Trade Crisis? What Trade Crisis?*

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Abstract

We investigate the dramatic 2008–2009 trade collapse using microdata from a small open economy, Belgium. Belgian trade essentially fell because of reduced quantities and unit prices, rather than fewer firms involved in international transactions, fewer trading partners per firm, or fewer products traded. Our difference-in-difference results point to a fall in the demand for tradables – especially durables and capital goods – as the main driver of the recent collapse. Finance and involvement in global value chains played only minor roles. Firm-level exports-to-turnover and imports-to-intermediates – as well as exports-to-production and imports-to-production – ratios reveal a comparable collapse of domestic and cross-border operations. Access to credit affected both types of activities to the same extent. Overall, our results point to a general fall in demand and not a crisis of Belgian cross-border trade per se.

Keywords: 2008–2009 trade collapse; trade crisis; margins of trade; firm-level analysis; Belgium.

JEL Classification: F01; F10; F14.

*The title of this paper is freely borrowed from Lindsey Brink's March 7, 1990, *Wall Street Journal* article (page A18, eastern edition). Both articles, though dealing with different sets of issues, argue that trade is often said to be in a crisis even when closer scrutiny of the situation or the data suggests that there is no specific 'trade crisis'.

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1 Introduction

World trade in manufactures fell by about 30% in nominal terms between the first quarter of 2008 and the second quarter of 2009 (WTO, 2009). While some countries experienced episodes of sharp sectoral drops in exports or imports during the past, the current trade collapse is remarkably wide-ranging across industries and highly synchronized across OECD countries (Araújo and Martins, 2009). It's magnitude also substantially exceeds the fall in world GDP. Though it is well known that trade is generally more responsive to macroeconomic shocks than GDP, even when accounting for the long-term increase in the income elasticity of trade (Freund, 2009), computable general equilibrium models and international real business cycle models significantly under-predict both the magnitude and the speed of the recent collapse (see, e.g., Benassy-Quéré *et al.*, 2009; Levchenko *et al.*, 2010).

Why was the fall in trade not commensurate with the recession? Many conjectures focusing on the supply side of trade have been put forward: a dramatic trade credit crunch (Auboin, 2009; Chor and Manova, 2010); the widespread disruption of global value chains (Yi, 2009);[1] or protectionism raising its ugly head again (Evenett, 2009; Jacks *et al.*, 2011). All these conjectures point at a trade crisis – a crisis of the activity of trading across national boundaries *per se*. Alternatively, other conjectures have been focusing on the demand side of trade: a disproportionate fall in the demand for tradable goods in most OECD countries (Eaton *et al.*, 2011); or inventory adjustments (Alessandria *et al.*, 2010) and the postponement of durable goods purchases. In principle, all these mechanisms may have played a role in the recent collapse. Only empirical analysis can allow us to discriminate between them.

The main contribution of this paper is to provide a detailed microeconometric investigation of the determinants of the trade collapse for a small open economy, Belgium. Matching Belgian microdata for the universe of firm-country-product exports and imports (excluding entrepôt trade) with balance sheet information, we perform three sets of empirical exercises. First, we decompose the trade collapse along the extensive and the intensive margins as in Bernard *et al.* (2009). Changes in the intensive margin are defined as changes in average trade values per firm-market-product, while changes in the extensive margin refer to changes in the number of firms, destinations, and products. Second, using an econometric model of *trade growth* by firm, country, and product, we investigate the determinants of the fall in trade. Building on a difference-in-difference approach, we use the first semesters of 2007 and 2008 as the pre-treatment period and the first semesters of 2008 and 2009 as the post-treatment period, we search for evidence supporting the aforementioned conjectures by looking at the differential post-treatment effect of particular firm-, country-, and product-covariates. Last, using again a difference-in-difference strategy, we examine changes in exports-to-turnover and imports-to-intermediates – as well as exports-to-production and imports-to-production – ratios across firms. To the best of our knowledge, no other

[1] As pointed out by Freund (2009), among others, a fall in final demand in a world with fragmented production chains should have a proportional impact on intermediate trade (disregarding input substitution or price changes). Increasing fragmentation may explain the long-term rise of the trade elasticity with respect to GDP, but not its short-term rise during macroeconomic crises. Evidence for the *disruption* of global value chains during recessions is required to explain higher short-term trade elasticities. To the best of our knowledge such evidence is missing to date.

study has so far analyzed the recent trade collapse using firm-level data on both trade *and* domestic operations, though doing so is required to see whether international activity has been disproportionately hit by the crisis.

Our key findings can be summarized as follows. First, virtually all of the trade collapse occurred at the *intensive* margin. In other words, firm exit and the dropping of products and markets played only a limited role relative to price adjustments and output scaling in explaining changes in trade values. Furthermore, entry and exit dynamics during the crisis did not substantially differ from those observed in a 'normal year'. Our findings echoe those by Bernard *et al.* (2009) on the 1997 Asian crisis, but are nonetheless remarkable given the magnitude of the current trade collapse. We also uncover interesting patterns in the changes of entrants' and stayers' export values, that would deserve further analysis using dynamic trade models.

Second, we isolate firm-, country- and product-specific components of the trade collapse by comparing pre- and post-treatment trade growth. The single most important factor explaining changes in exports is the destination country's growth rate of GDP. Had growth rates between 2008S1–2009S1 been the same as between 2007S1–2008S1, Belgian exports would have fallen by about 54% less than what we actually observed. This result is quantitatively close to that reported by Eaton *et al.* (2011), despite a very different dataset and methodology. Another finding is that trade in consumer durables and capital goods fell more severely than trade in other product categories and in particular consumer non-durables. Had the fall in demand across product categories been equal to the fall in consumer non-durables, Belgian exports would have fallen by about 21% less than what we actually observed. Once country- and product-specific components have been controlled for, the remaining contribution of the firm dimension to the trade collapse is relatively modest. The Belgian credit crunch seems to have somewhat affected exporters: differences in indebtedness and debt maturity can explain up to 33% of the firm-level fall in exports.[2] Similarly involvement in global value chains can explain about 24% of the fall in imports. Though there are minor effects of inventory adjustment on imports, they are limited to the distribution sector only.

Finally, to assess whether international trade has been hit more strongly by the crisis than production and domestic activity, we use changes in exports-to-turnover and imports-to-intermediates – as well as exports-to-production and imports-to-production – ratios and regress pre- and post-treatment changes in those ratios on a number of firm characteristics and industry dummies. Our analysis reveals that there are almost no systematic differences across firms. In particular, financial variables have no explanatory power. These results confirm that foreign operations were not significantly more affected than domestic operations: though exporters indeed suffered from restricted access to credit, their domestic and foreign sales were equally affected. Similarly, involvement in global value chains did not have any stark effects on

[2] According to the Central Corporate Credit Register of the National Bank of Belgium (NBB), authorized and used credit lines in the Belgian manufacturing sector decreased by 4.40% and 3.11% respectively between June 2008 and June 2009. Furthermore lending through letters of credit, typically used in international transactions, decreased by 5.18% over the same period.

imports-to-intermediates ratios. Supply-side conjectures have, therefore, considerably less explanatory power when used to compare changes in foreign and domestic operations.

Overall, our results suggest that a general fall in demand for tradables – especially for consumer durables and capital goods – is responsible for about two-thirds of the recent trade collapse in Belgium. Since trade and domestic activity were affected in roughly similar ways, talking about a 'trade crisis' seems inappropriate.

Related literature. Firstly, our paper is closely related to ongoing empirical investigations of the trade collapse. Baldwin (2009), which includes a large survey of empirical studies concludes in favor of demand-side explanations. Most studies rely on aggregate data or descriptives, although some decompose the margins of US and French trade, with results similar to ours. Closer to our work, Bricongne *et al.* (2009) provide a careful examination of monthly French firm-level exports. They find a dominant role for the intensive margin, with little differences across exporter size classes. They also find a more severe fall in sectors that depend more on external finance, and among firms that default on a payment. They do not, however, systematically exploit balance sheet data to link changes in exports to firm-level characteristics. Levchenko *et al.* (2010) examine the variation in US exports and imports across 6-digit industries. They find some support for the 'fragmentation explanation' and some role for durable goods, but no evidence of a trade credit effect or of inventory adjustments. They also find that industries experiencing larger reductions in domestic output had a larger fall in trade. Chor and Manova (2010) uncover significant composition effects in US imports, using variation over time in cross-country differences in interbank interest rates and cross-industry differences in financial characteristics. However, due to data limitations, they evaluate financial characteristics at the industry level (thereby potentially mis-measuring attributes of the subset of exporters) and industrial production indices at the country level. Eaton *et al.* (2011) calibrate the Eaton-Kortum model on bilateral trade data for 30 countries. They find that a global demand shock, especially for durables, can explain most of the fall in trade. Yet, implicit bilateral trade frictions, as proxied by Head and Ries (2001) indices, also contributed to the fall in trade for some countries such as China and Japan. Interestingly, Eaton *et al.* (2011) find orders of magnitude for the impact of the demand shock on trade that are comparable to ours. Their approach builds on the structure of a general equilibrium trade model while abstracting from cross-industry and cross-firm patterns, whereas we focus on the latter aspects using a microeconometric methodology. We thus view our results as complementary to theirs. Finally, Alessandria *et al.* (2010) calibrate a model of inventory adjustment using data for both the US car industry and aggregate US data. Their model generates a fall in trade in excess of 33% of the fall in output, in line with the data.

Secondly, our work is related to studies of changes in trade patterns during major macroeconomic crises. Bernard *et al.* (2009) investigate the contributions of the different margins of trade to changes in US exports to, and imports from, several Asian countries during the 1997 financial crisis. They find that most of the adjustments occurred at the intensive margin, thus favoring a quick subsequent

recovery. Amiti and Weinstein (2011) find that shocks to the health of Japanese exporters' main banks explain up to half of changes in firm-level exports, controlling for industry-time fixed effects. They do not find any effect of bank health on domestic sales. Iacovone and Zavacka (2009) use a difference-in-difference approach to show that past financial crises caused a greater decrease in exports among firms that depended to a larger extent on trade credit. Last, Berman and Martin (2009) show in a gravity framework that countries that are more dependent on trade finance have larger bilateral export declines in times of financial or currency crises.

The remainder of the paper is organized as follows. Section 2 outlines some broad facts about the current trade collapse and its impact on Belgium. Section 3 decomposes the collapse along various margins and along various country, product, and firm dimensions. Section 4 presents our difference-in-difference approach to disentangle the contributions of firm, product and country characteristics to the observed changes in the intensive margin. Section 5 examines the evolution of changes in domestic activity compared to changes in international activity. Section 6 discusses what can be learned from our exercise. Details concerning data sources, as well as the description and construction of variables, are relegated to Appendix A. Tables and Figures referred to in the main text are found in Appendix B. Details on robustness checks, including Tables and Figures, are provided in Appendix C.

2 The collapse of Belgian production and trade: an aggregate snapshot

We dissect the fall in trade using data from a small open economy, Belgium. Using Belgian data has several advantages. First, given its small size, international shocks are reasonably exogenous to Belgium. Second, changes in Belgian GDP and trade were remarkably synchronized with those of other European Union (EU) countries, thus suggesting that the Belgian experience may apply more broadly. Last, very high export and import shares of sales and purchases, respectively, make the 'super trader' Belgium an ideal laboratory to study the impacts of the crisis on vertical specialization and global value chains.[3] Using Belgian data has, however, the drawback of including a large amount of re-exports. Indeed, Belgium (in particular Antwerp) is a key port of entry to – and exit from – the EU. Many 'Belgian' firms thus trade exclusively with non-resident partners. We deal with this potential problem in two ways. First, we exploit the information gathered by the National Bank of Belgium (NBB) since 2001 and systematically exclude trade by firms identified as non-resident.[4] Second, we control for a firm's

[3] According to figures from the World Bank WDI database, Belgian merchandise imports and exports amounted jointly to 187% of Belgian GDP in 2007.

[4] Non-resident firms are the main re-exporters. They are identified by the Belgian customs using information from VAT declarations. Firms with a Belgian VAT identifier that have a foreign legal address and firms offering fiscal representation services to foreign firms are considered by default as non-resident. Non-residents must report how much they trade with residents (domestic trade) and non-residents (re-exports) in VAT declarations. They are classified as 'pure' non-residents if they are not involved in any trade transactions with residents, and as 'mixed' non-residents otherwise. We exclude both types of non-residents. Note that non-resident firms are not compelled to file balance sheets. Non-resident foreign trade

industry in our regressions. Doing so should largely capture the remaining re-exports which are strongly concentrated on wholesalers' and retailers' foreign trade.

Insert Figure 1 about here.

We first provide an aggregate snapshot of the Belgian trade collapse. Figure 1 depicts the dramatic decrease of imports and exports from November 2008 onwards, with monthly merchandise exports and imports falling by about 10% relative to their value a year before. The situation deteriorates until January 2009, when it stabilizes at a steady lower level until the end of our data coverage period (June 2009). Furthermore, Figure 1 reveals seasonal fluctuations. For these reasons, we will focus throughout the paper on a comparison between the first semesters of 2008 and 2009 (henceforth, 2008S1 and 2009S1). Exports and imports of goods by Belgian residents fell by 26.23% and 27.77%, respectively, between these two periods.

Differences across products categories. An important finding from previous studies using aggregate data (e.g., Baldwin, 2009) is that the trade collapse has not been uniform across products. Belgium is no exception: as shown in Figure 2, we observe large differences in export and import changes across broad product categories, despite the absence of special sectoral fiscal stimulus packages during the period we consider. Trade in intermediates and consumer durables fell much more dramatically than trade in other product categories, energy being an exception. These aggregate statistics seem to lend support to explanations based on the disruption of global value chains or the postponement of durable goods and equipment purchases.

