three main reasons have been given as to why trade fell so sharply, so quickly and so much out of proportion with the fall in demand: first, a composition effect; second, the increasing reliance on manufacturing models dominated by complex international value chains and; third, financing difficulties and shortage of liquidity linked to the intensification of the financial crisis.

Starting with the composition effect, merchandize trade tends to be the hardest hit by demand shocks, because it is mainly made of durable goods and other postponable production (Benassy-Quéré et al., 2009; Eaton et al., 2009; O'Rourke, 2009). Adding to this, recent fiscal stimulus packages have been mostly oriented towards non-tradeables such as construction and infrastructure: an exception is represented by the fiscal incentives for the domestic purchase of new cars. Hence, composition may contribute to explain the disproportionate contraction of trade relative to GDP. It has indeed been shown to have played an important role in the US case (Levchenko et al., 2009).

Turning to global supply chains, goods are traded several times before reaching the consumer (Tanaka, 2009; Yi, 2009). The growing importance of internationally fragmented production may therefore also contribute to explain the unusually high discrepancy between the drop in overall activity and the contraction in trade. Moreover, the quick communication among firms can explain why inventory adjustments were so sudden (Alessandria et al., 2010) and why the downsizing of trade was so synchronized and homogeneous worldwide (Baldwin, 2009).

Nevertheless, simulations aimed at identifying the contribution of the demand channel and that take into account international input-output relationships have hardly reproduced the magnitude of the slump in world exports, suggesting that additional factors might have played a role (Benassy-Quéré et al., 2009; Willenbockel and Robinson, 2009).

Given the financial origin of the crisis, financial constraints and liquidity shortages have been called into cause as possible additional determinants. Recent literature shows that financial constraints can have a considerable negative legacy on export performance. For example, the decrease in financing might have caused one-third of the 1993 Japanese export collapse after the banking crisis (Amiti and Weinstein, 2009). Furthermore, cross-country evidence from 23 past

banking crises suggests that export growth is particularly slow in sectors reliant on external finance (Iacovone and Zavacka, 2009). Finally, bottlenecks idiosyncratic to trade credit and financing can also hinder trade (Auboin, 2009). The view that trade credit has played a role in the recent trade crisis is however challenged in the case of US imports and exports (Levchenko et al., 2009) as well as by the findings of IMF/BAFT surveys. According to the latter, the general availability of trade finance was maintained over the course of the crisis, although the cost of trade credit increased and a potentially long lasting shift towards structured trade finance took place (G20, 2010).

Given this background, in this paper we look at the micro-economic dimension of the recent episode of trade collapse. We quantify, at the firm level, the mechanisms through which the trade collapse materialized. To the best of our knowledge, this is the first paper that addresses these issues using consistent and exhaustive information on individual firms' exports before and throughout a trade crisis.[1] Another important innovation of the paper is to use monthly data, which on the one hand allows a more precise assessment of the deployment of a trade crisis and on the other hand implies novel methodological challenges. The key questions addressed in our paper are the following. First, have different firms been differently affected by the crisis, based on their size, their degree of globalization, their overall financial situation, liquidity and access to external financing? Second, has the sectoral and geographical composition of firms' exports played a role in the trade collapse? Third, what are the lessons that one can draw from this episode of trade collapse?

The rest of the paper is organized as follows. Section 2 shortly reviews the insights from the theory on the possible impact of the crisis on individual firms. The following sections provide an empirical assessment of the subject, based on a dataset of individual exporters located in France. More specifically, Section 3 presents the facts emerging from a detailed analysis of the margins of trade, of the sectoral composition of the trade collapse and of the distribution of the losses across firms of different size. Section 4 investigates the microeconomic causes of the export engine failure, including the role of financial constraints and of their interaction with various types of trade costs. Finally, Section 5 concludes and draws the implications of our results.

[1]The exception is Bernard et al. (2009) investigating the impact of the 1997 financial crisis on individual US exporters and relying on annual data. They find that the intensive margin had the main contribution to the decline in US exports.

2 Crisis impact on individual firms - insights from the theory

Economic theory would suggest that in an environment of generally adverse economic conditions, average sales and profit margins tend to diminish. Tougher competition forces the average firm to cut production costs and margins and to diversify markets and clients. In such an environment, the least performing and the most financially constrained firms will shrink or exit the market altogether. It is to be expected that the smallest and most fragile exporters are the first to be pushed out of the market. This is the case, because according to the models of firm heterogeneity (Melitz, 2003) the market entry cost and marginal cost of production increase thereby also increasing the minimum level of productivity a firm needs to survive. Meanwhile, the larger and more diversified firms should resist better, taking advantage of their size and market power to adjust and eventually pass part of the burden onto suppliers and wholesalers.

Also, we would expect that financial restrictions affect small firms' exports first. The interaction between credit constraints and firm heterogeneity sharpens the firm selection effect: churning and the associated reallocation of market shares from the least productive (and hence smaller) firms to the most productive exporters is higher than in normal circumstances (Manova, 2008). In models of firm heterogeneity, credit is necessary to cover the sunk cost needed to enter the market (Melitz and Ottaviano, 2007). The reason is that nothing has been produced and sold yet at the entry stage so that entrants have to borrow to pay the R&D wage bill. Analogously, one could think that additional credit is also needed to pay the wage bill at the production stage associated with the marginal cost of production. Amiti and Weinstein (2009) underline that additional delays and uncertainty on export make firms engaged in international trade more in needs for working capital financing. In terms of parameters of the models of firm heterogeneity, the presence of financing constraints implies that the overall entry cost, marginal cost and cut-off conditions become more restrictive. The impact is likely to be asymmetric, with smaller and less productive firms more affected by credit restrictions as a result of their size or lack of sufficient collateral and/or credit guarantees (Greenaway et al., 2007; Muuls, 2008). This intuition is confirmed by research in finance. In cross-country analyzes of financing obstacles to firm growth, statistically adverse impacts are associated not only with large collateral requirements, but also with a range of obstacles which tend to be more constrictive for small firms. These include heavy paperwork, high interest rates, need of special connections to access finance and restrictive bank lending practices (Meghana Ayyagari and Maksimovic, 2008).

Other dimensions of the dynamics of trade in the recent crisis need also to be examined.

First, if financial constraints were a key determinant of the trade collapse, the fall in trade might follow a sectorally differentiated pattern. Important differences across industries exist in financial dependence: the production technology, which tends to be sector specific, determines firms' financial needs (Rajan and Zingales, 1998). Second, the relative contribution to the trade contraction of the intensive and the extensive margins of trade also need closer inspection. In a multi-market setting, exporters start by serving the most profitable markets first and export up to the marginal market where entry costs are only just covered by local sales. In the trade literature, this is referred to as the *pecking order of trade*. In this environment, a violent shock in world demand should lead exporters to re-focus on their most profitable markets. Nonetheless, one may think that entering and exiting takes more time than changing the scale of operations of already active firms (Melitz and Ottaviano, 2007). In this perspective, it is possible that the intensive margin has absorbed most of the 2008-2009 trade collapse first-round effects, while the impact on the extensive margin will materialize fully over a longer period of time. An empirical fact reinforces the supposition of a predominance of the intensive margin in accounting for the recent trade collapse: exports are usually concentrated among few, large exporters, whose profit margins are relatively high. Hence, these firms are most likely to cope with the shock by squeezing profit margins but without risking to fall short of the break-even point, i.e. by the intensive margin channel. Contributing to the overall trade decline more or less in proportion to their greater presence in total exports, the trade collapse should be also dominated by the intensive margin.

All in all, a story of small exporters exiting the market over an extended period of time and, in the short run, the large ones contributing to a large share of the trade contraction, is what we expect. The policy implication of such a scenario is clear. Such outcome would have long-lasting, detrimental effects on exports, in particular in those sectors with higher external financial dependence. If small exporters are massively hurt by the crisis, and for an extended period of time, then the crisis will leave its footprint on export performance for many years to come. This is what Bernard et al. (2009) finds relative to the legacy of the Asian crisis.

3 Crisis impact on individual firms - the facts

To address these issues, we exploit a dataset of individual exporters located in France.[2] Using such data has two main advantages: first, it enables the investigation of the dynamics of the distribution of exporters based on the whole universe of exporters; second, it allows observing

[2]While we consider all exporters located in France, whatever the nationality of their ownership is, in the rest of the text we may at times loosely refer to our dataset as "French exporters".

their individual contributions to the value or diversity of exports in the sector to which they belong.

