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The Great Trade Collapse and the Spanish Export Miracle: Firm-level Evidence from the Crisis*

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Abstract

We provide novel evidence on the micro-structure of international trade during the 2008 financial crisis and subsequent global recession by exploring a rich firm-level data set from Spain. The focus of our analysis is on changes at the extensive and intensive firm-level margins of trade, as well as on performance differences (jobs, productivity, and firm survival) across firms that differ in their export status. We find no adverse effects of the financial crisis on foreign market entry or exit, but a considerable increase in the export intensity of firms after the financial crisis. Moreover, we find that exporters were more resilient to the crisis than non-exporters. Finally, while exporters showed a significantly more favorable development of total factor productivity after 2009 than non-exporters, aggregate productivity declined substantially in a large number of industries in Spanish manufacturing. We also briefly explore two factors that might help explain the surprisingly strong export performance of Spain in the aftermath of the great trade collapse: improved aggregate competitiveness due to internal and external devaluation and a substitutive relationship between domestic and foreign sales at the firm level.

JEL classifications: F10, F14, G01, D24.

Keywords: international trade, financial crisis, Spain, manufacturing, firm-level data.

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1 Introduction

The global recession that followed the 2008 financial crisis continues to place a heavy burden on the world economy. One important aspect of the crisis that has caught a lot of attention among both policymakers and economists was the sudden, synchronized, and more than proportional decline in global trade relative to global production – the so-called "great trade collapse" (Baldwin, 2009). While the causes and consequences of this event have been subject to extensive debate, the available evidence derives largely from aggregate data rather than from detailed firm-level data.[1] This is somewhat surprising, since the issue of firm heterogeneity and the fact that only a fraction of firms access foreign markets have become cornerstones of modern trade literature. To what extent have firms decided to leave foreign markets in response to the crisis? Are firms today relying less on imports and exports than before the crisis? And did firms perform better or worse during the crisis if they were active on foreign markets? A fine-grained analysis of the micro-structure of international trade in the years surrounding the financial crisis can provide answers to these questions by uncovering patterns in the data that would go unnoticed in an analysis based on aggregate data alone.

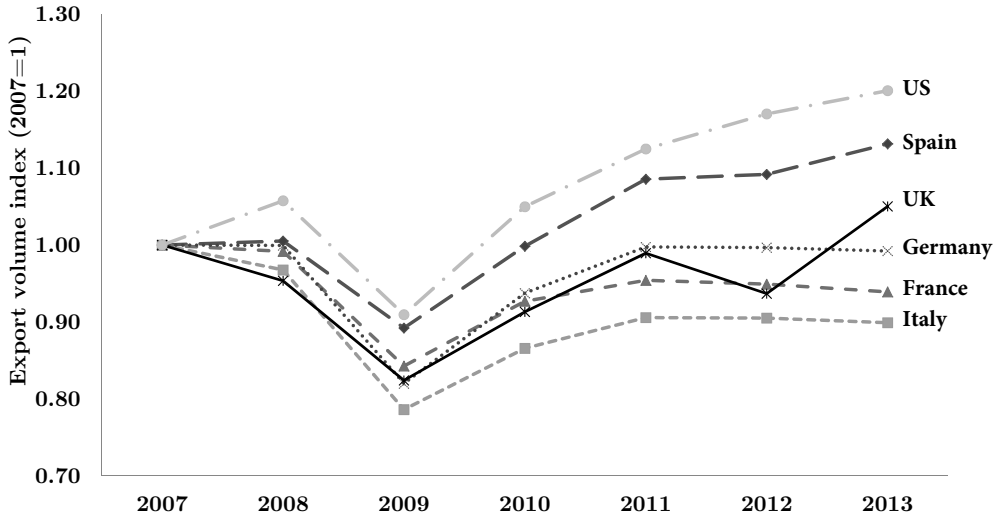
The objective of this paper is to provide such a fine-grained analysis using a representative sample of Spanish manufacturing firms over the period 2005-2012. Spain is a particularly interesting case to look into. On the one hand, the country was deeply affected by the financial crisis and subsequent recession. In the first half of 2009, real industrial production contracted by 21.4% relative to the first half of 2008.[2] Importantly, Spain went through very difficult times also after the financial crisis. Following zero growth in 2010, total production contracted again in 2011-2013, reflecting what is sometimes called a "double dip" recession. On the other hand, and perhaps surprisingly, the country showed a relatively strong export performance over the crisis period. Figure 1 demonstrates that the Spanish economy was able to improve its competitive position on international markets compared to other economies in Europe. For example, between 2007 and 2013 exports from Italy and France *decreased* by 10% and 7%, respectively. In contrast, exports from Spain *increased* by 13% over the same period. This development (celebrated by some as the "Spanish export miracle"[3]) put Spain ahead of not only other countries in economic turmoil, but also countries that quickly returned to economic growth after 2008, such as Germany and the UK.