Insert Figures 2 and 3 about here.

The left panel of Figure 3 provides a finer breakdown of the trade collapse across 2-digit Prodcom-2008 codes.[5] As can be seen from the Figures, trade in nearly all broad product categories fell, though in a very heterogeneous way. As for exports, 'Other mining and quarrying' and 'Manufacture of basic metals' suffered the largest drops of nearly 50%, while a few other categories like 'Printing and reproduction of recorded media', 'Manufacture of basic pharmaceutical products and preparations' and 'Manufacture of other transport equipment' saw their exports increase during the period. A similar pattern holds for imports.

Foreign and domestic operations. In line with developments in other OECD countries, Belgian trade fell much more than GDP. Across all goods, the fall of about 26% in exports and 28% in imports must be contrasted with a 'modest' 3.25% fall in nominal GDP over the same period. However, trade involves essentially manufactured goods and is not value added so that the fall in trade should be

accounted for about 26% of Belgian exports and 22% of Belgian imports in 2008. The figures for 2009 are 28% and 25%, respectively.

[5]The Prodcom classification, and in particular the 2008 version, is a hybrid product/activity classification used in the EU as a bridge between the main traded product classification (the CN8 nomenclature) and the main activity classification (NACE).

compared with the fall in manufacturing production value. Restricting the analysis to those goods for which data on production is available from the Prodcom dataset, the fall of about 25% in exports and 24% in imports closely mimics the roughly 25% fall in manufacturing production value over the same period.[6] Hence, in the aggregate, the fall in trade was commensurate with the fall in manufacturing production. As can be seen from the right panel of Figure 3, this pattern also broadly holds across 2-digit Prodcom-2008 codes, with some sectors even increasing their exports/imports to production ratios.

Insert Figure 4 about here.

Restricting ourselves again to goods for which data on production is available, Figure 4 reports monthly changes in the export-to-production and import-to-production ratios from January 2005 to June 2009. Figure 4 confirms the absence of a strong differential trend between production and trade for Belgium: if anything, it points to an increase (rather than a decrease) of these measures.

Geographical structure of the trade collapse. Table 1 breaks down changes in total Belgian trade (exports plus imports) with its top-100 trading partners between 2008S1 and 2009S1. On the one hand, trade with the Netherlands (Belgium's most important trading partner) fell by 31.83%. Trade with other major EU partners (Germany, France, UK, Italy) as well as with Japan, Korea and the US fell by roughly similar magnitudes. On the other hand, trade with China and Hong Kong, the GDP of which kept growing during the period, was much less affected. While there does not seem to be any clear geographical structure in trade flow changes, GDP growth could be a promising dimension to explore. We come back to that point later.[7]

Insert Table 1 about here.

Summary of the aggregate snapshot. Belgian exports and imports fell faster than GDP but roughly commensurate with manufacturing production value. The fall in trade showed substantial variation across product categories, with particularly strong drops in 'Consumer durables' and 'Capital goods'. To some extent, it also varied across origin and destination markets: trade with EU partners, Japan and the US was more affected than trade with China and Hong Kong.

3 Margins of the trade collapse and firm dynamics

To gauge each margin's contribution to the Belgian trade collapse, we perform a decomposition of changes in exports and imports along the lines suggested by Bernard *et al.* (2009).

[6] See Appendix A for further details on the Prodcom dataset. Based on that dataset, manufacturing production volumes fell by 18%, while manufacturing production value fell by 25%. These statistics are consistent with the small changes in overall exports-to-production and imports-to-production ratios presented in the right panel of Figure 3. Observe also that the overall change in prices and quantities is roughly comparable to the one of aggregate trade presented in Section 3.

[7] The suspiciously large growth of trade with Ireland might be related to abusive transfer pricing given that Ireland's corporate tax rate is substantially lower than Belgium's.

3.1 The extensive and intensive margins

Belgian exports X in a given time period can be decomposed as $X = f\,\overline{c}\,\overline{g}\,\overline{x}$, where f, $\overline{c}$ and $\overline{g}$ denote the the number of exporters, the average number of countries each exporter sells to, and the average number of products each exporter ships to each country, respectively; and where $\overline{x} \equiv X/(f\,\overline{c}\,\overline{g})$ are average sales per exporter-country-product. Defining $\Delta X \equiv X^{'}/X$, where $X^{'}$ refers to exports in another period, and applying this Δ transformation to the other variables, we may decompose the change in Belgian exports between 2008S1 and 2009S1 as follows:

$$\Delta X = \Delta f\,\Delta\overline{c}\,\Delta\overline{g}\,\Delta\overline{x}. \tag{1}$$

Changes in the first three terms of expression (1) are referred to as changes in the *extensive margin* of trade, while changes in the last term are referred to as changes in the *intensive margin*.[8] Information about physical quantities exported allows us to further decompose changes in the intensive margin into changes in average quantities ($\overline{q}$) and in average prices ($\overline{p}$): $\Delta\overline{x} \equiv \Delta\overline{q}\Delta\overline{p}$. We provide more detailed information about how this latter decomposition is implemented in Appendix A. The changes in imports, ΔM, can of course be decomposed in the same way.

Insert Table 2 about here.

As mentioned earlier, Belgian exports for all firm-country-product combinations fell by about 26% between 2008S1 and 2009S1. The top panel of Table 2 reveals that, despite the huge fall, the number of exporters and the number of products shipped on average by each exporter to each country increased by 0.96% and by 0.16%, respectively. The average number of countries served by Belgian exporters dropped by -1.92%. Changes at the extensive margin hence decreased Belgian exports by $(1.0096 \times 0.9808 \times 1.0016 - 1) \times 100\% = -0.82\%$. As can be seen from Column 6 in Table 2, changes at the extensive margin are dwarfed by changes at the intensive margin. Indeed, the average value of exports per firm-country-product fell by 25.63% between 2008S1 and 2009S1. Thus, as can be seen from the last line, the intensive margin contributes to more than 97% of the observed change in exports, whereas the contribution of the extensive margin is less than 3%.[9]

One distinct advantage of our dataset is that it provides information on either quantities or weights of shipments for each firm-country-product observation. This allows us, as mentioned before, to decompose the change in export values more finely into quantity and price changes.[10] As can be seen from the last two columns of Table 2, changes in the intensive margin are mainly driven by changes in quantities

[8] We have neither information on the number of trading partners nor on shipments for each exporter per country-product combination. Thus, our intensive margin $\Delta\overline{x}$ still contains some 'extensive margin' components that we cannot isolate.

[9] Combining the two margins of trade, the total change in Belgian exports is given by $(1.0096 \times 0.9808 \times 1.0016 \times 0.7437 - 1) \times 100\% = -26.23\%$. Letting EM and IM denote the extensive and the intensive margins, this total change can be expressed as $\Delta X = \Delta\text{IM} \times \Delta\text{EM}$. Using logarithms, we compute the relative contribution of the intensive and the extensive margins to the total change in trade as $\ln(\Delta\text{IM})/\ln(\Delta X)$ and $\ln(\Delta\text{EM})/\ln(\Delta X)$, respectively.

[10] For the finer decomposition using changes in quantities and in prices, the total change in exports is decomposed as $(1.0096 \times 0.9808 \times 1.0016 \times 0.8 \times 0.9296 - 1) \times 100\% = -26.23\%$, where the last two terms in the decomposition are the changes in the average quantity and the average price, respectively.

shipped. On average, Belgian exports by firm-country-product decreased in terms of quantities by 20%. Average unit prices also fell, but 'only' by 7.04%.

The bottom panel of Table 2 performs the same decomposition for total Belgian imports, which fell by about 28% across all firm-country-product combinations between 2008S1 and 2009S1. Observe that the overall picture is very similar to that of exports, although there is even slightly less change at the extensive margin. There seems to be some 'downsizing' in terms of the average number of countries and the average number of products per country each firm imports, but this is almost completely offset by more firms importing. As can be seen from the last two columns and the last line in Table 2, the intensive margin accounts again for almost all the change in imports and most of it is driven by a sharp decrease in quantities. A first clear conclusion thus emerges: *the collapse of both Belgian exports and imports is overwhelmingly driven by a fall in exports or imports per firm-country-product, itself driven to a large extent by a sharp fall in quantities exported or imported and some decrease in unit prices.*

To gauge whether the trade collapse visible in Table 2 roughly affects all firms, sectors, and trading partners equally, we also repeat the above decompositions by splitting our sample more finely along various dimensions. In particular, we focus on the following four sets of questions: (i) Is there a geographic pattern in the trade collapse, i.e., are Belgian trade margins behaving differently across 'regions'? (ii) Are large or small, and more or less productive, firms affected differently? (iii) Does a firm's ownership status (foreign vs. domestically owned) and its multinational status matter? (iv) Does a firm's debt structure in terms of overall leverage or financial versus commercial debt matter? A detailed decomposition of changes in exports and imports at the different margins along these dimensions can provide some first insights into the key explanations of the sharp fall in trade during the 2008S1–2009S1 trade collapse. In particular, item (i) provides information about geographic shifts in trade flows, while items (ii)–(iv) provide information about reallocation of market shares across firms, the collapse of global value chains, and the importance of access to credit.

Insert Table 3 about here.

As can be seen from the subset of results collected in Table 3, the overall decomposition of margins, while not identical, remains qualitatively very similar across all specifications. In particular, the intensive margin remains dominant whereas changes at the extensive margin are uniformly small. The key points worth noting are that: (i) trade in goods classified as 'Intermediates, Capital, & Durables' fell more than trade in 'Other goods'; (ii) the extensive margin was more strongly affected for Belgian trade with its EU partners that for trade with the rest-of-the-world; (iii) larger and more productive firms were hit a bit more severely, especially for imports, and multinationals contracted their imports more than firms without an international ownership structure; and (iv) firms with larger debt-to-liabilities ratios or with a larger share of financial (as opposed to commercial) debts experienced slightly larger declines in exports. While firms were, therefore, to some extent affected differently by the crisis, it is fair to say that the magnitudes of those differences are relatively small.

To summarize, the most striking and robust feature that emerges from our data is that the 'full

extensive margin' (i.e., the number of firms times the number of countries per firm times the number of products per country-firm) is extremely stable, both for imports and exports. This result continues to hold true when we decompose the sample into various subgroups. Put differently, *almost all of the action takes place at the intensive margin, with virtually no change occurring at the extensive margin.* This finding firstly highlights the extreme flexibility of firms, of their input suppliers, and of their clients. Secondly, negligible changes at the extensive margin, even in the wake of a major shock, suggest that sunk costs are an extremely important component of trade costs. If trade costs were recoverable (either variable or fixed) we should have seen a massive contraction at the extensive margin with firms exiting markets and severing trade relations to cut losses. Thirdly, our findings also suggest that trade should pick up again rapidly as the recession fades away and as the macroeconomic environment returns to normal.[11]

3.2 Firm dynamics and the trade collapse

Table 4 shows that about 98% of both 2008S1 and 2009S1 exports were accounted for by 'stayers' – firms that were exporting in both semesters. The remaining share in 2008 was due to 'exiters' – firms that exported in 2008S1 but not in 2009S1. The remaining share in 2009S1 was accounted for by 'entrants' – firms that exported in 2009S1 but not in 2008S1. Table 4 further reveals that the 2007S1–2008S1 patterns were very similar, thus suggesting that 2008S1–2009S1 *was not exceptional in terms of firm dynamics.* Despite slightly more exit from and slightly less entry into foreign trade, and a smaller export share of entrants during the crisis, the overall pattern is not very different from the one observed in the foregoing year. In particular, there is still a large turnover and some net entry despite the crisis. Finally, the observed patterns also broadly hold for imports.

Insert Table 4 about here.

The absence of massive exit from foreign trade during a major crisis is striking. This finding gives further support to dynamic trade models with sunk entry costs (e.g., Das *et al.*, 2007). The fact that almost all firms remain active traders during a period where trade contracts by 25% can be explained by the option value of staying in the presence of these sunk entry costs. Of course, an alternative explanation could be that firms expected a short crisis and thus did not want to severe links too quickly.

The bottom part of Table 3 summarizes the margin decomposition where we compare trade of the 2008S1 and 2009S1 cohorts of stayers, entrants, and exiters. In the case of exports, it reveals some interesting facts that can be related to recent models of export dynamics. Comparing across cohorts, 2009S1 entrants and exiters fared much worse than the previous cohort – a 77% decrease in export values. Meanwhile, 2009S1 stayers fared worse than the previous cohort, partly including the same firms, but less dramatically so – about 27% decrease in export values. This finding is at odds with Melitz-type models, where a common demand shock should affect entrants and stayers identically. Part

[11] In April 2010, Belgian monthly imports and exports were already back to their April 2008 level.

of the explanation involves compositional effects through differences in entrants' number of products and countries served. Table 3 shows clearly that *entrants are much more strongly affected at the extensive margin than stayers.* Nonetheless the magnitude of the gap between entrants and stayers suggests that something else is at work. Overall a more sophisticated dynamic trade model is necessary to explain why entry remained substantially stable but 2009S1 entrants exported much less than the previous cohort. In fact, this finding could help to discriminate between the various mechanisms suggested by the recent literature.[12] We leave this task for future research as it goes beyond the scope of this paper. In the case of imports, we find that entry remained stable but more exit occurred. There were considerably more exiters than in the previous cohort, but the increase was offset by an equally considerable fall in average imports. Average imports of exiters fell by about as much as those of stayers. Overall, the rise in the number of importers during the trade collapse was dwarfed by the fall in the intensive margin, as noted earlier, but understanding why the number of importers increased during a major crisis would deserve further investigation.