Monthly exports by destination and product category as provided by the French Customs are observed for the period January 2000 to April 2009. Our elementary unit of observation is the value exported each month by a French resident in each Combined Nomenclature 8-digit (CN-8 hereafter) sector to each export destination.[3]

3.1 Distribution of French exporters

We start by characterizing the distribution of French exporters. France is broadly similar to other countries, in that exporting is limited to a very select club of "champions", flanked by a large number of marginal competitors exporting on an irregular basis (Mayer and Ottaviano, 2007).

To illustrate this in the French case, consider the largest exporters (1%) in each sector, defined following the 2-digit Harmonized System (HS-2 hereafter) classification. Accordingly, we use the criterion of total value of a firm's exports relative to the exports of all other firms exporting in the same sectors. We find that the top 1% exporters represent 63% of total French exports. The next four percentiles represent 24% of total exports. The smallest exporters (80%) represent only 3% of the total value. In a nutshell, some 1,000 individual exporters account for two-thirds of the total exports of the 5th largest world exporter.

The second characteristic, directly linked to the very large presence of small exporters in the distribution is the churning (numerous entries and exits). Since not every firm exports every month, we look at annual export activity. Some 20,000 exporters enter each year, and as many exit. Thus, over a period of ten years it is possible to observe 300,000 different exporters, with a maximum of 100,000 each year and a maximum of 50,000 each month. What are the dynamics related to these switchers? Only 35% of the entries correspond to firms that are observable in the following year's statistics. But three years after entry 20% of the entrants have survived. Hence the survival rate increases very quickly after a very low start in the first year.

3.2 A first glance at the 2008-2009 collapse

Turning back to the recent crisis, the data on French exporters during the turmoil, which cover the period up to April 2009, seem to confirm the intuition from the theory that initially trade responds to a shock by adjusting the intensive margin. The number of exporters has been only slightly reduced by the crisis, while the value of total trade has sunk significantly. A first glance

[3]The detailed description of our dataset is available in Appendix A.1.

at the data (Figure 1) points to a steep decline in the value of total exports from September 2008 onwards. The number of French exporters, which has been on a decreasing trend since the year 2000, appears to have further contracted during the crisis, from 50,458 units in October 2008 to 46,616 units in April 2009. While seasonality and the number of working days may bias the results somewhat, all in all about 3,800 firms stopped exporting, corresponding to 7 percent of the average number of monthly exporters over the ten-years period considered.[4] In conclusion, the comparison of the data series relative to total export values versus those relative to the number of exporters suggests that the great bulk of the adjustment has been on the intensive rather than on the extensive margin. However, to confirm this intuition, we need more formal methods. We therefore proceed to apply a decomposition into trade margins.

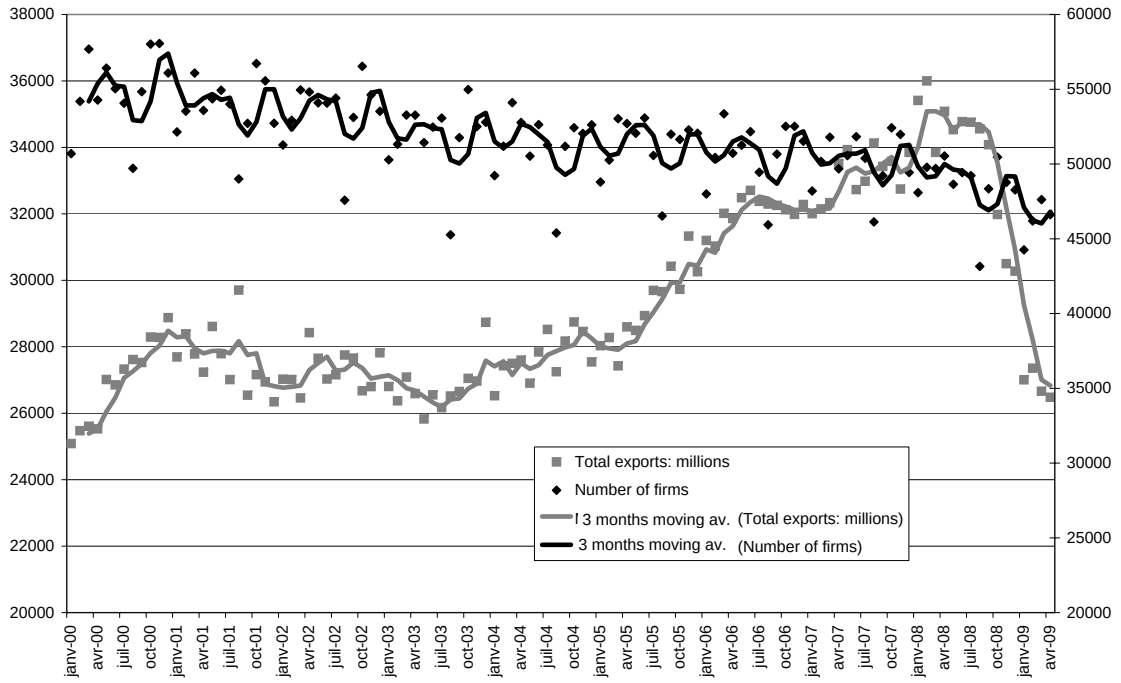
3.3 Decomposition of trade margins

Usually decompositions of trade margins are computed using annual flows as changes in the value of the flows present continuously throughout the considered period. Calculating the margins of trade on monthly firm-level data is more challenging. Not only biases might arise due to problems of seasonality and different patterns of working days (see appendix A.1.1), but, in addition, monthly data imply a very large turnover of exporters and flows. There are about 95,000 individual French firms exporting at least once a year, but only 50,000 exporting firms in the monthly data: not all exporters are exporting each month, and this is even truer for the individual products exported to each destination markets. Hence, since with monthly data churning is amplified, it is not possible, as in the case of yearly data, to define and compute the intensive margin as the change in the value of the flows present continuously throughout the considered period. Indeed this method would lead to a large and undesirable selection of flows and to a sharp overestimation of the extensive margin.

To get around such problems, we rely on the so-called *mid-point growth rates* Davis and Haltiwanger (1992); Buono et al. (2008). With this method, elementary monthly trade flows in a sector or product category can be classified into four types: created (positive extensive margin), destroyed (negative extensive margin), increased (positive intensive margin), and decreased (negative intensive margin). The difference between created and destroyed flows gives the net extensive margin while the net intensive margin is computed from the difference between increased and decreased flows. This method provides an alternative - and incidentally more precise - assessment of the extensive margin. When summing up the margins, it allows to

[4]This figure may be overestimated since the value exported by some firms may have fallen below the reporting thresholds during the crisis. See Appendix A.1 for more information on the threshold applying to export reporting obligation.

Figure 1: Total value of French exports and total number of French exporters, 2000-M1 to 2009-M4



Note: Chapters 97, 98 and 99 of the HS2 are dropped. 3-months moving averages. Left scale: euros. Source: French customs data, own calculations

correctly approximate the observed aggregate growth rates of exports: unlike other methods, it controls for composition effects, thereby allowing to avoid biases whereby the exit of small firms mechanically and erroneously translates into an increase in the intensive margin and in the average number of products per firm.[5]

The mid point growth rate is computed on elementary flows here defined as follows: monthly export flows by a French firm to a given destination of each CN-8 digit product (the most granular piece of information available in the French Customs data). For a firm i exporting a

[5]For instance, the average number of product per firm keeps increasing during the crisis.

value x to a country c of product k at month t, the mid-point growth rate is defined as follows:

$$g_{ickt} = \frac{x_{ickt} - x_{ick(t-12)}}{\frac{1}{2}\left(x_{ickt} + x_{ick(t-12)}\right)} \tag{1}$$

Similarly, the weight attributed to each flow g_{ickt} is given by the relative share of the flow in the total exports, where *total* refers to the exports by the overall population of French exporters:

$$s_{ickt} = \frac{x_{ickt} - x_{ick(t-12)}}{\left(\sum_c \sum_i \sum_k x_{ickt} + \sum_c \sum_i \sum_k x_{ick(t-12)}\right)} \tag{2}$$