[1] Important contributions using aggregate or sector-level trade data include Chor and Manova (2012) and Eaton et al. (2016). We discuss the existing micro-level evidence further below.

[2] Annual industrial production in 2009 declined by 16.2% relative to 2008. For real manufacturing exports, the same number is 21.2%. The data come from the Spanish Instituto Nacional de Estadística (INE).

[3] See, for example, the article "El *milagro* del sector exterior de España: admirable, pero con algunos claroscuros," published on May 10th, 2013, in the Spanish daily newspaper elEconomista.es.

Figure 1: Export volumes, 2007-2013†



†Note: The data are taken from the World Development Indicators (WDI) provided by the World Bank.

In this paper, we zoom in on the Spanish crisis experience. Adopting a micro-level perspective on Spanish firms allows us to investigate two important issues related to the crisis episode that remain obscure in aggregate data. First, we can disentangle the effects of the crisis at the extensive and the intensive firm-level margins of trade, i.e., we can separate a firm's decision to access foreign markets at all from the volume of a firm's exports and imports (as shares of its total sales and purchases, respectively). This distinction is crucial for the purpose of our analysis and allows us to address two interesting questions: Did aggregate trade decline because of firms exiting foreign markets, or because of a contraction in firm-level trade volumes? And was the subsequent recovery and export boom due to firms scaling up their exports, or due to new firms entering foreign markets? These questions are important because a destruction of cross-border trade linkages at the firm level can have long-lasting adverse effects on the economy (Monarch and Schmidt-Eisenlohr, 2016), and these effects are not expected for adjustments at the intensive margin. Conversely, the entry of new exporters might soften the adverse effects of the crisis by increasing the potential for future economic growth, because new exporters in Spain are more likely to engage in productivity-enhancing technology upgrading than non-exporters (Hanley and Pérez, 2012). In terms of methodology, we follow the literature estimating firm-level models of exporting and importing based on panel data (e.g. Bernard and Jensen, 1997, 1999). However, this literature is typically interested in the evolution of firm-specific characteristics (e.g. productivity, management, or labor force composition) and how these influence firms' export and import decisions, respectively. In contrast, our focus is on the direct effects of the financial crisis and subsequent recession, i.e., changes in

macro conditions that are beyond the control of individual firms.

The second issue we investigate are differences in firm performance and crisis resilience between exporting and non-exporting firms. Since exporting firms are known to be larger and more productive, on average, than non-exporting firms, their behavior can be important for aggregate outcomes. It is thus crucial to understand the performance of these firms in times of exceptional economic distress. Does exporting to foreign markets make firms more immune to shocks, or does it make them more vulnerable? This is an interesting question that should be settled empirically, as there exist theoretical arguments supporting either view. While allocating sales across various markets, domestically and abroad, insures the firm against an adverse demand shock in one market, there is also a substantial risk involved in exporting (e.g. currency risk, non-payment risk, transport risk etc.), and relying on foreign markets in times of a globally synchronized crisis might prove particularly harmful to firm performance. To answer this question, we estimate differences between exporters and non-exporters in terms of size, productivity, and survival, so-called exporter premia (Bernard and Jensen, 1999), and we study the evolution of these premia over the crisis years. Importantly, increasing exporter premia during the crisis could be taken as an indication that economies become less vulnerable to economic shocks through exporting. Furthermore, if it is primarily non-exporting firms that are forced to exit the market due to the crisis, then this might (in the medium to long run) induce a reallocation of resources away from non-exporting firms towards exporting firms, where they are put to more efficient use. The same logic applies if for non-exporters the evolution of productivity through the crisis and afterwards is less favorable than for exporters. Hence, differences in crisis performance of exporters vs. non-exporters are relevant also for the long-run growth perspective of the Spanish economy.

The main results of our empirical analysis can be summarized as follows. First, the sharp drop in international trade that the Spanish manufacturing sector experienced in 2009 took place at the intensive margin, not the extensive margin. This means that, while the financial crisis caused a strong reduction in firm-level imports and exports, it did not prompt firms to exit foreign markets altogether. In the years *after* the financial crisis, we do see changes at the extensive margin, but we see more, rather than less, firms starting to enter foreign markets. As a result, there is now a larger share of firms involved in international trade than before the crisis. Furthermore, firms have diversified their export portfolios to include more distant destinations outside the European Union.