While our descriptive exercises highlight several insights, they are not suited to identify the magnitudes, significance, and contribution of the different determinants of the trade fall. We therefore next turn to econometric analysis, taking full advantage of our firm-country-product trade data and balance sheet data.

4 Firm-, country-, and product-level characteristics: the determinants of the trade collapse

As shown in the foregoing, the bulk of the fall in Belgian trade occurred at the intensive margin. Therefore, we can safely analyze the determinants of the trade collapse by focusing solely on that margin, i.e., firm-country-product transaction values. Given the overwhelming contribution of stayers to export and import values – as shown in the previous Section, 98% of 2008S1 and 2009S1 exports were accounted for by stayers – we can explore the determinants of the fall in trade by restricting the analysis to these firms.[13]

In this Section, we look for the various conjectures put forth in the literature and quantify their contribution to the fall in trade by looking at the differential impact of firm, product and country characteristics before and after the start of the collapse. If, say, highly leveraged firms experience lower export growth than other firms in a 'normal' period, nothing could be learned from the simple fact that they suffered a stronger fall in trade during the collapse. However, by comparing the negative export

[12] Recent work on firm-level export dynamics builds on several mechanisms to explain export dynamics at the intensive and extensive margins: serially correlated permanent shocks to TFP, credit or capacity constraints, uncertainty about demand or costs, search and learning dynamics, reputation-building, endogenous R&D investment or quality upgrading.

[13] Such an analysis would be flawed in the presence of large changes at the extensive margin. Had the number of exporting firms drastically fallen, we would have needed to analyze the determinants of export participation before and after the collapse (by using, for example, a probit approach). The stability of the extensive margin across firms, products, and markets allows us to neglect these determinants in the analysis as they are of second-order importance.

growth effect of being highly leveraged before and after the start of the collapse we can infer whether restricted access to credit played a role or not and gauge its magnitude.

4.1 An econometric model of changes in trade values

The primary data for our regression analysis are export and import values by firm-country-product in 2007S1, 2008S1, and 2009S1. As stated before, we consider stayers only. We aggregate data at the HS4 product level (more than 1,000 product categories) and consider only 'continuing transactions', i.e., firm-country-product trade triples that record positive values in two consecutive semesters among the three we consider.[14] Our aim is to provide econometric results that can make sense of aggregate changes in trade, and focusing on continuing transactions avoids giving too much weight to low-value transactions (most discontinuous transactions are indeed of low value). To push this idea even further, we also experimented with weighted least squares for the continuous transactions. The results, reported in Appendix C, are almost identical. We thus present, in what follows, only the un-weighted results with continuous transactions.

We describe our econometric model for exports, the model for imports being identical. Using data on continuous transactions only, we consider as dependent variable the change in log export values of firm f to country c of product p, $\Delta X^t_{fcp} \equiv \log X^{t+1}_{fcp} - \log X^t_{fcp}$, between two consecutive semesters (i.e., log export growth between 2007S1 and 2008S1, as well as between 2008S1 and 2009S1). Using the difference-in-difference terminology, the pre-treatment (trade collapse) period corresponds to 2007S1–2008S1 while the post-treatment period is given by 2008S1–2009S1. Together with the post-treatment time dummy variable TC^t, we consider as independent variables a number of firm, country and product characteristics that proxy for the various conjectures put forward to explain the trade collapse, along with their interactions with TC^t. Formally, the estimating equation is given by:

$$\Delta X^t_{fcp} = \alpha + TC^t + \beta_{\mathbf{1}}^{'}\mathbf{W^t_{fcp}} + \beta_{\mathbf{2}}^{'}\mathbf{W^t_{fcp}}TC^t + \epsilon^t_{fcp} \tag{2}$$

where $\mathbf{W^t_{fcp}}$ is a vector containing our firm ($\mathbf{F^t_f}$), country ($\mathbf{C^t_c}$), and product ($\mathbf{P^t_p}$) characteristics together with a battery of industry dummies (S^t_s); and where ϵ_{fcp} is a residual term with the standard properties for the consistency of OLS.[15] In the case of firm covariates, we use one-year lagged balance sheet

[14] Any firm-country-product trade triple that records positive values in both 2007S1 and 2008S1 (or 2008S1 and 2009S1) is a continuing transaction. By definition, continuing transactions are a subset of stayers' transactions. They account for the lion's share of trade values in 2007S1, 2008S1, and 2009S1. For example, there were 272,216 continuing transactions out of the 433,529 (430,000) export transactions in 2008S1 (2009S1), thus corresponding to 62.79% (63.31%) of the number of total transactions and to 93.66% (91.83%) of total transaction values. The observed fall in the value of continuing export transactions between 2008S1 and 2009S1 is 27.48%, which is quite close to the 26.23% decrease recorded for all export transactions. As for imports, there were 331,981 continuing transactions out of the 560,258 (559,530) transactions in 2008S1 (2009S1), thus corresponding to 59.26% (59.33%) of the number of total transactions and to 92.83% (90.47%) of total transaction values. The observed fall in the value of continuing import transactions between 2008S1 and 2009S1 is 29.57%, which again closely matches the 27.77% decrease recorded for all import transactions.

[15] The industry dummies are at the 2-digit NACE classification rev 1.1 level. The NACE rev 1.1 is the main industry classification in the European Community. It draws extensively on the ISIC rev 3.

information (i.e., for example, 2007 data for 2008S1–2009S1 export growth) to somewhat mitigate endogeneity of firm characteristics. Having data varying along three dimensions, we follow the procedure of Cameron *et al.* (2011) and apply multi-level clustering to obtain more reliable standard errors.

Equation (2) is an econometric model of change in log trade values. The vector of coefficients $\beta_{\mathbf{1}}$ measures the impact of our covariates in a 'normal' period (2007S1–2008S1), while the vector $\beta_{\mathbf{2}}$ captures changes induced by the trade collapse treatment (2008S1–2009S1).[16]

Insert Table 5 about here.

Table 5 summarizes the list of covariates we use in (2). All firm characteristics prefixed by 'D' are binary variables, taking value 1 if a particular characteristic is above the sectoral median across all trading firms and 0 otherwise. Doing so allows us to maximize the number of firms we can include in the analysis while reducing the risk of bias due to measurement error and potential outliers.[17] It also provides us, as in the case of standardized regression coefficients, with a relevant metric to compare the contribution of the different firm characteristics to changes in trade values. Last but not least, the binary specification is able to broadly account for non-linear effects of the covariates.

4.2 Results

Table 6 reports coefficients and standard errors obtained from estimating (2) via OLS. We run two separate regressions, one for export growth and one for import growth. For each regression, we report two sets of coefficients in separate columns. The first and third columns (Base) report $\beta_{\mathbf{1}}$ parameters for, respectively, the export and import growth regressions of the pre-treatment period (2007S1–2008S1). The second and fourth columns (DD) provide $\beta_{\mathbf{2}}$ parameters, i.e., *changes* in the responsiveness of export and import growth into the post-treatment period of the trade collapse (2008S1–2009S1).

Insert Tables 6 and 7 about here.

[16] In unreported estimations, available upon request, we consider 2006S1–2007S1 as a 'normal' period obtaining virtually identical results.

[17] Our analysis covers the bulk of continuing transactions. Considering the period 2008S1–2009S1, there are 204,598 (out of 272,216) continuing export transactions for which all data on firm, country, and product characteristics is available. These transactions represent 69.50% of 2008S1 export values and 68.41% of 2009S1 export values. The fall in export values between 2008S1 and 2009S1 corresponding to these transactions is 27.21%, which is very close to the 27.48% export decrease for all continuing transactions. Overall, the data covers 6,959 firms, 170 countries, and 1,075 HS4 products. Considering again the period 2008S1–2009S1, we have 255,035 (out of 331,981) continuing import transactions for which all the data is available. These transactions represent 70.47% of 2008S1 import values and 67.62% of 2009S1 import values. The fall in import values between 2008S1 and 2009S1 corresponding to these continuing transactions is 30.66%, in line with the 29.57% import decrease for all continuing transactions. Overall, the data covers 13,545 firms, 148 countries, and 1,099 HS4 products. One may a priori worry about potential biases that could arise because we have to drop a number of continuing transactions for which data – essentially balance sheet information – is missing. However, balance sheet data are missing mainly for Belgian affiliates of foreign groups that do not exist as a separate legal entity in Belgium. Such firms are not required to report unconsolidated accounts even if they are technically considered as residents by Belgian customs. Including these firms in the analysis would have been desirable, but a positive aspect of dropping them is that they are likely to engage in substantial amounts of re-exports. When taken together, our focus on Belgian residents only, the exclusion of the above-mentioned firms, and the inclusion of industry fixed effects represent a very conservative way of dealing with the issue of re-exports.

Firm characteristics. Table 6 shows that firm-level difference-in-difference coefficients are, in general, small and rarely significant, and that the model's explanatory power is very weak. Table 7 further reveals that there is no evident problem of collinearity among our firm-level variables. At first sight, our results thus suggest that: (i) the trade collapse has been quite symmetric across firms within a given industry; (ii) some of the supply-side explanations of the trade collapse clearly play at best a second-order role.

We now discuss results for each group of covariates. As indicated by the positive and significant coefficient of D_{size} in the first column (Base) of Table 6, exports by large firms grow on average 3.71% faster than those of other firms in a 'normal' year. As further shown by the coefficient of D_{size} in column two, there has been no significant change in that pattern after the start of the trade collapse. Note that the latter finding also holds for productivity D_{prod}. This confirms our margin decomposition of Section 3, with the additional insight that neither firm, nor country, nor product covariates do interfere. As for import growth, more productive firms did suffer more during the collapse, though the implied contribution to the fall is rather limited. To assess the magnitude of this effect, we can compute the counterfactual 2008S1–2009S1 import growth without a differential effect of D_{prod} by letting $D_{prod} \times TC^t = 0$. Had firms with above-median productivity been affected by the collapse as those with below-median productivity, the overall fall in exports (27.21%) would have been 14.74% less severe, i.e. $0.2721 \times 0.1474 = 4.01\%$ growth points.

Involvement in global value-added chains (as measured by the value and significance of D_{interm_share}, $D_{share\_exp\_sales}$, and $D_{value\_add\_chain}$ in column two) did not differentially affect export growth in 2008S1–2009S1 as compared to 2007S1–2008S1. This casts doubt on the hypothesis of a disruption of global value chains (Yi, 2009). Observe further that $D_{share\_imp\_interm}$ is actually positive and significant in column two, indicating that firms with above-median ratios of imports to intermediates experienced a smaller fall in exports! When computing the counterfactual 2008S1–2009S1 export growth in the absence of a differential effect of $D_{share\_imp\_interm}$, i.e., by letting $D_{share\_imp\_interm} \times TC^t = 0$, we find that the overall fall in exports would have been 22.71% stronger! Turning to imports, an above-median involvement in global value chains, and in particular D_{interm_share} and $D_{share\_exp\_sales}$, does correspond to lower import growth in 2008S1–2009S1. However, the contribution is modest. When both $D_{interm\_share} \times TC^t = 0$ and $D_{share\_exp\_sales} \times TC^t = 0$, all else equal, we find that 23.84% of the overall import fall would not have occurred in this counterfactual world.

Variables proxying for firms' financial structure (as measured by the value and the significance of $D_{ext\_fin\_dep}$, $D_{share\_debts\_o\_liab}$, $D_{share\_debts\_due\_after\_one}$, and $D_{share\_fin\_debt}$) appear to play some role in 2008S1–2009S1 export changes. Firms with shorter debt maturity and a larger fraction of financial (as opposed to commercial) debt experienced a significantly larger fall of exports during the trade collapse. Our findings thus lend some support to the trade credit crunch hypothesis (Auboin, 2009; Chor and Manova, 2010). How large is that effect? Firms with above-median debt maturity experienced a 4.56% higher export growth, whereas firms with above-median financial debts saw their exports shrink by about 6.68% more. Both values must be compared with the 27.21% total fall in export values in our

sample. To further assess the magnitude, we predict the counterfactual export growth in the absence of negative financial effects, letting $D_{share\_debts\_due\_after\_one} \times TC^t = 1$ and $D_{share\_fin\_debt} \times TC^t = 0$, all else equal. We find that about one-third (33.06%) of the 2008S1–2009S1 fall in exports can be attributed to our measures of finance. It is worth noting, however, that financial variables do not seem to affect changes in import values at all.[18]

The difference-in-difference coefficient for D_{share_stock}, proxying for inventory capacity, is not significant for both export and import growth. The latter finding contrasts with the inventory adjustment explanation as we would have expected imports of firms with greater inventory capacity to contract more, all else equal (Alessandria *et al.*, 2010). Still, it may be argued that inventory adjustments occur primarily among distributors. Therefore we also run the same regressions on a sub-sample comprising firms from the distribution sector only (NACE industries 50, 51 and 52), which represented 40.25% of Belgian imports in 2008S1.[19] We find that imports of distributors with above-median inventory-to-sales ratios significantly fell by 3.23 percentage points more than those of other distributors in 2008S1–2009S1. This coefficient accounts for 11.80% of the fall in imports of the distribution sector. However, we find no effects of stocks in the export growth regressions. Overall, we conclude that, although inventory adjustment accounted for some of the import fall in an important sector, it played a minor role in the trade collapse in general.