Finally, the year-on-year growth rate of the total value of French exports is given by summing - across all exporters i, products k, and countries of destination c - each individual flow g_{ickt} weighted by s_{ickt}.[6]

$$G_{ickt} = \sum_c \sum_i \sum_k s_{ickt} * g_{ickt} \tag{3}$$

Provided that elementary trade flows can each month be classified into four subsets (created - disappeared - increased - decreased), G_t can also be computed by aggregating separately flows corresponding to the above mentioned four contributions: extensive positive (entry), extensive negative (exit), intensive positive (increase in existing flows), intensive negative (reduction in existing flows).[7]

We use the mid-point growth rate method to compute the decomposition into extensive and intensive margin using monthly firm level export data per destination and CN-8 digit product category averaged over (a) the immediate pre-crisis period (2006-2007) and (b) the period of the crisis (from September 2008 to April 2009). According to our definition, a new flow can be a new exporting firm, or a new destination served by an incumbent exporter, or a new product by an incumbent exporter to a destination which he already serves with other products. Margins are computed, as simple averages of the contributions of the intensive and extensive margin, for the overall population of French exporters and for each group of firms ranked by size, i.e. for the smallest 80% exporters, for the 80-95% percentile, for the 95-99% percentile and for the largest 1% exporters. In order to construct each group of firms, we rank these latter by HS-2 digit sector of activity, according to the total value of exports relative to the exports of all other firms exporting in the same sector, in a given month. Hence the monthly composition of the

[6] G represents a good approximation of the log change in total exports.

[7] Indeed all flows corresponding to an entry will post a value of +2 while all flows corresponding to exits a value of -2. Finally all changes in the size of existing flows will post a value comprised between -2 and 0, if the flows have decreased over time, and a value comprised between 0 and +2, if the flows have instead increased over time.

quantiles in a given sector actually varies. An individual firm can belong to different quantiles in different sectors owing to the fact that it can export in more than one HS 2-digit Chapter. [8]

Turning to the results of our decomposition, over the biennium 2006-2007, the overall increase in the value of French monthly exports was estimated at 6.2%. It was driven by changes in the intensive margin, which were equal to 3.9 % (i.e. accounted for 63% of the total increase). Sales in existing flows (*firm* per *destination* per *product*) increased by 20.1%. However this gain was largely offset by a negative intensive margin of 16.2%. The remaining 1.5% increase (i.e. 37% of the total gain in exports) was contributed by the extensive margin. As much as 57% of the gains in the extensive margin arose from the product dimension, i.e. from a strategy of product diversification by incumbent exporters in destinations in which they were already present. An additional 40% gain was achieved by incumbent exporters entering in new destination markets. Finally, only about 3% of the extensive margin gain came from new exporters (see Table 1). It is worth noting that the use of monthly export data implies more entries and exits than in the case of annual data. This is the result of the larger turnover of elementary flows: one particular exporter might export a given product to a given destination only in February in year t and only in March in year *t+1*. In this case, it will be counted as an exit in February in year *t+1* and an entry in March in year *t+1*. Nonetheless, the net contribution of the extensive margin should remain relatively unaffected and comparable to the extensive margins computed on annual data for the period prior to the crisis. This is indeed what emerges from a comparison of Table 1 with Table 9 in Appendix A.2, where the yearly data are used to illustrate developments over the first seven years of the decade.

During the trade collapse (September 2008 - April 2009), French exports recorded a 16.2% year-on-year loss on average (see Table 2). The contraction of sales in existing flows was equal to 12.7% (i.e. the intensive margin accounted for 79% of the total contraction in exports). The downsizing of the extensive margin was equal to 3.4% (21% of the total), which was evenly accounted for by a retrenchment in terms of product variety offered and of destinations. The trade losses due to firms that stopped their export activity altogether was negligible. Interestingly, 75% of the intensive margin loss was absorbed by the largest 1% exporters. By contrast, this group accounted for a mere 23% of the extensive margin. For sake of comparison, in the biennium 2006-2007, the contribution of this group of exporters to developments in the

[8] This approach does not consist in ranking all firms having exported at least once during the preceding 12 months in a given sector, as opposed to the status of operator on a yearly basis used by the French customs. Note that any other definition of quantiles aiming at keeping their population constant would miss at least the entry decisions. Our definition is consistent with the choice of performing an analysis of the whole universe of French exporters. Incidentally, a firm may appear several times in the database, if it exports CN8-digit products belonging to more than one HS2-digit sector. However, each time, only its exports relative to the relevant sector are taken into account.

Table 1: Contributions to mid-point growth rates, average 2006/2007, French monthly exports (percent)

Percentiles	**0-80**	**80-95**	**95-99**	**99-100**	**Total**
Firm entry	1.2%	1.4%	1.6%	1.8%	6.0%
Firm exit	-1.1%	-1.3%	-1.2%	-2.3%	-5.9%
Net firm	**0.0%**	**0.1%**	**0.4%**	**-0.4%**	**0.1%**
Country entry	0.6%	2.2%	3.4%	5.2%	11.4%
Country exit	-0.6%	-2.0%	-3.1%	-4.8%	-10.5%
Net Country	**0.0%**	**0.2%**	**0.3%**	**0.4%**	**0.9%**
Product entry	0.4%	1.8%	4.3%	11.7%	18.1%
Product exit	-0.3%	-1.7%	-3.9%	-10.8%	-16.7%
Net Product	**0.0%**	**0.1%**	**0.3%**	**0.9%**	**1.3%**
Net extensive margin	**0.1%**	**0.4%**	**1.0%**	**0.9%**	**2.3%**
Intensive positive	0.3%	2.0%	4.8%	12.9%	20.1%
Intensive negative	-0.3%	-1.7%	-3.9%	-10.3%	-16.2%
Net intensive margin	**0.0%**	**0.3%**	**1.0%**	**2.6%**	**3.9%**
Total	**0.1%**	**0.7%**	**1.9%**	**3.5%**	**6.2%**

Source: French customs data, own calculations.
Note: Chapters 97, 98 and 99 of the HS2 are excluded from the analysis. Simple averages of contributions are calculated for each month, with the exception of last row. Exporters are ranked according to the value of their exports within a sector.

intensive and extensive margin was equal to 89% and 65%, respectively. From the data, it also emerges that large exporters absorbed the shock mostly through the intensive margin (92% of their loss is accounted by this channel). By contrast, smaller exporters recorded important losses along the extensive margin. For example, for the bottom 80% exporters, 76% of the total losses in exports came from the extensive margin, of which 53 percentage points was due to firms that stopped exporting altogether and an additional 20 percentage points from firms that stopped serving specific destinations.

Taken together, these results support insights from Section 2. Large firms have absorbed the largest part of the 2008-2009 trade collapse. Nonetheless, small players have been massively hurt by the crisis. With important casualties among small firms, the crisis may have long lasting detrimental effects on exports and export potential.

3.4 No conditional differences between small and large firms

One question with important policy implications is whether small and less productive firms have been more than proportionally harmed by the economic crisis. One could expect that larger, more productive and more globalized firms are better able to overcome the contraction of foreign demand or any supply-side constraints. Recent research for instance finds that large firms are better able to overcome increased credit constrains because they can rely on intra-group financing or securities issuing Muuls (2008).

In order to check this, while also accounting for the role of different geographic and sectoral specialization across firms, we adopt a shift-share analysis. This method of analysis is an

Table 2: Contributions to mid-point growth rates, average September 2008-April 2009, French monthly exports (percent)

Percentiles	**0-80**	**80-95**	**95-99**	**99-100**	**Total**
Firm entry	1.0%	1.2%	1.2%	1.2%	4.7%
Firm exit	-1.3%	-1.5%	-1.4%	-0.6%	-4.7%
Net firm	**-0.2%**	**-0.3%**	**-0.2%**	**0.6%**	**0.0%**
Country entry	0.5%	2.0%	2.9%	5.3%	10.8%
Country exit	-0.6%	-2.4%	-3.9%	-5.6%	-12.5%
Net Country	**-0.1%**	**-0.4%**	**-1.0%**	**-0.3%**	**-1.8%**
Product entry	0.3%	1.2%	2.3%	4.8%	8.5%
Product exit	-0.3%	-1.3%	-2.7%	-5.8%	-10.1%
Net Product	**0.0%**	**-0.1%**	**-0.4%**	**-1.1%**	**-1.6%**
Net extensive margin	**-0.3%**	**-0.8%**	**-1.5%**	**-0.8%**	**-3.4%**
Intensive positive	0.3%	1.8%	4.3%	11.1%	17.5%
Intensive negative	-0.4%	-2.5%	-6.6%	-20.7%	-30.2%
Net intensive margin	**-0.1%**	**-0.7%**	**-2.3%**	**-9.6%**	**-12.7%**
Total	**-0.4%**	**-1.5%**	**-3.9%**	**-10.4%**	**-16.2%**

Source: French customs data, own calculations.
Note: Chapters 97, 98 and 99 of the HS2 are excluded from the analysis. Simple averages of contributions are calculated for each month, with the exception of last row. Exporters are ranked according to the value of their exports within a sector.

adaptation of the weighted variance analysis (ANOVA) which was initially developed by studies in regional economics to give a statistical base to the geographical structural analysis Jayet (1993) and that has been more recently applied to international trade Cheptea et al. (2005). Instead of decomposing a variable's growth by algebraic means (such as the constant market share analysis in the trade field), this method allows to perform econometric estimations at the most granular level of the data and to capture thereby estimated parameters associated with e.g. sectoral or geographical fixed effects. Results are independent from the order of decomposition, unlike in decompositions based on algebraic methods.