Neither multinationals nor foreign owned firms have been differentially affected by the trade collapse. Both the export and the import difference-in-difference coefficients are indeed not significant, thus lending further support to the finding that there was no major disruption of global value chains. Finally, interactions of two-digit NACE industry dummies with the trade collapse treatment TC^t, the reference industry being 'Manufacture of motor vehicles, trailers and semi-trailers', are significant only in 9 cases, thereby suggesting that strong industry patterns are not to blame either.

Country characteristics. We view GDP growth as the key variable to gauge the contribution of a demand shock to the collapse of exports. Two results stand out from our analysis. First, the coefficient differs widely between 2007S1–2008S1 and 2008S1–2009S1. In a 'normal' period, the coefficient of log export change with respect to the trading partners' percentage growth of GDP is around one percent (0.0138). This means that a 1% increase in the aggregate demand of a given country, as proxied by its percentage growth of GDP, translates into a 1.38% increase in export values to that destination. To the extent that such an increase in exports reflects a proportional change in the demand for tradable goods, our coefficient is broadly consistent with standard cross-section/cross-country gravity models in which the coefficient on GDP of the export destination is close to unity. However, during the trade collapse, the responsiveness of changes in log export values with respect to percentage growth of GDP of the

[18] As in most related work, our variables only imperfectly capture access to credit in general and trade finance in particular. However, contrary to most other work on the crisis, we use firm-level measures of these variables and do not rely on even more imperfect sectoral measures.

[19] Regression tables are omitted to save space but are available upon request.

importing countries increased significantly ($0.0138 + 0.0115 = 0.0253$), thus suggesting that the global recession induced a disproportionate fall in the demand for tradable goods.

Insert Figure 5 about here.

To gain further insights on the relationship between firm export growth and GDP growth in the destination country, we also consider the presence of non-linearities. In particular, we include GDP growth to the powers two and three, both alone as well as interacted with the trade collapse post-treatment dummy TC^t, as further regressors in our estimations. Results indicate that there are indeed non-linearities at work in a typical year. However, difference-in-difference coefficients reveal that the trade collapse caused a structural change in the relationship between GDP and export growth rates. As can be seen from Figure 5, plotting the estimated marginal effect of GDP growth on export growth in both periods, the post-treatment curve deviates more from the 45 degree line (the unit-elastic benchmark), especially for countries with large GDP drops, than the pre-treatment curve. In words, the negative shock on GDP has been amplified strongly the more negative that shock was.

Finally, we can again make use of our model to gauge the contribution of the demand shock to the change in log export values. To this end, we consider the counterfactual situation where GDP growth rates for 2008S1–2009S1 are replaced with those prevailing in 2007S1–2008S1, all else equal. We find that, had growth in GDP between 2008S1–2009S1 been the same as in the previous period, the export drop would have been 54.15% less severe. We may thus conclude that about 54% of the export collapse can be attributed to a generalized fall in the demand for tradable goods. This result is similar to that of Eaton *et al.* (2011), though both approaches use very different data and methodologies.

Turning to imports, the interpretation of the GDP growth coefficient, which now refers to the exporting country, is more difficult. In any case, as can be seen from Table 6, both the base and the difference-in-difference coefficients are not significant. We can nevertheless gauge the counterfactual impact of Belgian GDP decline on imports by using the GDP growth coefficient estimated for exports and data on Belgian GDP growth for the two periods. We find that 44.65% of the import drop can be attributed to a fall in demand for tradable goods in Belgium. Hence, almost half of the fall in imports is due to the demand shock.

The difference-in-difference coefficients of the two dummies for trade with non-EU countries and outside of the OECD are both positive, sizeable, and significant for export and import growth. This means that trade with countries outside of the EU helped to mitigate the trade collapse. In a counterfactual world in which growth in trade outside of the EU would have followed the same trend as that observed in the EU, i.e. both $OECD\_NO\_EU \times TC^t = 0$ and $NO\_OECD\_NO\_EU \times TC^t = 0$, exports (imports) would have fallen by 20.86% (38.27%) more than what we observed. Note that the fact that non-EU trade, especially imports, fell less than EU trade suggests indirectly that protectionist measures played only a minor role in explaining the trade collapse (see Eaton *et al.*, 2011, for similar findings).

As for fluctuations in exchange rates, the magnitude of the coefficients indicates that they have affected exports (imports) more (less) strongly during the trade collapse period. However, the implied

magnitudes for changes in export and import values are small. Using the estimated model to evaluate a counterfactual situation in which no exchange rate change against the Euro would have occurred during 2008S1–2009S1, i.e. both $exch\_rate\_change$ and $exch\_rate\_change \times TC^t$ are set to zero, reveals that fluctuations of the Euro can be blamed for only a very little share (5.92%) of the total drop in Belgian exports.

Product characteristics. The reference group for product dummies in Table 6 is consumer non-durables. Therefore, the foregoing discussions and the magnitudes of the fall in demand apply solely to this category of goods. However, in line with the margin decomposition provided in Section 3, interactions of product dummies with TC^t for the categories intermediates, consumer durables, and capital goods are all negative and strongly significant in the export growth analysis, thereby indicating that these goods experienced a larger fall. As for imports, the same result holds for intermediates and consumer durables.

What are the causes of such different behavior across product categories? The answer is likely to be a differential fall in demand. To provide evidence of this, we estimate our export growth model separately for each of the broad product categories.[20] Our estimates of the $growth\_rate\_GDP$ coefficient are in line with the ultimate conclusion of Baldwin (2009) that 'postponable goods' have been particularly hit by the negative demand shock affecting tradable goods. More precisely, the difference-in-difference coefficient we obtain when restricting the sample to consumer durables (0.0127) is higher than that when restricting the sample to consumer non-durables (0.0022). Even higher coefficients (0.0156 and 0.0186) are obtained in intermediates goods and capital goods regressions, respectively. Evaluating a counterfactual scenario in which the fall in trade would have been the same across product categories and equal to the one of the reference group 'consumer non-durables', i.e., letting the significant interactions of product dummy coefficients with TC^t be equal to zero, delivers the following results: 21.47% of the export collapse is due to a more severe shock affecting postponable goods, the equivalent figure for imports being 10.95%.

Finally, the difference-in-difference coefficient of the Rauch (1999) measure of product differentiation ($frac_{lib\_diff}$) is positive and significant for both export and import growth. This suggests that more differentiated goods experienced a smaller fall in trade. In particular, had the fall for differentiated goods been as severe as for other goods, the export (import) drop would have been 21.47% (23.32%) more severe.

Summary of findings. In the case of exports, our results point to the important role played by a generalized fall in demand for tradables, especially consumer durables and capital goods. Evidence for this is provided by an unusually large GDP growth coefficient, sizeable product dummies, and widely different GDP growth coefficients during 2008S1–2009S1 in regressions for separate product categories.

[20] Regression Tables are omitted to save space but are available upon request.

Restricted access to finance seems to also play a role in the fall in exports, albeit of a smaller magnitude. We find no strong evidence for the disruption of global value chains or for inventory adjustments. When taken together, the demand shock (about 54%) and financial variables (about 33%) explain the bulk of the observed fall in Belgian exports during the recent crisis. The remaining effects percolate mostly through the composition of trade (both in terms of product categories, with durables being hit more; and in terms of geography, with intra-EU trade suffering more severely).

In the case of imports, a fall in Belgian demand seems to be the main explanation. We find some limited role for involvement in global value chains, but no role for both trade finance and inventory adjustments.

5 Trade crisis or trade collapse?

So far, we have uncovered strong evidence that a fall in demand for tradeable goods (particularly for 'postponable goods') has been the major cause of the trade collapse. There is also some evidence that financial constraints contributed to that fall, though to a lesser extent. Observe that these findings do not *per se* imply that there has been a trade crisis, i.e., a situation in which international trade suffered more than domestic trade. To investigate this question, we now examine in detail changes in exports-to-turnover and imports-to-intermediates ratios at the firm level.[21] We further complement this analysis with some evidence about firm-level exports-to-production and imports-to-production ratios using the sub-sample of firms for which production data is available.[22]

As shown earlier in Figures 3 and 4, there seems to be no systematic fall in exports-to-production and imports-to-production ratios, both in the whole economy and across broad product categories. In fact, those ratios even increased in some product categories, *thus implying that domestic production contracted in some cases more than international trade.* This descriptive evidence already casts some doubts on the existence of a 'trade crisis' in Belgium. Indeed, if international trade *per se* is in a crisis, both ratios should have fallen during the period we consider. Nevertheless, there might still be compositional effects across firms and industries, and those can provide valuable information on the channel(s) through which the fall in demand affected Belgian exports and imports. We therefore now revisit this issue using a more detailed micro-econometric analysis.

To this end, we use again a difference-in-difference approach where the treatment is the trade collapse. In the main text, we focus on exports-to-turnover and imports-to-intermediates ratios due to wider data coverage. However, the analysis of exports-to-production and imports-to-production ratios, that we report as a robustness check in Appendix C, yields qualitatively similar results. We first construct the

[21] Data on firm turnover (sales revenue) and purchases of intermediates for 2007S1, 2008S1, and 2009S1 come from monthly and quarterly VAT declarations. The frequency at which declarations have to be filed depends on the firm's size. See Appendix A for more details.

[22] Data on firm-level production for 2007S1, 2008S1, and 2009S1 comes from monthly Prodcom declarations covering medium and large Belgian manufacturing firms only. See Appendix A.

log of the firm-level ratio of exports-to-turnover in the first semester of year t as follows:

$$\phi_{f,X}^{t} = \log\left(\frac{X_f^t}{Turn_f^t}\right), \tag{3}$$

where $Turn_f^t$ denotes firm f's turnover and X_f^t stands for exports aggregated at the firm-level. Analogously, we define the log of the firm-level ratio of imports-to-purchased intermediates in the first semester of year t as follows:

$$\phi_{f,I}^{t} = \log\left(\frac{I_f^t}{Inte_f^t}\right), \tag{4}$$

where $Inte_f^t$ denotes firm f's total purchases of intermediates and I_f^t represents imports aggregated at the firm-level. We consider the three semesters 2007S1, 2008S1, and 2009S1 and regress both $\phi_{f,X}^{t+1} - \phi_{f,X}^{t}$ and $\phi_{f,I}^{t+1} - \phi_{f,I}^{t}$ on a constant, the post-treatment time dummy variable TC^t, the same set of (lagged) firm-level characteristics used in the previous Section, and interactions between firm-level characteristics and TC^t. We use OLS and provide robust standard errors. To get a closer match with aggregate figures, we also experimented with weighted least squares. Results, reported in Appendix C, are qualitatively similar when compared to our baseline specification.

The sample of firms used in our analysis is given by the stayers for which both balance sheet information and VAT declarations are available, i.e., 8,360 (8,250) firms among the 12,964 (12,481) export stayers and 14,388 (13,983) firms among the 23,782 (21,209) import stayers for the period 2008S1–2009S1 (2007S1–2008S1). VAT declarations are virtually exhaustive so that the binding data constraint is the availability of balance sheet information. For example, the data cover 73.07% (73.61%) of 2008S1 (2009S1) exports and 71.33% (70.20%) of 2008S1 (2009S1) imports by stayers. As explained before, most firms that have to be dropped are Belgian affiliates belonging to foreign groups that are considered as residents by Belgian customs but do not exist as a separate legal entity. It is likely that a substantial part of the trade done by these firms involves re-exporting and, in that respect, their exclusion from the analysis is more of an asset than a liability. However, some small firms simply do not submit balance sheets and have to be dropped.

Let us first highlight a few descriptives about the constructed ratios for the period 2008S1–2009S1. The difference $\phi_{f,X}^{2009} - \phi_{f,X}^{2008}$ has a mean of -0.0290 and a median of -0.0183: the average exports-to-turnover ratio decreased by 2.9%, while the median ratio fell by 1.83% with respect to its initial value. The mean ratio $\left(X_f^{2008}/Turn_f^{2008},\ \text{not in log}\right)$ in 2008S1 was 35.52%, meaning that the 2.9% fall translates into a meager 1 percentage point reduction ($2.9\% \times 0.3552 = 0.0103$). We can hence already conclude that its decrease has, on average, been negligible – the ratio of exports-to-turnover at the firm level has not been affected by the trade collapse. Observe furthermore that the correlation between $\phi_{f,X}^{2009}$ and $\phi_{f,X}^{2008}$ equals 0.84, thus suggesting that the pattern has remained very stable at the firm-level during the trade collapse. Results for imports-to-intermediates ratios convey the same message. The mean of $\phi_{f,I}^{2009} - \phi_{f,I}^{2008}$ equals -0.0296, while the median equals -0.0124. The average imports-to-intermediates

ratio decreased by 2.96% while the median ratio fell by 1.24%, starting from an average level of 26.16%. Thus, changes in that ratio were negligible too. Last, the correlation between $\phi_{f,I}^{2009}$ and $\phi_{f,I}^{2008}$ is 0.79.

Insert Table 8 about here.

Table 8 reports the results of our difference-in-difference estimations. As can be seen from the left panel of the Table, only the difference-in-difference coefficient of D_{size} is significant in explaining changes in exports-to-turnover ratios for the trade collapse period. This holds despite the fact that, as shown in Table 7, there is no major problem of collinearity among regressors. We may thus conclude that *the negative effect of financial variables identified in the analysis of the previous Section has affected foreign trade and domestic activity equally.* In other words, the credit crunch has not disproportionately hurt the activity of trading across national borders *per se*.

The coefficient of D_{size} in column two of Tables 8 indicates that, during the collapse, large firms experienced a significant reduction of their exports-to-turnover ratio as compared to small firms. To get a sense of the magnitude, starting with an average exports-to-turnover ratio of 0.3627 in 2008, large firms would see their ratio decrease by 0.3627×0.1020=0.0370 points. This is hardly strong evidence of a major trade crisis. Turning to imports-to-intermediates ratios, there is slightly more action with five of the difference-in-difference coefficients being significant. The positive value of for in column four actually points to foreign owned firms increasing their imports-to-intermediates ratios with respect to other firms during the collapse. However, there are three measures of involvement in global value chains that turn out to the significantly negative: D_{interm_share}, $D_{share\_imp\_interm}$, and $D_{value\_add\_chain}$. Again, given the value of the coefficients, none of them implies stark changes in imports-to-intermediates ratios. As for interactions of NACE dummies with TC^t, the reference industry being again 'Manufacture of motor vehicles, trailers and semi-trailers', they are generally not significant. For example, in both exports-to-turnover and imports-to-intermediates regressions, only 1 of the 22 manufacturing industry dummies has a significant coefficient at the 5% confidence level.

The fact that almost all coefficients in the exports-to-turnover and imports-to-intermediates regressions are not significant and that, even when they are, their magnitude is small, leads us logically to conclude that it is not a trade crisis – just a trade collapse caused by a strong decrease in the demand for tradables that has equally affected domestic and foreign operations.

6 What have we learned?

Using detailed trade and balance sheet data, we provide a micro-econometric analysis of the fall in Belgian imports and exports before and during the 2008–2009 trade collapse. A few clear results emerge from our analysis. First, the overwhelming part of the trade collapse occurred at the intensive margin and is due to a fall in average quantities and unit prices. Exporters' and importers' presence in foreign markets showed remarkable resilience. Interestingly, there was no massive exit which may be explained by the existence of large sunk costs of entering foreign markets (Roberts and Tybout, 1997): large sunk

entry costs create an option value of remaining an exporter or an importer during the crisis. Since most of the adjustments took place at the intensive margin, Belgian trade expectedly bounced back quickly after the collapse.[23] These results resemble findings on trade during the Asian crisis (Bernard *et al.*, 2009), but are nonetheless remarkable given the magnitude of the recent trade collapse.

Second, we find overall only little support for supply-side based explanations of the trade collapse. On the one hand, GDP growth of the destination countries is the single most important determinant of exports in our econometric analysis, explaining up to 54% of the fall in exports and 45% of the fall in imports. This applies particularly to the demand for durable goods and capital goods: trade in these categories fell systematically more, with a greater elasticity to GDP. While studies using more aggregated data (Baldwin, 2009) or calibrated simulations (Eaton *et al.*, 2011) reach qualitatively and quantitatively similar conclusions, we are not aware of any other firm-level analysis confirming these results to date. On the other hand, few firm- or product-level characteristics are systematically related to the fall in trade, especially when compared with the fall in domestic operations. For instance, access to credit (as proxied by financial balance sheet variables) can explain about 33% of the fall in exports, but has no explanatory power regarding exports-to-turnover or exports-to-production ratios. In other words, financial constraints affected foreign and domestic operations equally. Similarly, involvement in global value chains, as measured by either the share of imported intermediates or by export intensity, explains quantitatively some of the collapse of imports, but has little explanatory power on imports-to intermediate ratios. More generally, exports-to-turnover and imports-to-intermediates ratios did not show any strong systematic correlation with other firm characteristics, nor did they follow any general downward trend. If there was a recent increase in trade frictions due to protectionism, it had no sizable effect on Belgian trade.

Of course, more research is needed to investigate the causes of the disproportionate fall in the demand for tradable goods. Candidate explanations involve deferred consumption of durables due to precautionary motives, substitution patterns among consumers with non-homothetic preferences, or a bias towards non-tradables in fiscal stimuli packages. While our data do not allow us to test these conjectures, we can mention two related findings. First, we found a higher GDP growth elasticity of capital goods, intermediate goods, and consumer durables exports relative to consumer non-durables. Second, we found a non-linear relationship between GDP growth on export growth across countries, with an increase in curvature during the trade collapse. Countries hit by more severe recessions disproportionately reduced their imports from Belgium. Again, an in-depth investigation of these mechanisms is fundamental to our understanding of the crisis and would be a welcome topic for future work.

Third, some of our findings also raise questions for research on trade and firm dynamics. For instance, sales of entrants and exiters in 2009S1 were dramatically lower than those of the previous cohort, while the same was not true for stayers. This fact is at odds with the Melitz (2003) model and would deserve

[23] Belgium's monthly exports exceeded the 2008S1 average in June 2010 for the first time since the collapse. Monthly exports and imports were quickly approaching their average pre-collapse level by late 2010.

further investigation in relation to recent dynamic export models. It would also be of interest to check whether initial conditions can have a permanent impact on firms' survival and subsequent growth. Will Belgian firms that entered export markets during the crisis perform worse in the future than the other exporters? Last, the large increase in the number of importers despite the large fall in imports would also be worthy of investigation.

To conclude, let us point out two caveats of our analysis. As we acknowledged, we do not observe the number of trading partners a firm has for each product-market combination. The conclusion that trade collapsed due to a price and quantity adjustment relies on stability in this 'hidden' extensive margin, which we can only conjecture. Also, we do not know to what extent our results generalize to other countries. Developing countries might be much more severely affected by the credit crunch and the drying up of trade credit (Berman and Martin, 2009). This would cause a higher trade fall at the extensive margin there, and make a quick recovery less likely. Furthermore, implicit trade barriers might have risen more in some pairs of countries than in others (Jacks *et al.*, 2011; Eaton *et al.*, 2011). More research involving micro-data from other countries is thus certainly called for in the future.

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Appendix.

A Data description

Balance sheet data and firm-level variables. Firm-level variables are constructed from 2006 and 2007 balance sheet data from the Business Registry covering the population of firms required to file their (unconsolidated) accounts to the National Bank of Belgium (NBB). The data combine annual accounts with data from the Crossroads Bank on firms' main sector, activity and legal status. Overall, most firms that are registered in Belgium (i.e., that exist as a separate legal entity) and have limited liability are required to file annual accounts.[24] Specifically, all limited-liability firms that are incorporated in Belgium

[24]Exceptions include: sole traders; small companies whose members have unlimited liability; general partnerships; ordinary limited partnerships; cooperative limited liability companies; large companies whose members have unlimited liability, if none of the members is a legal entity; public utilities; agricultural partnerships; hospitals, unless they have taken the form of a trading company with limited liability; health insurance funds; professional associations; schools and higher education institutions.

have to report unconsolidated accounts involving balance sheet items and income statements. Belgian firms that are in addition part of a group also have to submit consolidated accounts where they report the joint group's activities in a consolidated way. However, Belgian affiliates of a foreign group which do not exist as a separate legal entity in Belgium are not required to report unconsolidated accounts (they are required to file a consolidated account, but these data do not allow us to obtain firm-level characteristics for the Belgian affiliate). There are two types of annual accounts: full and abbreviated. Firms have to file a full annual account when they exceed at least two of the three following cutoffs: (i) employ at least 50 employees; (ii) have an annual turnover of more than 7.3 million euros; and (iii) report total assets of more than 3.65 million euros.

For the 2008S1–2009S1 (2007S1–2008S1) analysis, we selected those companies that either filed a full or an abbreviated balance sheet in 2007 (2006) while reporting at least one employee. Annualized balance sheets provide us with information on the (full-time equivalent) number of employees, operating profits, equity and liability values, the amount of liabilities due after or within one year, the amount of liabilities held by financial institutions or commercial parties, the values of intermediate stocks, and the NACE rev1.1 5-digit code of the firm. Data on firm turnover, value added, purchased intermediates, and investments in 2006 and 2007 come from mandatory VAT declarations provided by the NBB. Balance sheets also record information on these four variables, but we prefer to use VAT declarations as information is more accurate and virtually covers the universe of Belgian firms. Multinational status and foreign ownership of a firm come from the yearly Survey of Foreign Direct Investments carried out by the NBB. Finally, firm-level imports and exports, which are needed to construct some firm-level controls, refer to the same year of the balance sheet information. Data have been obtained by aggregating firm-product-country level transaction values in the trade database over the entire year at the firm level.

Trade and production data. Import and export data by firm, product, and country for Belgium is collected by the NBB on a monthly basis. More precisely, the information comes from intra-EU (Intrastat) and extra-EU (Extrastat) trade declarations that cover the universe of trade transactions.[25] Firm and trade data were merged using the VAT number which identifies each firm in Belgium. The data is extremely rich and comparable in quality to the widely known French Customs data used by, e.g., Eaton *et al.* (2004). Imports and exports of each firm are recorded in current euros at the 8-digit CN level by country of origin/destination.[26] Information on either the number of units or the weight in kilograms (or sometimes both) of traded goods is available and is product specific. Weight is the most widely used quantity unit.

In order to construct the quantity index used in Tables 2 to 3 we have use a 'mixed quantity' unit corresponding to kilograms, whenever recorded, and to units for those products recorded in units

[25]For intra-EU trade, the thresholds above which a legal obligation to declare arises are relatively small. In addition firms often provide information about their trade even when they are below the thresholds. For Extra-EU trade data are exhaustive for trade flows over 1,000 euros or 1,000 kilograms.

[26]The 8-digit Combined Nomenclature (CN) is the main product classification in the European Community. It is an product-based classification that draws extensively on the Harmonized System (HS) nomenclature.

only. We then compute the average mixed quantity value across all firm-country-product transactions involved in the group considered (example: exports of small firms) separately for 2008 and 2009. We define the average price as the ratio of the average value of trade transactions across all firm-country-products involved in the group considered and the average mixed quantity defined above. As long as the composition of trade is stable across goods recorded in kilograms and in units, our indicators are informative about average changes in prices and quantities traded. To check robustness, we have also computed a quantity and a price index following the same methodology described above while considering only trade registered in kilograms. Results are very similar in terms of price and quantity changes between 2008S1 and 2009S1.

Finally, monthly production data are provided by the Belgian National Institute of Statistics. Data are based on mandatory monthly declarations by a sample of about 7,000 firms representing medium and large manufacturing producers in Belgium. Once anonymized, data are then made available to the public for different levels of sectoral aggregation under the Prodcom database brand. Some goods, especially those referring to agriculture and fishery, are not included in the data. In our robustness analysis, we make use of the firm-level version of the data.

Country and product data. Exchange rate variations between 2008S1 and 2009S1 (as well as between 2007S1 and 2008S1) refer to the change in the nominal interbank exchange rates with respect to the euro at noon on April 1st, as recorded by the Bank of Canada. We choose April 1st as our midpoint in the first semester of each year (April 2nd in 2007). The average growth rate of GDP between 2008 and 2009 is the average of the two annual growth rates of the GDP at constant prices and comes from the IMF World Economic Outlook database as of October 2009. A mirror definition applies to the average growth rate between 2007 and 2008. The product classification follows the EU's 'Main Industrial Groupings' in official statistics, as described in the European Commission Regulation No 586/2001 (March 26, 2001). This classification separates products into intermediate, capital, consumer durable, consumer non-durable, and energy products. Some HS4 products (mainly agricultural goods) cannot be assigned to one of these categories using the correspondence Table provided by the EU; we thus classify them as 'Residual goods'. The product group 'Intermediate, Capital, & Durables' used in the paper refers to the grouping of intermediate, capital goods, and consumer durables. All remaining product categories are subsumed by the 'Other Goods' group. The measure of product differentiation we use is based on the Rauch (1999) classification and corresponds to the share of HS6 codes within an HS4 category that are neither sold on an organized exchange nor referenced priced. We use the 'liberal' classification.

B Baseline Tables and Figures

Table 1: Percentage changes in total trade by country for the top-100 Belgian trading partners (2008S1–2009S1).

Country	Rank	% Trade change	Country	Rank	% Trade change	Country	Rank	% Trade change
NL	1	-31.83	AU	35	8.48	CY	69	-35.05
DE	2	-25.16	SA	36	-8.51	EC	70	15.35
FR	3	-25.31	RO	37	-28.39	LV	71	-42.00
GB	4	-27.47	EG	38	-53.49	PE	72	-37.83
IT	5	-26.87	TH	39	-16.16	BY	73	-18.36
US	6	-24.95	QA	40	35.67	LB	74	-1.65
ES	7	-25.68	MX	41	-11.40	CM	75	-4.22
LU	8	-31.10	ID	42	-12.77	GH	76	-18.40
SE	9	-41.33	MA	43	-31.07	CI	77	-2.92
IN	10	-32.49	TW	44	-14.58	SN	78	-49.34
CN	11	0.17	DZ	45	-1.61	SY	79	-16.80
JP	12	-23.78	UA	46	-37.26	SR	80	29.04
RU	13	-48.98	CD	47	-44.41	LY	81	14.89
PL	14	-23.40	VN	48	-31.80	DO	82	-50.12
NO	15	-39.12	AR	49	-36.59	JO	83	19.55
CH	16	-17.45	SG	50	-17.06	LS	84	-20.78
IL	17	-58.66	MY	51	-20.06	KW	85	21.52
TR	18	-33.78	SI	52	-21.13	LK	86	-22.96
CZ	19	-20.87	TN	53	-14.73	IS	87	-26.81
AT	20	-22.34	LT	54	-16.11	NC	88	-23.43
AE	21	-40.51	VE	55	-44.57	KE	89	-16.37
DK	22	-25.31	MH	56	-99.99	ZM	90	-28.98
KR	23	-36.82	IR	57	-22.45	CG	91	-24.93
BR	24	-34.73	PH	58	-31.52	GN	92	-6.82
IE	25	21.50	NZ	59	-2.26	MT	93	-22.05
FI	26	-25.84	NG	60	-32.34	SL	94	-39.26
PT	27	-25.03	AO	61	12.90	MR	95	-66.38
HK	28	-9.84	CL	62	36.79	HN	96	-22.24
CA	29	-21.86	PK	63	-8.21	BF	97	22.24
HU	30	-25.83	CO	64	12.48	KZ	98	-10.38
ZA	31	-25.33	BD	65	8.31	MK	99	-57.05
GR	32	-31.16	EE	66	-32.95	BJ	100	-21.04
BG	33	-46.43	HR	67	-37.08			
SK	34	-23.24	CR	68	-9.35			

Notes: Total trade is measured as exports plus imports. Country codes are given in the ISO2 format. Countries are ranked according to their total trade with Belgium in the first semester of 2008.