Elementary growth rates (mid-point growth rates in our case) – weighted by means of the variable s_{ikt} defined above, i.e. exports at time t plus exports at time *t-12* divided by the sum of total exports (all exporters, sectors and destinations) at times t and *t-12* – are accordingly regressed (at each period t) on a set of three dummies variables: *countries*, *sectors* and *size-groups*. Marginal averages (i.e. the marginal impact of a given sector or destination or size) are computed from the estimated fixed effects and confronted with the unconditional estimations. We illustrate the method by taking as example the mid-point growth rate for the top 1% exporters in April 2009 (see Table 3). In the unconditional computation this was equal to –30.2%. However, large exporters are largely represented in the car industry or may be exporting to markets heavily hit by the crisis. In April 2009, the contribution of the sectoral composition of exports was –1.1% and the contribution of the geographical composition of their exports accounted for another –0.2%. Thus, we must correct the apparent mid-point growth rate and subtract these two effects to obtain –29.0%. To wrap up, the year-on-year contraction recorded for the largest exporters in April 2009 would have been equal to –29.0%, had their

Table 3: Mid-point growth rate of exports (year-on-year) by group of exporters before and after correction for export composition (geographical and sectoral)

	Before correction				After correction			
Group	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Percentiles	(0-80)	(80-95)	(95-99)	(99-100)	(0-80)	(80-95)	(95-99)	(99-100)
2008-01	5.1	8.5	7.2	11.5	7.8	10.2	7.9	10.8
2008-02	4.7	10.2	11.4	11.6	2.4	9.3	10.5	12.2
2008-03	-4.1	3.4	5.0	4.8	-1.8	4.9	5.6	4.2
2008-04	2.9	4.8	6.2	3.8	2.3	3.7	4.5	4.6
2008-05	-2.9	-0.1	5.3	0.6	-3.3	-0.2	4.5	0.9
2008-06	-4.9	1.4	7.6	6.5	-3.3	1.7	7.2	6.5
2008-07	0.6	1.2	2.9	6.7	2.6	3.0	3.0	6.3
2008-08	-7.4	-1.4	2.0	1.6	-7.2	-1.3	1.1	1.9
2008-09	-2.6	0.7	-0.4	2.9	-3.1	-0.3	-1.4	3.4
2008-10	-7.0	-2.6	-4.5	-5.8	-9.5	-5.0	-6.0	-4.8
2008-11	-13.5	-8.8	-10.7	-5.4	-14.1	-9.3	-10.9	-5.2
2008-12	-11.1	-11.5	-17.9	-9.0	-9.9	-10.4	-14.8	-10.4
2009-01	-20.1	-20.5	-23.2	-30.2	-26.2	-25.9	-25.4	-28.1
2009-02	-21.6	-24.3	-26.1	-28.9	-22.6	-26.1	-26.8	-28.3
2009-03	-16.6	-19.8	-21.1	-26.5	-23.8	-25.7	-23.6	-24.2
2009-04	-21.3	-23.1	-26.2	-30.2	-27.1	-27.4	-26.9	-29.0

Source: French customs data, own calculations.
Note: Group 1 comprises exporters in the 0-80 percentiles, group 2 exporters in the 80-95 percentiles, group 3 exporters in the 95-99 percentiles and group 4 the largest 1% exporters. Exporters are ranked according to the value of their exports within a sector.

export structure been similar to the cross-destination and cross-sector average French exporter at that date.

Overall, Table 3 indicates that large and small exporters have been similarly affected by the crisis, if one corrects for the different geographical and sectoral orientation of exports. One notable exception is represented by the month of February 2009, when the largest exporters have been the most severely harmed. Meanwhile, the uncorrected growth rates of exports exhibit large differences between small and large exporters, with the large exporters being more severely hit over the entire duration of the crisis. These results, which are also confirmed by multivariate regression analysis, suggest that small firms concentrate in destinations or sectors which were relatively less affected by the trade collapse, and this cushioned their losses.

A difference between large and small exporters however exists. It concerns the timing of the events: the conditional figures suggest that the smallest exporters have been hit much earlier (already starting in August 2008) than larger exporters, whose exports started downsizing in the last quarter of 2008.

3.5 Further characterizations of the trade collapse: the sectoral, geographic and price dimension

We can use the fixed effects estimated in Section 3.4 to provide an econometrics based assessment of the sectoral and geographical composition of the exports collapse. Starting with the

sectoral dimension, we classify the HS-2 digit chapters into broad sectors of activity, namely in intermediate goods, consumption goods, automobile, other transport, other equipment, plus a residual grouping (see details in Appendix A.1.3). If we rank sectors by harm based on the coefficient of the fixed effects, we find that 11 out of the 15 most damaged sectors are classified as intermediate goods (see Table 4). In this "top-15 " there is only one sector representing consumption goods, namely "carpets and other textile floor coverings". Consumption goods on the other hand dominate the ranking of the least affected sectors, these are sectors whose coefficients are positive over the period of the trade collapse. Incidentally, some sectors of intermediates are also among the least affected. They however tend to be sectors whose production is relatively connected to non-durable consumption goods. When aggregating sectors across broad categories we find that more than one third of the overall deterioration is attributable to intermediate goods. Other equipment goods and the car industry contribute with about one fourth and one fifth respectively. By contrast, consumption goods and other transport material have been only marginally affected.

Table 4: Most and least harmed sectors during the trade collapse

Most harmed sectors				
ranking	**Sector**	**HS-2 code**	**broad category**	**f.e.***
1	Lead and articles thereof.	78	interm	-0.51
2	Copper and articles thereof.	74	interm	-0.41
3	Ores, slag and ash.	26	interm	-0.29
4	Vehicles o/t railw/tramw roll-stock, pts ; accessories	87	autom	-0.27
5	Zinc and articles thereof.	79	interm	-0.26
6	Nickel and articles thereof.	75	interm	-0.24
7	Arms and ammunition. parts and accessories thereof.	93	other eqt	-0.22
8	Ships, boats and floating structures.	89	other transp	-0.19
9	Other vegetable textile fibres. paper yarn ; woven fab	53	interm	-0.19
10	Carpets and other textile floor coverings.	57	cons	-0.17
11	Iron and steel.	72	interm	-0.16
12	Raw hides and skins (other than furskins) and leather.	41	interm	-0.16
13	Pulp of wood/of other fibrous cellulosic mat. waste etc	47	interm	-0.15
14	Man-made staple fibres.	55	interm	-0.15
15	Man-made filaments.	54	interm	-0.14
Least harmed sectors				
ranking	**Sector**	**HS code**	**broad category**	**f.e.***
35	Prep of cereal, flour, starch/milk. pastrycooks‘ prod	19	cons	0.15
36	Prod mill indust. malt. starches. inulin. wheat gluten	11	interm	0.16
37	Headgear and parts thereof.	65	cons	0.16
38	Toys, games ; sports requisites. parts ; access thereof	95	cons	0.16
39	Cocoa and cocoa preparations.	18	cons	0.18
40	Miscellaneous edible preparations.	21	cons	0.20
41	Railw/tramw locom, rolling-stock ; parts thereof. etc	86	other transp	0.20
42	Articles of leather. saddlery/harness. travel goods etc	42	cons	0.20
43	Meat and edible meat offal.	2	cons	0.21
44	Pharmaceutical products.	30	cons	0.23
45	Residues ; waste from the food indust. prepr ani fodder	23	interm	0.25
46	Products of animal origin, nes or included.	5	interm	0.26
47	Prepr feathers ; down. arti flower. articles human hair	67	misc	0.29
48	Live animals.	1	interm	0.30
49	Fertilisers.	31	interm	0.34
50	Coffee, tea, mat– and spices.	9	cons	0.37

Source: French customs data, own calculations. * normalized fixed effects (weighted average equals 0).