Table 2: Changes in the margins of total Belgian exports and imports (2008S1–2009S1).

		Extensive margin			**Intensive margin**		
Period	Total	Firms	Countries	Products	Sales	Quantities	Prices
			Total exports (all firm-country-product combinations)				
2008 S1	101.25	18,053	6.62	5.58	151,844	115,277	1.32
2009 S1	74.69	18,227	6.49	5.59	112,925	92,221	1.22
$(\Delta - 1)\%$	-26.23	0.96	-1.92	0.16	-25.63	-20.00	-7.04
Margin's contribution			2.68%		97.32%		
			Total imports (all firm-country-product combinations)				
2008 S1	106.10	31,497	3.88	7.02	123,681	118,747	1.04
2009 S1	76.64	33,576	3.74	6.78	89,855	98,089	0.92
$(\Delta - 1)\%$	-27.77	6.60	-3.54	-3.32	-27.35	-17.40	-12.05
Margin's contribution			1.79%		98.21%		

Notes: Total imports are given in billion euros while average sales are given in euros. See Appendix A.

Table 3: Changes in the margins of Belgian exports and imports, by subgroupings (2008S1–2009S1).

Subgroup of firms and transactions	Total % change	Extensive margin Firms	Countries	Products	*Contrib.*	Intensive margin Sales	*Contrib.*	Sales[1] Quantities	Prices
Product classifications[2]									
Exports class. as 'Other goods'	-21.03	1.09	-1.35	-0.52	**3.39%**	-20.39	**96.61%**	-11.29	-10.26
Exports class. as 'Interm., Capital, & Dura.'	-28.98	1.32	-2.60	0.50	**2.40%**	-28.40	**97.60%**	-24.10	-5.66
Imports class. as 'Other goods'	-25.64	6.42	-1.94	-3.96	**-0.77%**	-25.80	**100.77%**	-11.02	-16.61
Imports class. as 'Interm., Capital, & Dura.'	-29.17	5.36	-3.18	-3.03	**3.14%**	-28.40	**96.86%**	-23.45	-6.46
Regional components									
Exports to EU member states only	-26.06	1.43	-3.07	0.00	**5.62%**	-24.79	**94.38%**	-19.23	-6.88
Exports to OECD non-EU countries	-27.70	1.32	-1.68	4.18	**-11.43%**	-30.33	**111.43%**	-34.94	7.09
Exports to non-OECD non-EU countries	-26.22	0.68	-0.93	0.32	**-0.20%**	-26.27	**100.20%**	-10.96	-17.19
Firm types[3]									
Exports by small firms	-20.52	-2.44	1.14	2.31	**-4.13%**	-21.27	**104.13%**	-23.96	3.54
Exports by large firms	-27.35	0.72	-2.86	3.46	**-3.82%**	-28.23	**103.82%**	-23.44	-6.25
Imports by small firms	-12.80	1.51	0.30	-0.59	**-8.76%**	-13.84	**108.76%**	-10.31	-3.93
Imports by large firms	-30.46	0.62	-1.40	-2.02	**7.79%**	-28.46	**92.21%**	-16.48	-14.35
Ownership structure[4]									
Imports by non-multinational firms	-23.34	1.92	-1.40	-2.12	**6.17%**	-22.07	**93.83%**	-15.80	-7.45
Imports by multinational firms	-36.61	2.14	-1.84	-3.64	**7.58%**	-34.38	**92.42%**	-17.48	-20.49
Imports by non-foreign-owned firms	-19.91	2.06	-1.45	-2.41	**8.35%**	-18.41	**91.65%**	-10.31	-9.03
Imports by foreign-owned firms	-34.57	-0.45	0.16	-1.55	**4.36%**	-33.35	**95.64%**	-22.46	-14.04
Debt structure[5]									
Exports, low share of debts over liabilities	-24.53	0.27	-1.36	3.08	**-6.91%**	-25.98	**106.91%**	-23.25	-3.56
Exports, high share of debts over liabilities	-29.72	-1.55	-1.06	0.68	**5.52%**	-28.34	**94.48%**	-21.78	-8.39
Exports, low share of financial debts	-24.25	-0.70	-0.72	2.27	**-2.95%**	-24.87	**102.95%**	-21.97	-3.72
Exports, high share of financial debts	-29.36	-0.72	-1.44	2.01	**0.53%**	-29.23	**99.47%**	-23.21	-7.84
Firm dynamics: Stayers, entrants, and exiters[6]									
Exports of Stayers	-26.81	0.00	-1.41	2.16	**-2.28%**	-27.32	**102.28%**		
Imports of Stayers	-28.41	0.00	0.33	-2.07	**5.26%**	-27.14	**94.74%**		
Exports of Entrants	-77.83	-5.55	-7.67	-34.84	**37.52%**	-60.99	**62.48%**		
Imports of Entrants	-76.49	-4.80	-8.45	-14.64	**20.43%**	-68.39	**79.57%**		
Exports of Exiters	-77.36	9.16	-2.61	18.27	**-8.76%**	-81.99	**108.76%**		
Imports of Exiters	-1.35	69.82	-6.22	-7.74	**-2,832.58%**	-32.86	**2,932.58%**		

Notes: See Section 3 for additional details on the decomposition performed. All figures are expressed in terms of percentage changes. We report results for both exports and imports only when the results for those two categories are qualitatively and quantitatively sufficiently different. This table presents only a subset of the results. The full set of results is available as a spreadsheet from the authors upon request.

[1] As a robustness check (available upon request) we also provide an alternative price-quantity decomposition where we only focus on goods which are reported by weight. Results slightly differ from those reported in the paper. The reasons are that: the total trade of goods that are measured in kilograms has decreased less than the trade of goods measures in units; and Belgium trades proportionally more goods measured in kilograms with non-EU countries.

[2] The product classification follows the EU's 'Main Industrial Groupings' in official statistics, as described in the European Commission Regulation No 586/2001 (March 26, 2001). This classification separates products into intermediate, capital, consumer durable, consumer non-durable, and energy products.

[3] We define size in terms of employment and small (large) firms as those being below (above) the 2-digit NACE rev1.1 industry median size across all trading firms. Information on some exporters and importers are lost because of the lack of balance sheet data which is required for figures on employment and other firm characteristics.

[4] A multinational firm is a firm that is registered in Belgium and which owns, either directly or indirectly, more than 10% of the equity of at least one firm registered in another country. A foreign-owned firm is a firm that is registered in Belgium and the equity of which is, either directly or indirectly, owned (partially or in total) by one or more firms registered in another country, with each owing at least 10% of the equity of the Belgian firm.

[5] The ratios are computed from balance sheet information. The share of financial debts is the ratio of financial debts to total liabilities (thus excluding commercial debt).

[6] Figures refer to percentage difference between cohorts: 2009S1 stayers exported 26.81% less in 2009S1 than did 2008S1 stayers in 2008S1.

Table 4: The dynamics of exports and imports (2007S1–2009S1).

	2008S1–2009S1 trade dynamics					
	Exports			**Imports**		
Firm Type	N of firms	Trade share in 2009S1	Trade share in 2008S1	N of firms	Trade share in 2009S1	Trade share in 2008S1
Stayers	12,964	0.98	0.98	23,782	0.98	0.98
Entrants	5,263	0.02	0.00	9,794	0.02	0.00
Exiters	5,089	0.00	0.02	7,715	0.00	0.02
	2007S1–2008S1 trade dynamics					
	Exports			**Imports**		
Firm Type	N of firms	Trade share in 2008S1	Trade share in 2007S1	N of firms	Trade share in 2008S1	Trade share in 2007S1
Stayers	12,481	0.92	0.92	21,209	0.92	0.98
Entrants	5,572	0.08	0.00	10,288	0.08	0.00
Exiters	4,662	0.00	0.08	4,543	0.00	0.02

Notes: See Appendix A for further details.

Table 5: Firm, country, and product regressors.

Variable name	**Description**
Firm characteristics: 2006 (2007) values for 2007S1–2008S1 (2008S1–2009S1)	
D_{size}	Size (in term of employment) of the firm
D_{prod}	Value added per worker
D_{interm_share}	Share of intermediates over turnover
$D_{share\_exp\_sales}$	Share of exports over turnover
$D_{share\_imp\_interm}$	Share of imports over intermediates
$D_{value\_add\_chain}$	Exports times imports over turnover
$D_{ext\_fin\_dep}$	Investments minus operating profits over investments
$D_{share\_debts\_o\_liab}$	Ratio of debts over total liabilities
$D_{share\_debts\_due\_after\_one}$	Share of debts due after one year
$D_{share\_fin\_debt}$	Share of financial debt
D_{share_stock}	Ratio of stock over turnover
for	Foreign firm dummy
mne	Multinational dummy
S_s	NACE rev1.1 2-digit dummies
Country characteristics	
$OECD\_NO\_EU$	Dummy for countries belonging to the OECD (in 2008) but not to the EU
$NO\_OECD\_NO\_EU$	Dummy for countries belonging neither to the OECD nor to the EU
$exch\_rate\_change$	% change in the nominal exchange rate with the Euro between the end of the first quarter of 2007 (2008) and the end of the first quarter of 2008 (2009)
$growth\_rate\_GDP$	Average annual growth rate of the country's GDP between 2007 (2008) and 2008 (2009)
Product characteristics	
$intermediates$	Intermediate goods dummy
$capital\_goods$	Capital goods dummy
$consumer\_durables$	Durable consumer goods dummy
$consumer\_non\_durables$	Non-durable consumer goods dummy
$energy$	Energy related goods dummy
$redidual$	Goods not belonging to the previous categories
$frac_{lib\_diff}$	Measure of product differentiation (based on Rauch, 1999)

Notes: All firm characteristics prefixed with a 'D' are dummy variables that take value one if the firm characteristic is above the NACE rev 1.1 2-digit industry median across trading firms and zero otherwise. All data sources and the definitions of the variables are provided in Appendix A.

Table 6: Export and import growth – firm, country, and product determinants.

Coefficient	Export growth Base	Export growth DD	Import growth Base	Import growth DD
	Firm characteristics			
D_{size}	0.0371[b]	-0.0305	0.0218[b]	0.0068
	(0.018)	(0.030)	(0.009)	(0.015)
D_{prod}	0.0108	-0.0101	0.0391[a]	-0.0425[a]
	(0.015)	(0.027)	(0.009)	(0.016)
D_{interm_share}	0.0032	-0.0194	0.0071	-0.0279[c]
	(0.016)	(0.026)	(0.010)	(0.015)
$D_{share\_exp\_sales}$	-0.0087	-0.0239	0.0191	-0.0571[b]
	(0.023)	(0.054)	(0.013)	(0.025)
$D_{share\_imp\_interm}$	-0.0511[b]	0.0611[b]	-0.0280[b]	0.0017
	(0.021)	(0.031)	(0.011)	(0.014)
$D_{value\_add\_chain}$	0.0309	-0.0148	-0.0507[a]	0.0002
	(0.027)	(0.049)	(0.014)	(0.033)
$D_{ext\_fin\_dep}$	-0.0350	0.0201	-0.0256[b]	-0.0035
	(0.022)	(0.027)	(0.012)	(0.017)
$D_{share\_debts\_o\_liab}$	-0.0168	-0.0178	-0.0055	-0.0066
	(0.018)	(0.030)	(0.010)	(0.015)
$D_{share\_debts\_due\_after\_one}$	0.0104	0.0456[c]	0.0097	0.0102
	(0.021)	(0.024)	(0.013)	(0.017)
$D_{share\_fin\_debt}$	0.0209	-0.0668[b]	0.0011	-0.0043
	(0.022)	(0.029)	(0.011)	(0.019)
D_{share_stock}	0.0104	0.0234	0.0113	-0.0244
	(0.021)	(0.030)	(0.010)	(0.016)
for	0.0181	-0.0444	0.0029	0.0087
	(0.026)	(0.041)	(0.014)	(0.029)
mne	0.0114	-0.0255	-0.0304	0.0309
	(0.029)	(0.038)	(0.023)	(0.037)
	Country characteristics			
$OECD\_NO\_EU$	-0.1561[a]	0.2790[a]	-0.2988[a]	0.4841[a]
	(0.021)	(0.051)	(0.037)	(0.055)
$NO\_OECD\_NO\_EU$	-0.0742[a]	0.1013[c]	-0.2255[a]	0.3854[a]
	(0.028)	(0.053)	(0.042)	(0.067)
$exch\_rate\_change$	-0.2885[a]	-0.1769[c]	-0.2988[a]	0.2463[b]
	(0.071)	(0.091)	(0.086)	(0.101)
$growth\_rate\_GDP$	0.0138[a]	0.0115[b]	0.0056	0.0008
	(0.004)	(0.005)	(0.004)	(0.007)
	Product characteristics			
$intermediates$	0.0126	-0.0485[c]	-0.0246	-0.0334[c]
	(0.013)	(0.029)	(0.015)	(0.018)
$capital\_goods$	-0.0055	-0.0746[c]	-0.0393	-0.0218
	(0.020)	(0.043)	(0.031)	(0.037)
$consumer\_durables$	-0.0171	-0.1135[a]	-0.0305	-0.0568[c]
	(0.030)	(0.044)	(0.023)	(0.033)
$energy$	0.0944[b]	-0.1324[c]	-0.0409	0.0387
	(0.041)	(0.075)	(0.065)	(0.063)
$residual$	0.0150	-0.0579	-0.0572[b]	0.0239
	(0.024)	(0.043)	(0.026)	(0.022)
$frac_{lib\_diff}$	-0.0347[b]	0.0519[b]	-0.0255[b]	0.0497[a]
	(0.013)	(0.024)	(0.012)	(0.013)
NACE dummies	Yes		Yes	
Observations	400,626		506,114	
R^2	0.0104		0.0091	

Notes: The column 'Base' refers to coefficients of firm, country, and product characteristics alone, while the column 'DD' refers to coefficients of interactions of these characteristics with the trade collapse treatment time dummy TC^t. Multi-level clustered standard errors following Cameron *et al.* (2011) are given in parentheses. [a] p<0.01, [b] p<0.05, [c] p<0.1.