An inspection to the geographical dimension of the exports ' collapse, based on the 50 most popular destinations for French exports, also reveals some interesting regularities. Overall, the distribution of country-specific fixed effects is less dispersed than the distribution of sectoral fixed effects. The destinations towards which exports contracted most include mainly European destinations, the United States and some important members of *Factory Asia* (see Table 5). Meanwhile, no clear patterns seem to emerge from the list of the least affected destinations.

Table 5: Most and least harmed destinations of French exports during the trade collapse

Most harmed destinations			
ranking	**Country**	**Share in French exports**	**f.e.***
1	Taiwan	0.46%	-0.27
2	Chile	0.15%	-0.21
3	Ukraine	0.23%	-0.16
4	Spain	9.32%	-0.16
5	Argentina	0.23%	-0.12
6	China	2.30%	-0.09
7	Portugal	1.23%	-0.09
8	United Kingdom	8.08%	-0.07
9	Slovenia	0.31%	-0.06
10	United States of America	6.78%	-0.06
11	Poland	1.61%	-0.06
12	Turkey	1.40%	-0.05
13	Denmark	0.72%	-0.04
14	Romania	0.63%	-0.04
15	Czech Republic	0.85%	-0.03
Least harmed destinations			
ranking	**Country**	**Share in French exports**	**f.e.***
35	Thailand	0.25%	0.05
36	Finland	0.52%	0.07
37	Tunisia	0.81%	0.07
38	Brazil	0.78%	0.07
39	Côte d'Ivoire	0.18%	0.07
40	Canada	0.86%	0.08
41	Russian Federation	1.44%	0.08
42	Malaysia	0.36%	0.08
43	Israel	0.30%	0.09
44	Mexico	0.47%	0.09
45	Switzerland	2.81%	0.14
46	Australia	0.7%	0.16
47	Egypt	0.3%	0.16
48	Morocco	0.9%	0.16
49	Nigeria	0.3%	0.18
50	Algeria	1.1%	0.36

Source: French customs data, own calculations. * normalized fixed effects (weighted average equals 0).

To complete the characterization of the trade collapse for French exporters, we conclude Section 3 with a decomposition of the value flows into quantities and unit values. We follow common practice an use changes in unit values as proxies for changes in prices, despite the many well-known shortcomings (Schott, 2004).[9] Accordingly, we compute average price changes, for

[9]Unit value indices are not price indices since their changes may be due to price and (compositional) quantity changes. Bias in unit value indices are attributed to changes in the mix of goods exported and to the poor

total exports and vis-à-vis individual trade partners, by means of weighted averages of the elementary price changes.

We decompose each elementary flow i as follows:

$$dln(value)_{i,t/t-12} = dln(quantity)_{i,t/t-12} + dln(\frac{value}{quantity})_{i,t/t-12} \quad (4)$$

We then aggregate elementary price changes as one would do for a Tornqvist price index, using the following formula:

$$\sum_i w_{it}\ dln(value)_{i,t/t-12} = \sum_i w_{it}\ dln(quantity)_{i,t/t-12}] + \sum_i w_{it}\ dln(\frac{value}{quantity})_{i,t/t-12} \quad (5)$$

where the weight factor w_{it} is given by half the share of a flow over the total value of French exports in the two reference periods, i.e.

$$w_{it} = \frac{1}{2}\left(\frac{value_{i,t}}{\sum_i value_{i,t}} + \frac{value_{i,t-12}}{\sum_i value_{i,t-12}}\right) \quad (6)$$

With the above method, we can decompose both changes in total exports and changes in exports directed to specific destinations.

Applied to the period of the crisis, the decomposition indicate that nearly all the collapse of French exports originated from a contraction of the volumes exported while prices played only a minor role. We find that the overall price index for French exports was 1.4% higher in April 2009 than in April 2008. It was nearly unchanged compared to April 2007 (-0.1% between April 2007 and April 2008). Results broken down by destinations are provided in Appendix.[10]

quality of recorded data on quantities. However in our case the former problem may be less accurate since we use very highly disaggregated trade flows at the firm-destination-product level.

[10]Important caveats to our analysis are the following: Our analysis is based exclusively on the intensive margin as we can only apply the above method to continuous flows. In addition we exclude from the analysis all elementary flows without quantity reported. Hence we exclude all intra-EU trade flows for firms exporting overall less than 460,000 euro per year to the other 26 members of the Union. We believe that both these restrictions do not bias the turf of the data: we have shown in section 3.3 that the intensive margin dominated the dynamics of trade during the crisis, and the threshold for intra-EU trade reporting is sufficiently low to be of second order importance.

4 Microeconomic causes of the export engine failure

The analysis in Section 3 clearly indicated that small and large firms suffered comparatively proportional trade losses, with a much more important differentiation across other characteristics, including the sector of activity. An important difference at the microeconomic level emerged to be the margin through which the adjustment took place: predominantly the intensive margin for large firms and the extensive margin for small firms. Such an outcome is consistent with a story where the trade collapse was due to an important fall in demand worldwide, compounded by composition and value chain effects, which explain the sectoral heterogeneity. On top of this and on account of the financial origin of the crisis and of the differential effect along the margins dimension, it is likely that financial constraints also played a role.

4.1 Specification

We test this hypothesis on the following baseline equation on the period 2008M1 to 2009M4 by means of simple and weighted OLS.[11]

$$g_{ickt} = \alpha * d\ln(import)_{ckt} + \beta * PI_{it} + \gamma * PI_{it} * crisis + u_{ct} + v_{kt} + \varepsilon \tag{7}$$

Our dependent variable, the mid-point growth rate of firms' exports has three additional dimensions: time t, HS2 sector k and destination c. It is computed on flows in value.[12]

A first determinant of the change in exports is the demand for imports in the sector and destination market each firms exports to. We compute this demand as sectoral 'net' imports in each destination market, where French exports are subtracted from the total imports of the destination. This procedure allows to avoid endogeneity problems. Data provided by the International Trade Centre (ITC) record monthly imports up to 2009M4 for a subset of only 52 countries, which however represent about 84% of the value of French exports (see Appendix A.1.2 for further details). Given these figures, this variable is well suited to control for the 2008-2009 well-documented contraction in global demand and, to some extent, reflect the extremely

[11] The choice of the subperiod is constrained by computational capacity limits.

[12] In Section 3, the mid-point growth rate was calculated for each firms at the product level (CN-8 digit): the most granular piece of information available in the French customs database. In our econometric analysis, however, we aggregate the product dimension of the data in sectors. Thus, our dependent variable comprises export flows, where each data point corresponds to the value of exports of all exported products categorized under CN-8 categories belonging to the same HS2 sector by each French exporter to each destination country. In other words, we cumulate all products exported within a sector at the firm level, by destination. Consolidating, at the firm-level, the additional information on the product dimension into a sectoral information helps evaluating results. While eliminating noise from the data and making the dataset more manageable, this categorization takes into account that the current crisis appears to have had a distinctive sectoral dimension.

skewed sectoral dimension of the crisis.

A second determinant to be addressed is the overall impact of the crisis, notwithstanding the demand and sectoral issues referred to above. Indeed, the general climate of uncertainty and its impact on business confidence, shortage of liquidity and a more restrictive access to the financing of business activities in some regions of the world may have exacerbated contraction of both activity and trade, beyond demand developments. To control for this we create a dummy variable taking value 1 from 2008M9 onwards.

Beyond the well established determinants of export performance, this paper aims at investigating the impact of financial constraints. Direct information on credit constraints during the crisis is not available. Hence we follow (Aghion et al., 2010) and identify firms that are credit constrained indirectly, through their defaults on payments to trade creditors. Since 1992, French banks have a legal obligation to report within four business days to the *Systeme Interbancaire de Telecompensation* any accident whereby a firm fails to pay its creditors. These defaults on credits are called *Payment Incidents*. The Banque de France centralizes this information and makes it readily available through a weekly paper or via Internet to all commercial banks and other credit institutions. The Banque de France allows free access to the full history of incidents of payments over the preceding 12 months. This service has the sole purpose of providing information to banks and other credit institutions about their customers, in order for them to adapt their credit supply to this information. Having experienced a payment incident during the previous year has a negative and significant impact on the amount of new bank loans: both the probability of contracting a new loan and the size of future loans are negatively affected by having had a payment incident (Aghion et al., 2010). Our variable of credit constraints *Payment Incidents (PI* thereafter) is a dummy variable equal to 1 if a firm experienced at least one payment incident over the preceding 12 months. Further details about the variable are provided in Appendix A.1.3.