Table 7: Correlations of 2007 firm-level variables.

D_{size}	1												
D_{prod}	0.00	1											
D_{interm_share}	-0.01	-0.02	1										
$D_{share\_exp\_sales}$	0.10	0.10	0.00	1									
$D_{share\_imp\_interm}$	0.08	0.10	-0.12	0.20	1								
$D_{value\_add\_chain}$	0.37	0.17	0.07	0.44	0.32	1							
$D_{ext\_fin\_dep}$	-0.03	-0.34	0.11	-0.06	-0.07	-0.09	1						
$D_{share\_debts\_o\_liab}$	-0.06	-0.10	0.15	-0.06	-0.01	-0.04	0.13	1					
$D_{share\_debts\_due\_after\_one}$	0.00	-0.11	-0.06	-0.04	-0.01	-0.03	0.16	0.22	1				
$D_{share\_fin\_debt}$	0.01	-0.08	-0.06	-0.01	0.04	0.00	0.13	0.26	0.52	1			
D_{share_stock}	-0.03	-0.08	-0.05	0.15	0.22	0.04	0.06	0.04	0.06	0.10	1		
for	0.21	0.27	0.07	0.04	0.07	0.21	-0.16	-0.04	-0.20	-0.14	-0.13	1	
mne	0.19	0.19	0.00	0.06	-0.03	0.19	-0.05	-0.02	0.02	0.03	-0.07	0.43	1

Table 8: Changes in firm-level exports-to-turnover and imports-to-intermediates ratios.

	Changes in exports-to-turnover		Changes in imports-to-intermediates	
Coefficient	**Base**	**DD**	**Base**	**DD**
D_{size}	0.0936[a]	-0.1020[c]	0.0502[a]	-0.0859[a]
	(0.032)	(0.052)	(0.019)	(0.032)
D_{prod}	0.0557[c]	-0.0525	0.0263	0.0138
	(0.030)	(0.050)	(0.018)	(0.029)
D_{interm_share}	0.0442	-0.0150	0.0583[a]	-0.0710[b]
	(0.027)	(0.044)	(0.017)	(0.028)
$D_{share\_exp\_sales}$	-0.1290[a]	-0.0188	-0.0116	0.0657
	(0.031)	(0.050)	(0.030)	(0.050)
$D_{share\_imp\_interm}$	0.0012	0.0219	-0.0187	-0.0978[a]
	(0.029)	(0.049)	(0.016)	(0.027)
$D_{value\_add\_chain}$	-0.0561	-0.0445	0.0209	-0.0953[b]
	(0.036)	(0.058)	(0.029)	(0.048)
$D_{ext\_fin\_dep}$	-0.0826[a]	0.0654	0.0089	-0.0455
	(0.029)	(0.048)	(0.017)	(0.029)
$D_{share\_debts\_o\_liab}$	0.0225	-0.0297	-0.0110	0.0056
	(0.028)	(0.046)	(0.017)	(0.029)
$D_{share\_debts\_due\_after\_one}$	0.0513[c]	-0.0570	0.0108	-0.0150
	(0.030)	(0.048)	(0.018)	(0.032)
$D_{share\_fin\_debt}$	-0.0260	-0.0129	-0.0031	0.0423
	(0.030)	(0.049)	(0.019)	(0.032)
D_{share_stock}	0.0372	-0.0105	0.0106	0.0060
	(0.027)	(0.044)	(0.017)	(0.028)
for	-0.0986[b]	0.0872	-0.0360	0.1283[b]
	(0.047)	(0.071)	(0.030)	(0.056)
mne	0.0813[c]	-0.1055	0.0350	-0.0432
	(0.044)	(0.072)	(0.036)	(0.061)
NACE dummies	Yes		Yes	
Observations	16,610		28,371	
R^2	0.0177		0.0103	

Notes: The column 'Base' refers to coefficients of firm characteristics alone, while the column 'DD' refers to coefficients of interactions of these characteristics with the trade collapse treatment time dummy TC^t. Robust standard errors in parentheses. [a] p<0.01, [b] p<0.05, [c] p<0.1.

Figure 1: Monthly exports and imports (million euros).

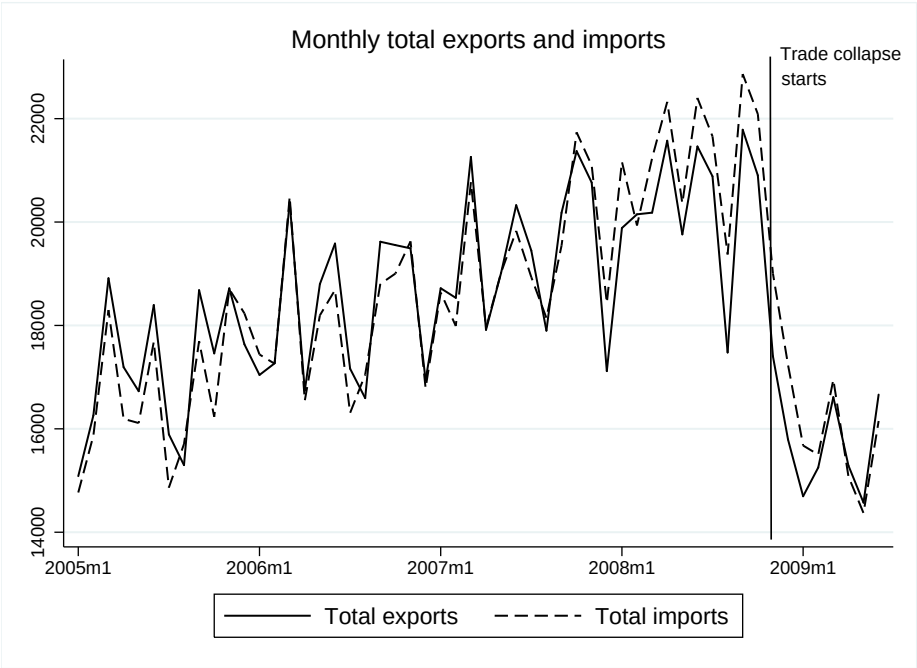


Figure 2: Percentage changes in exports and imports, by broad product category (2008S1–2009S1).

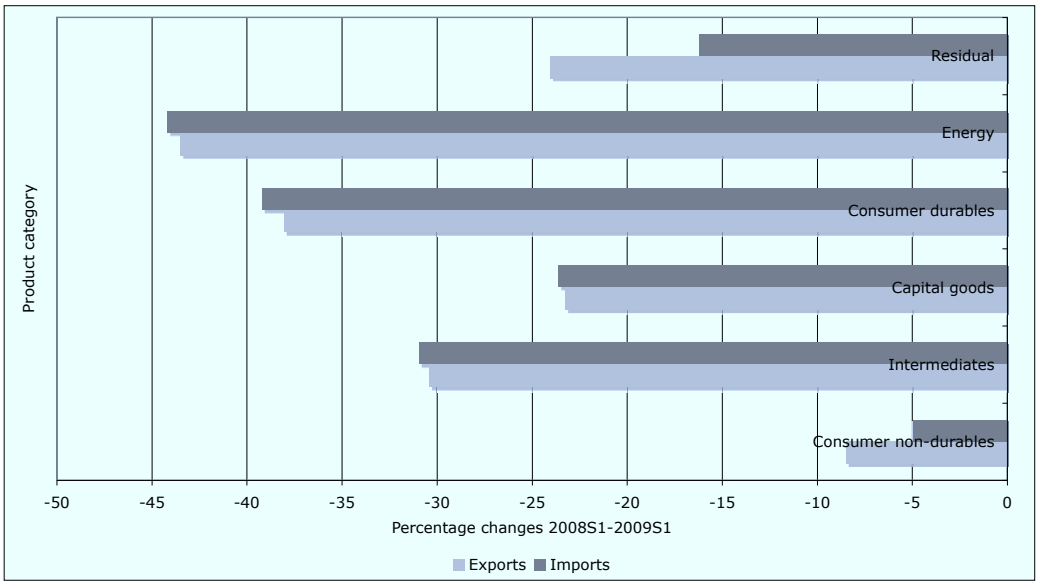


Figure 3: Percentage changes in exports, imports, and ratios to production by product (2008S1–2009S1).

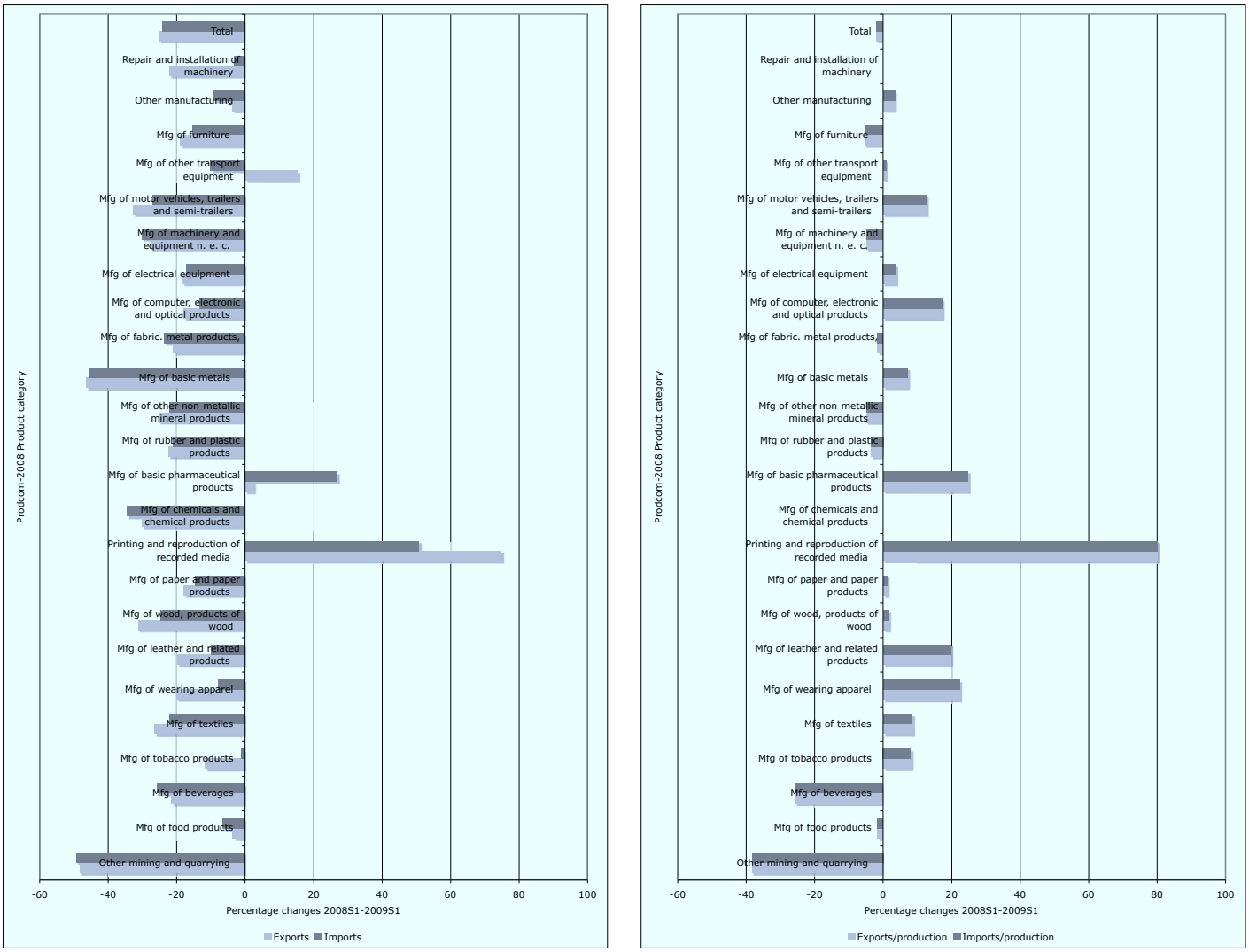
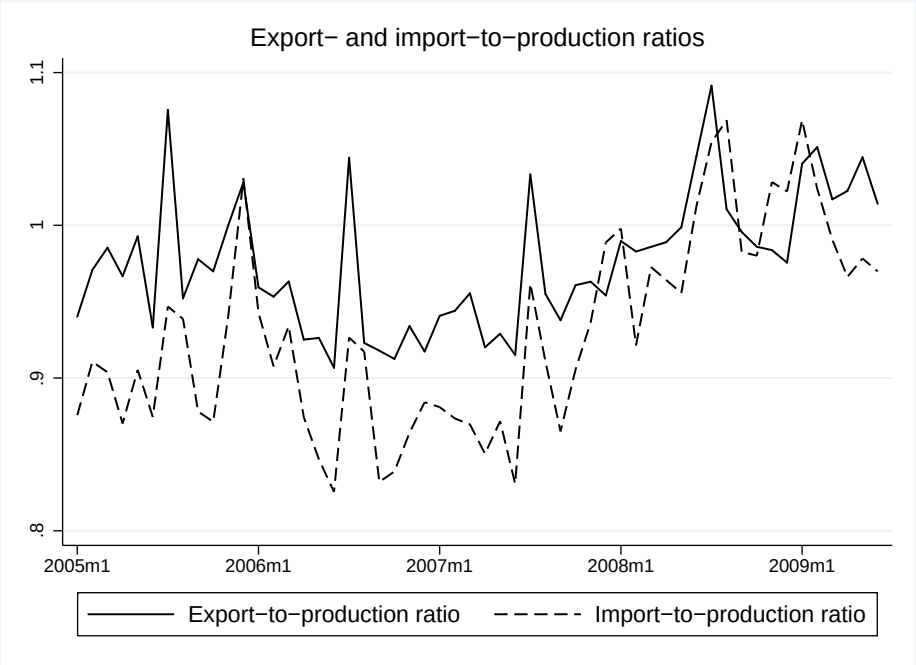
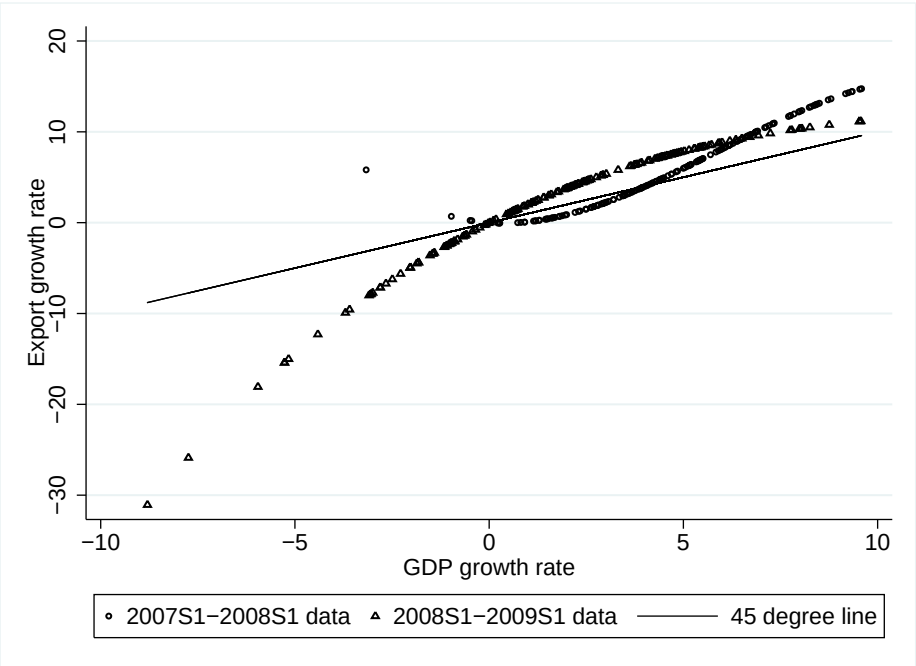