Country-time and HS2-time fixed effects act as sectoral deflators, controlling for any time-varying country and sectoral determinant, including the exchange rate and any sectors specific shock as well as, to some extent, for composition effects or for sectoral differences in internationally fragmented production.

4.2 Results

The results of the baseline specification are reported in Columns (1) to (4) of Table 6. Having experienced a payment incident over the previous 12 months has a negative impact on the firm's export in normal time. During the crisis period the negative impact is heightened by

2%, to be compared to a 17% year-on-year drop in firms' exports on average during the crisis. These results are relatively stable across estimations and also robust to the inclusion of different control variables.

The literature on the link between financial dependence and firms performance indicates that there is a sectoral dimension to the financial dependence of a firm: by and large, the production function determines the type of financial needs dominant in a sector (Rajan and Zingales, 1998). On this account, it is likely that in good times a well developed financial sector can be the source of a comparative advantage in financially constrained sectors. By contrast, during the turmoil, this advantage can be expected to reverse due to credit shortage. To control for the sectoral dimension, we construct an index of financial dependence for HS-2 digit industries akin to Rajan and Zingales (1998). Accordingly, our index of external financial dependence is equal to one minus the ratio of the mean of internal financing over the mean gross fixed capital formation over the period 2003-2007 for each firm in the dataset. Data are taken from the *FiBEn* database constructed by the Banque de France, which contains information on both flow and stock accounting variables of a large sample of French firms and is based on fiscal documents, balance sheets and P&L statements (see Appendix A.1.3 for further details). We obtain the aggregation at the HS-2 digit sector by computing the median value across firms. As the technological needs of sectors are slow to evolve, we can assume their time-invariance over the period of estimation. Meanwhile, the inclusion of sector-time fixed effects (on a monthly basis) allows us to control for sectoral volatility over the cycle. An innovation of our paper with respect to the previous related literature is that we calculate our indices of financial dependence based on a dataset of firms included in our data-sample. We use this indicator to carry out separately regressions for sectors whose index of external financial dependence is below the median and for sectors whose index is above the median. Results of the regression on sectors below the median are reported in column (3) of Table 6 and those for sectors above the median in column (4). The additional negative effect of the crisis seems to be fully driven by developments in the sectors dependent on external finance.

4.3 Robustness checks

Even if payment incidents have been found to be a clear generator of credit constraints, this measure is not immune from potential endogeneity problems. A negative export performance and the fact of having experienced a payment incident may result from omitted variables. For example a firm may decide that an activity is not worth pursuing and, as a result it may reduce both output (and therefore exports) and its diligence towards its creditors in that activity.

Table 6: Microeconomic determinants of the trade collapse

	(1)	(2)	(3) RZ<med.	(4) RZ>med.	(5)	(6)	(7) weighted	(8) Group
dln(import)	0.065	0.065	0.072	0.051	0.061	0.058	0.286	0.066
	0.004	0.004	0.006	0.006	0.005	0.005	0.002	0.004
Incident of payment	-0.269	-0.259	-0.260	-0.254	-0.076	-0.083	-0.097	-0.271
	0.004	0.005	0.007	0.009	0.007	0.007	0.002	0.006
Crisis*Incident of payment		-0.020	0.007	-0.073	-0.041	-0.017	-0.079	-0.019
		0.007	0.009	0.013	0.009	0.010	0.005	0.008
ln(net assets)					-0.002	-0.004		
					0.001	0.001		
Crisis * ln(net assets)					0.001	0.003		
					0.001	0.001		
ln(VA/nbr employees)					0.023	0.025		
					0.002	0.002		
Crisis * ln(VA/nbr employees)					0.003	-0.001		
					0.002	0.002		
Financial charges / VA						0.000		
						0.000		
Crisis * Financial charges / VA						0.000		
						0.000		
Internal financing / investment						-0.023		
						0.009		
Crisis * Int.financing / inv.						0.052		
						0.013		
Leverage ratio						-0.001		
						0.001		
Crisis * Leverage ratio						-0.003		
						0.001		
Obs.	6135735	6135735	4175151	1960584	4576938	4140150	6135735	5724816
R2	0.01	0.01	0.01	0.01	0.01	0.01	0.08	0.01
Nbr. Firms	105212	105212	79524	49215	45776	38849	105212	0
Year*Sector f.e.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country*Sector f.e.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Source: French customs data, own calculations.

Robust standard errors into parentheses. Intercept not reported. All financial variables are computed from FIBEN/Centrale des Bilans, Banque de France. PI: Payment Incident (0/1). Significance levels: *:10% **:5% ***:1%

To deal with the potential endogeneity problem, we therefore enrich the baseline equation to control for a range of classical firm-level determinants of export performance, including size (net assets), productivity (value added per employee), and a set of three variables providing a measure of the financial dependence of the firm. Namely, dependence on external finance (internal financing over gross fixed capital formation), cost of debt (financial charges over value added) and leverage ratio (debt over own funds). All the RHS firm-level variables, with the exception of the *Payment Incidents* variable, are taken from the *FiBEn* database.

We first control in column (5) for firm heterogeneity in size (net assets) and productivity (value added per employee). In column (6), we also include dependence on external finance (internal financing over gross fixed capital formation), cost of debt (financial charges over value added) and leverage ratio (debt over own funds). The inclusion of these additional firm level control does reduce the magnitude of the coefficient on payment incident, but not the additional significant impact that we find during the crisis.

Table 6 also allows to confirm the results of Section 3 about the lack of a conditional

difference in the impact of the crisis on firms of different size: see Column (3), which includes net assets, a proxy for firm differences across size. Interestingly, however, firms of different size seem to be differently constrained by credit restrictions. Estimations weighted by the size of a firm's exports suggest a weaker effect of the *PI* variable in normal times, but higher during the crisis. A possible reason is that larger firms are less affected by incidents of payment in normal times, when bank credit is not constrained while small firms are always constrained, irrelevant of what the banks' loans policy is.

Results in Column (8) refer to another type of robustness test: data are consolidated by ownership, so that all France-based firms belonging to the same proprietary group are clustered together. More precisely the trade flows by all France-based subsidiaries are consolidated in one observation and the the *Payment Incidents* variable is averaged using exports as weights.

5 Conclusion

In conclusion, our results show that the crisis has affected exporters of different sizes evenly, after controlling for the sectoral dimension of the turmoil and for the geographical specialization of firms of different sizes. Indeed, small firms seem to concentrate in destinations or sectors which were relatively less affected by the trade collapse, and this would have cushioned their losses. The smallest exporters have nevertheless been hit much earlier (already starting in August 2008) than larger exporters, whose exports started downsizing in the last quarter of 2008.

Yet, an important difference at the microeconomic level emerged to be the margin through which the adjustment took place: predominantly the intensive margin for large firms and the extensive margin for small firms. Such an outcome is consistent with a story where the trade collapse was due to an important fall in demand worldwide, compounded by composition and value chain effects, which explain the sectoral heterogeneity. Our econometric analysis however shows that credit constraints have also played a role in the financial crisis: credit constrained firms have reduced their exports more in the period of the crisis than in "normal" times and than other French exporters.

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A Appendix

A.1 Data description

A.1.1 Firm level export data

We rely on individual firms exports recorded on a monthly basis by the French customs. The period covered is 2000M1 to 2009M4. We exclude from the data the items belonging to HS2 Chapter 97 ('Works of art, collectors' pieces and antiques'), 98 ('Special Classification Provisions'), and 99 ('Special Transaction Trade') as well as monetary gold. Each exporter is identified by a unique officially assigned identification number (SIREN). Each exporter ships its products in one or more product categories defined at the Combined Nomenclature 8-digit level, comprising some 10,000 different categories. Each category of product exported by a given firm can be shipped to more than one market. Accordingly, the most granular piece of information available in the French customs database is the value exported each month by a French resident firm in a CN8 category to each destination country. From a simple statistical point of view, the resulting four-dimensional data point is defined as elementary flow. On average, 629000 elementary flows were recorded monthly over the period from 2005M1 to 2009M4. Changes in trade flows over time may originate from changes in any of the following: number of exporters, number of products, destination markets served and value shipped per each elementary flow. In our analysis, we use the above level of detail in Section 3. By contrast, in the econometric analysis of Section 4, we aggregate the product dimension of the data in HS 2-digit sectors. Thus, our dependent variable comprises export flows, where each data point corresponds to the value of exports of all exported products categorized under CN 8-digit categories belonging to the same HS 2-digit sector by each French exporter to each destination country. In other words, we cumulate all products exported within a sector at the firm level, by destination.[13] Consolidating, at the firm-level, the additional information on the product dimension into a sectoral information helps evaluating results. While eliminating noise from the data and making the dataset more manageable, this categorization takes into account that the current crisis appears to have had a distinctive sectoral dimension, as stylized facts from aggregate data suggest (effect strongest on durable goods, financial dependence of firms clearly following a sectoral dimension, etc.).

[13]Incidentally, a firm may appear several times in the database, if it exports CN8 products belonging to more than one HS2 sector. It should be noted however that, each time, only its exports relative to the relevant sector are taken into account.

One issue to bear in mind is that our dataset is subject to some limitations linked to data-censoring. While we use all the information collected by the French Customs, the exports reporting obligation applies only if a firm export above a legal threshold. More specifically, two different size thresholds apply, one for extra-EU trade and one for intra-EU trade. For exports to non-EU countries, firms have the obligation to declare their exports if the the yearly cumulated value of their exports is 1,000 euro or more. For exports to other EU member state, 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 euro. These size thresholds may bias negatively the extensive margin, since small firms are more subject to extensive margin adjustments (see findings in Section 3.3) Using monthly data, however, it is unclear how this issue could be effectively tackled. Moreover we are interested in changes over time, and not in absolute figures. Hence we consider this issue of second order importance.

Finally, it should be noted that there is considerable seasonality in our dataset and the number of working days is also an important determinant of monthly exports. We deseasonalize the data by applying the coefficient of adjustment used by the French customs to broad categories of products, and focus on year-on-year variations, whereby month m of year t is compared to the same month of year t-1.[14]

A.1.2 Sectoral import data

In order to control for developments in global demand, we use monthly sectoral data at the two-digit level of the Harmonized System for 52 countries, as provided by the ITC (UNCTAD-WTO, Geneva). The tagging by HS2 allows to categorize goods into 97 different sectors (As discussed in the main text of the paper we exclude sectors HS98 and HS99 from our dataset).

A.1.3 Financial data

We draw financial data from a variety of official and commercial sources:

Payment Incidents Since 1992, French banks have a legal obligation to report within four business days to the *Systeme Interbancaire de Telecompensation* any accident whereby a firm fails to pay its creditors. These defaults on credits are called *Payment Incidents*. The Banque de France

[14]See the website of the French Customs for a further detail on the above mentioned coefficients of adjustment (http://www.douane.gouv.fr/)

centralizes this information and makes it readily available through a weekly paper or via Internet to all commercial banks and other credit institutions. The Banque de France allows free access to the full history of incidents of payments over the preceding 12 months. This service has the sole purpose of providing information to banks and other credit institutions about their customers, in order for them to adapt their credit supply to this information. The categories of payment incidents recorded in the database include: (1) the inability of clients to pay, e.g. due to insufficient funds, (2) requests for extensions of payment delays, as well as (3) payment incidents due to technical reasons (mainly missing details on bank account or the issuer) or due to contestation of claim. We consider only the first source of payment incident, related to the inability of the firm to pay its trade creditors.

Table 7 reports the number of exporters reporting at least one payment incident per month. Their number is relatively stable over the period: on average, 2855 exporters experience at least one incident of payment between January 2008 and April 2009, or 6% of French exporters. The figures are respectively 2943 during the crisis period (September 2008 to April 2009) and 2766 between January and August 2008 (vs. 3003 in 2007).

Table 7: Number of exporter reporting an incident of payment

year	month											
	1	2	3	4	5	6	7	8	9	10	11	12
2007	2839	3016	3219	3111	3165	3164	2998	2727	2884	3010	3020	2889
2008	2493	2753	2785	2878	2778	2869	2911	2662	2780	3046	3033	2952
2009	2673	2853	2980	3231								

Source: Banque de France, own calculations.

FiBEn FiBEn ("fichier bancaire des enterprises") is a firm level database collected by the Banque de France from firms, banks and registry of commercial courts. It contains accounting and financial data on all French companies with a turnover of at least 75,000 euros per year or with credit outstanding of at least 38,000 euros (see http://www.banque-france.fr/gb/instit/services/page2.htm). Annual accounting data are available for about 200,000 firms. These include almost 50% of exporters recorded by the French customs database over the period 2007M1-2009M4 and about 80% of the firms with 20 to 500 employees. Descriptive statistics are presented in Table 8.

Sectoral indices of external financial dependence Table 11 presents our variable of financial dependence at the sectoral (HS-2) level and the classification into broad sectors of activities.

Table 8: Descriptive Statistics

Variable	Obs.	Mean	S.D.	Q1	Median	Q3
Incident of payment	6135735	0.03	0.18	0.00	0.00	0.00
dln(import)	6135735	-0.06	0.23	-0.16	-0.04	0.06
ln(net assets)	5183686	9.70	1.99	8.24	9.46	10.94
ln(VA/nbr employees)	4576938	4.32	0.69	3.93	4.26	4.62
Internal financing / investment	4501875	2.57	16.50	0.00	1.10	3.50
Financial charges / VA	4501875	0.08	0.14	0.01	0.04	0.08
Leverage ratio	4387091	0.75	1.73	0.04	0.24	0.82

Source: FIBEn, own calculations.

A.2 Illustration of the mid-point growth rate method over data for the period 2001-2007

To illustrate the mid-point growth rate method further, let us consider the period 2001-2007 and compute the corresponding decomposition using yearly data. Table 9 shows, for each group of firms ranked by size, the simple averages of the contributions of the intensive and extensive margin. Accordingly over the first seven years of the decade, the overall increase in the value of French exports was estimated at 2.9%. The extensive margin contributed to this gain with a 1.5% gain (corresponding to 53% of the total). The gain in the extensive margin was in turn due to new firms entering the market, which accounted for 57% of the extensive margin gain, and to a diversification of products (48% of the extensive margin). By contrast, geographically, there was a small retrenchment of French exports, signalled by a contribution of -5% of the country extensive margin to the overall extensive margin. 77% of the overall increase in exports was generated by the top 1% firms, with their contribution to the extensive margin being even more important (79%).

A.3 Decomposition of flows into values and quantities: geographic breakdown

Section 3.5 shows that unit value changes played only a very secondary role during the trade crisis. However considerable variation across destinations exists. Prices toward euro area markets were remarkably stable during the crisis. By contrast, French export prices increased substantially toward the US, Japan and China, namely by 13%, 22% and 16% respectively towards the US, China and Japan (see Table 10). In the period of reference, the currencies of these countries all experienced important exchange rate appreciations vis-à-vis the Euro: 8% for the US dollar and for the Chinese Renmibi and 9% for the Yen). Hence, it is possible that the observed movements reflect to some

Table 9: mid-point growth rates, average 2001/2007, French yearly exports, in percent

Percentile	**0-80**	**80-95**	**95-99**	**99-100**	**Total**
Firm entry	0.2%	0.3%	0.6%	1.0%	2.0%
Firm exit	-0.2%	-0.3%	-0.3%	-0.4%	-1.2%
Net firm	**0.0%**	**0.1%**	**0.3%**	**0.6%**	**0.9%**
Country entry	0.4%	0.9%	1.2%	2.1%	4.6%
Country exit	-0.4%	-0.9%	-1.3%	-2.2%	-4.7%
Net Country	**0.0%**	**0.0%**	**0.0%**	**-0.1%**	**-0.1%**
Product entry	0.1%	0.8%	1.9%	7.6%	10.4%
Product exit	-0.1%	-0.8%	-1.8%	-6.8%	-9.6%
Net Product	**0.0%**	**0.0%**	**0.0%**	**0.7%**	**0.7%**
Net extensive margin	**0.0%**	**0.1%**	**0.3%**	**1.2%**	**1.5%**
Intensive positive	0.1%	1.2%	3.8%	15.2%	20.4%
Intensive negative	-0.2%	-1.2%	-3.5%	-14.2%	-19.0%
Net intensive margin	**0.0%**	**0.0%**	**0.3%**	**1.0%**	**1.4%**
Total	**0.0%**	**0.1%**	**0.6%**	**2.3%**	**2.9%**

Note: Chapters 98 and 99 of the HS2 are dropped. Simple averages of contributions calculated for each year, with the exception of last row. Exporters are ranked according to the value of their exports within a sector.