Figure 4: Monthly export-to-production and import-to-production value ratios.



Notes: Export and imports are considered only for those goods for which data on production is available from the Prodcom dataset.

Figure 5: Non-linearities in the marginal effects of GDP growth on export growth.



Notes: The 'concave' curve (△) depicts pre-treatment coefficients, while the 'convex' curve (○) represents post-treatment coefficients.

C Tables for robustness checks

Table 9: Export and import growth – firm, country, and product determinants (weighted least squares).

Coefficient	Exports growth Base	Exports growth DD	Imports growth Base	Imports growth DD
	Firm characteristics			
D_{size}	0.0320^{c}	-0.0272	0.0189^{c}	0.0048
	(0.018)	(0.029)	(0.010)	(0.016)
D_{prod}	0.0208	-0.0219	0.0409^{a}	-0.0498^{a}
	(0.017)	(0.023)	(0.010)	(0.016)
D_{interm_share}	0.0098	-0.0372^{c}	0.0030	-0.0199
	(0.015)	(0.022)	(0.009)	(0.015)
$D_{share\_exp\_sales}$	0.0039	-0.0104	0.0088	-0.0619^{b}
	(0.021)	(0.031)	(0.014)	(0.025)
$D_{share\_imp\_interm}$	-0.0505^{a}	0.0518^{b}	-0.0241^{a}	0.0025
	(0.016)	(0.024)	(0.009)	(0.015)
$D_{value\_add\_chain}$	0.0260	-0.0177	-0.0471^{a}	0.0013
	(0.024)	(0.034)	(0.015)	(0.024)
$D_{ext\_fin\_dep}$	-0.0312	0.0257	-0.0319^{a}	0.0020
	(0.020)	(0.025)	(0.010)	(0.016)
$D_{share\_debts\_o\_liab}$	-0.0169	-0.0185	-0.0080	-0.0100
	(0.018)	(0.027)	(0.010)	(0.015)
$D_{share\_debts\_due\_after\_one}$	0.0138	0.0413^{b}	0.0096	0.0163
	(0.015)	(0.020)	(0.011)	(0.018)
$D_{share\_fin\_debt}$	0.0113	-0.0675^{a}	0.0015	-0.0139
	(0.018)	(0.023)	(0.012)	(0.019)
D_{share_stock}	0.0113	0.0092	0.0160^{c}	-0.0256^{c}
	(0.016)	(0.023)	(0.009)	(0.015)
for	0.0086	-0.0442	-0.0038	0.0031
	(0.022)	(0.033)	(0.015)	(0.027)
mne	0.0079	-0.0065	-0.0346^{c}	0.0296
	(0.027)	(0.035)	(0.021)	(0.032)
	Country characteristics			
$OECD\_NO\_EU$	-0.1271^{a}	0.1974^{a}	-0.2443^{a}	0.3591^{a}
	(0.018)	(0.032)	(0.020)	(0.032)
$NO\_OECD\_NO\_EU$	-0.0521^{b}	0.0275	-0.1644^{a}	0.2775^{a}
	(0.024)	(0.035)	(0.028)	(0.039)
$exch\_rate\_change$	-0.3061^{a}	-0.1648^{b}	-0.3057^{a}	0.2405^{b}
	(0.066)	(0.081)	(0.082)	(0.108)
$growth\_rate\_GDP$	0.0120^{a}	0.0125^{a}	0.0042	0.0030
	(0.004)	(0.005)	(0.003)	(0.004)
	Product characteristics			
$intermediates$	0.0026	-0.0702^{a}	-0.0295^{a}	-0.0453^{a}
	(0.013)	(0.020)	(0.010)	(0.015)
$capital\_goods$	-0.0069	-0.1045^{a}	-0.0585^{a}	-0.0306
	(0.020)	(0.031)	(0.013)	(0.020)
$consumer\_durables$	-0.0393	-0.1167^{a}	-0.0194	-0.0605^{b}
	(0.032)	(0.044)	(0.015)	(0.024)
$energy$	0.0897^{b}	-0.1403^{b}	0.0145	-0.0533
	(0.041)	(0.070)	(0.050)	(0.073)
$residual$	-0.0021	-0.0655^{c}	-0.0705^{a}	0.0204
	(0.024)	(0.034)	(0.016)	(0.024)
$frac_{lib\_diff}$	-0.0484^{a}	0.0615^{a}	-0.0555^{a}	0.0563^{a}
	(0.012)	(0.018)	(0.008)	(0.012)
NACE dummies	Yes		Yes	
Observations	400,626		506,114	
R^2	0.0138		0.0119	

Notes: Estimates using weighted least squares. The column 'Base' refers to coefficients of firm, country, and product characteristics alone, while the column 'DD' refers to coefficients of interactions of these characteristics with the trade collapse treatment time dummy TC^t. Firm-level clustered standard errors are given in parentheses. ^{a} p<0.01, ^{b} p<0.05, ^{c} p<0.1.

Table 10: Changes in firm-level exports-to-turnover and imports-to-intermediates ratios (weighted least squares).

Coefficient	Changes in exports-to-turnover Base	DD	Changes in imports-to-intermediates Base	DD
D_{size}	0.0878[a]	-0.1000[c]	0.0472[a]	-0.0817[a]
	(0.031)	(0.051)	(0.018)	(0.031)
D_{prod}	0.0522[c]	-0.0523	0.0234	0.0192
	(0.029)	(0.049)	(0.017)	(0.028)
D_{interm_share}	0.0436	-0.0165	0.0529[a]	-0.0617[b]
	(0.027)	(0.043)	(0.016)	(0.027)
$D_{share\_exp\_sales}$	-0.1267[a]	-0.0114	-0.0088	0.0637
	(0.030)	(0.049)	(0.028)	(0.047)
$D_{share\_imp\_interm}$	0.0065	0.0204	-0.0183	-0.0894[a]
	(0.028)	(0.047)	(0.016)	(0.026)
$D_{value\_add\_chain}$	-0.0601[c]	-0.0435	0.0203	-0.0947[b]
	(0.036)	(0.058)	(0.027)	(0.046)
$D_{ext\_fin\_dep}$	-0.0839[a]	0.0666	0.0091	-0.0441
	(0.028)	(0.047)	(0.017)	(0.028)
$D_{share\_debts\_o\_liab}$	0.0216	-0.0298	-0.0114	0.0071
	(0.027)	(0.044)	(0.017)	(0.028)
$D_{share\_debts\_due\_after\_one}$	0.0525[c]	-0.0604	0.0084	-0.0119
	(0.029)	(0.047)	(0.018)	(0.031)
$D_{share\_fin\_debt}$	-0.0211	-0.0186	-0.0013	0.0384
	(0.029)	(0.047)	(0.018)	(0.031)
D_{share_stock}	0.0379	-0.0094	0.0095	0.0073
	(0.026)	(0.042)	(0.016)	(0.027)
for	-0.1043[b]	0.1021	-0.0364	0.1268[b]
	(0.047)	(0.070)	(0.029)	(0.055)
mne	0.0802[c]	-0.0999	0.0342	-0.0396
	(0.044)	(0.071)	(0.035)	(0.058)
NACE dummies	Yes		Yes	
Observations	16,610		28,371	
R^2	0.0183		0.0098	

Notes: Estimates using weighted least squares. The column 'Base' refers to coefficients of firm characteristics alone, while the column 'DD' refers to coefficients of interactions of these characteristics with the trade collapse treatment time dummy TC^t. Robust standard errors in parentheses. [a] p<0.01, [b] p<0.05, [c] p<0.1.

Table 11: Changes in firm-level exports-to-production and imports-to-production ratios.

Coefficient	Exports to Production change Base	DD	Imports to Production change Base	DD
D_{size}	-0.0636	0.2204[b]	0.1526[a]	-0.1889[b]
	(0.060)	(0.088)	(0.051)	(0.083)
D_{prod}	-0.0256	0.0444	0.0310	-0.0140
	(0.041)	(0.060)	(0.032)	(0.049)
D_{interm_share}	0.0647[c]	-0.0309	-0.0632[b]	0.0878[c]
	(0.036)	(0.055)	(0.030)	(0.047)
$D_{share\_exp\_sales}$	-0.1142[a]	0.0999	0.0367	-0.0120
	(0.042)	(0.069)	(0.042)	(0.066)
$D_{share\_imp\_interm}$	0.0339	0.0340	0.0352	-0.0807[c]
	(0.037)	(0.063)	(0.027)	(0.045)
$D_{value\_add\_chain}$	-0.0947[b]	-0.0763	0.0242	-0.0357
	(0.046)	(0.074)	(0.046)	(0.070)
$D_{ext\_fin\_dep}$	-0.0261	-0.0557	0.0280	-0.0622
	(0.040)	(0.060)	(0.032)	(0.048)
$D_{share\_debts\_o\_liab}$	-0.0283	0.0394	-0.0227	-0.0406
	(0.037)	(0.059)	(0.031)	(0.049)
$D_{share\_debts\_due\_after\_one}$	0.0133	0.0732	0.0500	-0.0287
	(0.039)	(0.061)	(0.035)	(0.054)
$D_{share\_fin\_debt}$	-0.0193	-0.0011	-0.0271	0.0354
	(0.040)	(0.062)	(0.034)	(0.055)
D_{share_stock}	0.0170	0.0164	-0.0464	0.0458
	(0.035)	(0.057)	(0.030)	(0.046)
for	0.0328	0.0127	-0.0444	0.1115[c]
	(0.040)	(0.060)	(0.035)	(0.057)
mne	0.0243	-0.1167[c]	0.0008	-0.0496
	(0.036)	(0.066)	(0.031)	(0.055)
NACE dummies	Yes		Yes	
Observations	5,012		5,939	
R^2	0.0255		0.0322	

Notes: The column 'Base' refers to coefficients of firm characteristics alone, while the column 'DD' refers to coefficients of interactions of these characteristics with the trade collapse treatment time dummy TC^t. Robust standard errors in parentheses. [a] p<0.01, [b] p<0.05, [c] p<0.1.