Source: French customs data, own calculations

extent Pricing-to-market strategies by French exporters: the euro depreciation gave French exporters the possibility to increase prices in euro without loss in competitiveness. Symmetrically, prices fell towards the UK partly as a consequence of an appreciation of the euro vis-à-vis the British Pound (French exporters may have cut prices in euro to remain competitive on the UK market). At any rate, changes in prices have been much greater than changes in exchange rate. Note that the dispersion across destinations has been much more important for values than for quantities.

Table 10: Decomposition of value changes into volumes and prices

	dln(value)	dln(quantity)	dln($\frac{v}{q}$)
All destinations	-0.31	-0.32	0.01
euro area	-0.38	-0.37	0
extra-euro area	-0.22	-0.26	0.04
UK	-0.40	-0.37	-0.03
US	-0.15	-0.28	0.13
Japan	-0.14	-0.31	0.16
China	-0.14	-0.36	0.22

Note: Important caveats to our analysis are the following: Our analysis is based exclusively on the intensive margin as we can only apply the above method to continuous flows. In addition we exclude from the analysis all elementary flows without quantity reported. Hence we exclude all intra-EU trade flows for firms exporting overall less than 460,000 euro per year to the other 26 members of the Union.

Source: French customs data, own calculations

Table 11: External financial dependence and classification by broad sectors of activities

	HS2		**RZ**
1	Live animals	interm	0.05
2	Meat and edible meat offal	cons	0.13
3	Fish, crustaceans, molluscs, aquatic invertebrates nes	cons	0.20
4	Dairy products, eggs, honey, edible animal product nes	cons	0.02
5	Products of animal origin, nes	interm	0.11
6	Live trees, plants, bulbs, roots, cut flowers etc	cons	0.02
7	Edible vegetables and certain roots and tubers	cons	0.02
8	Edible fruit, nuts, peel of citrus fruit, melons	cons	0.12
9	Coffee, tea, mate and spices	cons	0.08
10	Cereals	interm	-0.04
11	Milling products, malt, starches, inulin, wheat gluten	interm	0.28
12	Oil seed, oleagic fruits, grain, seed, fruit, etc, nes	cons	-0.09
13	Lac, gums, resins, vegetable saps and extracts nes	interm	-0.04
14	Vegetable plaiting materials, vegetable products nes	interm	
15	Animal,vegetable fats and oils, cleavage products, etc	interm	0.16
16	Meat, fish and seafood food preparations nes	cons	0.07
17	Sugars and sugar confectionery	cons	0.05
18	Cocoa and cocoa preparations	cons	0.07
19	Cereal, flour, starch, milk preparations and products	cons	0.07
20	Vegetable, fruit, nut, etc food preparations	cons	-0.02
21	Miscellaneous edible preparations	cons	0.00
22	Beverages, spirits and vinegar	cons	0.00
23	Residues, wastes of food industry, animal fodder	interm	0.12
24	Tobacco and manufactured tobacco substitutes	cons	
25	Salt, sulphur, earth, stone, plaster, lime and cement	interm	-0.13
26	Ores, slag and ash	interm	0.09
27	Mineral fuels, oils, distillation products, etc	interm	0.17
28	Inorganic chemicals, precious metal compound, isotopes	interm	-0.07
29	Organic chemicals	interm	0.05
30	Pharmaceutical products	cons	0.15
31	Fertilizers	interm	-0.13
32	Tanning, dyeing extracts, tannins, derivs,pigments etc	interm	-0.07
33	Essential oils, perfumes, cosmetics, toileteries	cons	-0.01
34	Soaps, lubricants, waxes, candles, modelling pastes	interm	0.01
35	Albuminoids, modified starches, glues, enzymes	interm	-0.14
36	Explosives, pyrotechnics, matches, pyrophorics, etc	interm	
37	Photographic or cinematographic goods	cons	0.13
38	Miscellaneous chemical products	interm	-0.14
39	Plastics and articles thereof	interm	-0.04
40	Rubber and articles thereof	interm	-0.04
41	Raw hides and skins (other than furskins) and leather	interm	0.47
42	Articles of leather, animal gut, harness, travel goods	cons	-0.24
43	Furskins and artificial fur, manufactures thereof	cons	
44	Wood and articles of wood, wood charcoal	interm	-0.28
45	Cork and articles of cork	interm	-0.38
46	Manufactures of plaiting material, basketwork, etc.	cons	
47	Pulp of wood, fibrous cellulosic material, waste etc	interm	0.13
48	Paper & paperboard, articles of pulp, paper and board	interm	0.06
49	Printed books, newspapers, pictures etc	cons	0.10

	HS2		**RZ**
50	Silk	interm	
51	Wool, animal hair, horsehair yarn and fabric thereof	interm	0.25
52	Cotton	interm	0.23
53	Vegetable textile fibres nes, paper yarn, woven fabric	interm	0.10
54	Manmade filaments	interm	0.09
55	Manmade staple fibres	interm	-0.25
56	Wadding, felt, nonwovens, yarns, twine, cordage, etc	interm	-0.04
57	Carpets and other textile floor coverings	cons	0.21
58	Special woven or tufted fabric, lace, tapestry etc	cons	-0.10
59	Impregnated, coated or laminated textile fabric	cons	0.07
60	Knitted or crocheted fabric	cons	0.09
61	Articles of apparel, accessories, knit or crochet	cons	0.10
62	Articles of apparel, accessories, not knit or crochet	cons	0.06
63	Other made textile articles, sets, worn clothing etc	cons	-0.07
64	Footwear, gaiters and the like, parts thereof	cons	-0.03
65	Headgear and parts thereof	cons	0.03
66	Umbrellas, walking-sticks, seat-sticks, whips, etc	misc	
67	Bird skin, feathers, artificial flowers, human hair	misc	
68	Stone, plaster, cement, asbestos, mica, etc articles	interm	-0.15
69	Ceramic products	cons	-0.10
70	Glass and glassware	interm	-0.17
71	Pearls, precious stones, metals, coins, etc	misc	0.00
72	Iron and steel	interm	-0.47
73	Articles of iron or steel	interm	-0.29
74	Copper and articles thereof	interm	-0.27
75	Nickel and articles thereof	interm	
76	Aluminium and articles thereof	interm	-0.24
78	Lead and articles thereof	interm	
79	Zinc and articles thereof	interm	-0.31
80	Tin and articles thereof	interm	
81	Other base metals, cermets, articles thereof	interm	-0.13
82	Tools, implements, cutlery, etc of base metal	other eqt	-0.04
83	Miscellaneous articles of base metal	misc	-0.15
84	Nuclear reactors, boilers, machinery, etc	other eqt	-0.11
85	Electrical, electronic equipment	other eqt	-0.12
86	Railway, tramway locomotives, rolling stock, equipment	other transp	0.18
87	Vehicles other than railway, tramway	autom	0.00
88	Aircraft, spacecraft, and parts thereof	other transp	0.25
89	Ships, boats and other floating structures	other transp	0.01
90	Optical, photo, technical, medical, etc apparatus	other eqt	-0.14
91	Clocks and watches and parts thereof	cons	-0.02
92	Musical instruments, parts and accessories	cons	-0.55
93	Arms and ammunition, parts and accessories thereof	other eqt	-0.90
94	Furniture, lighting, signs, prefabricated buildings	other eqt	-0.02
95	Toys, games, sports requisites	cons	-0.17
96	Miscellaneous manufactured articles	misc	-0.05

Source: FIBEn, own calculations.

Note: External financial dependence equals gross fixed capital formation minus Internal financing (Cash flow - Dividend payments) over Gross fixed capital formation. We use the mean of Internal financing and Gross fixed capital formation over 2003-2007. We restrict our sample to firms that reports data for at least 3 years over the period. We allocate each firm to its main HS2 sector and take the median value at the sector (HS2) level, keeping only sector in which more than 30 firms reports in FIBEn.