Second, while firms active in the export market saw their export volumes plummet in the financial crisis, this decline was not limited to exports, but rather, it was visible to the same extent in their domestic sales. This observation might seem surprising in

light of the discussion about the great trade collapse. Moreover, the decline in exports was fully made up for (and even overcompensated) already by 2011. Those firms that entered the financial crisis as exporters have in fact been allocating ever larger shares of their production to foreign markets over the past few years. It seems that these firms have effectively compensated for the lack of domestic demand by expanding their sales abroad. In this sense, firms in the Spanish manufacturing sector are on average more, not less, 'globalized' today than they were before the financial crisis.

Third, we find that it made a significant difference for key economic performance indicators (such as jobs, productivity, and survival) whether or not firms were active on export markets when the crisis hit the Spanish economy. While all firms strongly reduced their output and laid off large numbers of workers during and after the financial crisis, firms that entered the crisis as exporters (and continued to export throughout the crisis years) saved more jobs, stayed more productive, and were more likely to survive. One of the more alarming findings is that from 2007 to 2009 firms' average total factor productivity (TFP) deteriorated by around 15%. For non-exporters, TFP continued to decline by another 15% from 2009 to 2011. Exporters, in contrast, maintained about the same level of productivity in 2011 as they had in 2009. Our analysis also shows that *aggregate* TFP in the Spanish manufacturing sector declined as a result of the crisis.

After having documented these facts, we explore two possible explanations for the favorable development of Spanish exports after the financial crisis. The point of departure of both explanations is the fact that aggregate demand was hit much harder in Spain than in most other large economies, both within and outside the European Union. We argue (and provide evidence for the idea) that, as a result of this, the Spanish economy has become more competitive internationally through internal as well as external devaluation. This is the first explanation we discuss in our paper. The second explanation is that the more than proportional decline in domestic demand has prompted firms to substitute domestic with foreign sales. Importantly, such a response is not implied by the standard Melitz (2003) model, but has recently been rationalized in trade models in which short-run production costs are convex in total output (Blum et al., 2013; Soderbery, 2014; Vannoorenberghe, 2012). We present some evidence drawn from our data that is consistent with this idea. However, we should like to emphasize that a rigorous causal analysis or an investigation into the relative importance of the two explanations for the strong export performance of the Spanish economy is beyond the scope of our paper. In a similar vein, we do not wish to claim that these two explanations are the most important, let alone the only, factors behind the strong export performance of the Spanish economy.

Our paper contributes to the small empirical literature that investigates firm behav-

ior in response to the financial crisis with a focus on firms' trading activities. Two prominent studies in this literature using French and Belgian data, respectively, are by Bricongne et al. (2012) and Behrens et al. (2013), who carefully gauge the crisis-induced drop in international trade along the dimensions of firms, products, and trading partners.[4] Closely related to our paper are the studies by Giri et al. (2014) and Álvarez and Sáez (2014), which provide evidence on exports and firm performance during and after the crisis using Mexican and Chilean firm-level data, respectively. Studies with a particular focus on firm survival over the crisis years depending on firms' trading activities are Costa et al. (2014, for Italy) and Görg and Spaliara (2014, for the UK). There seems to be a consensus emerging from this literature that most of the crisis adjustment in firm exports took place at the intensive margin. Exporting firms are typically found to be more resilient to the crisis and there is some evidence that firms' financial conditions played a relevant role for their crisis performance.[5] We complement this literature with evidence on both importing and exporting firms in Spain during and after the financial crisis. More generally, our paper fits into the large empirical literature analyzing firm heterogeneity in international trade. Reviews of this literature can be found in Bernard et al. (2012) and Greenaway and Kneller (2007).

Our paper also relates to an ongoing discussion about the export performance of the Spanish economy in the period *before* the financial crisis. Antràs (2011) observes that the share of Spanish exports in world trade was stable throughout the period 2000-2010 despite rising unit labor costs relative to other Eurozone countries between 2000 and 2008. As trade models with homogeneous firms cannot account for this fact, he argues in favor of an explanation based on firm heterogeneity. Correa-López and Doménech (2012) suggest that a number of strategic actions taken at the firm level (e.g. technology and skill upgrading, product innovations, and financial optimization) contributed to the internationalization of Spanish firms over the period 1990-2010. In contrast to these studies, we focus explicitly on the years surrounding the financial crisis, which involved a number of particular challenges and changes in the competitive position of Spanish firms. In addition, we document and analyze differences in firm performance and crisis resilience in relation to firms' export activities.

The rest of the paper is organized as follows. In Section 2, we describe the data used in our empirical analysis. Section 3 presents the main analysis of our paper. We start with a decomposition of changes in total trade into extensive and intensive margins in Section 3.1. Section 3.2 analyzes the probability of firms to engage in exporting and importing before, during, and after the financial crisis. Section 3.3 proceeds by analyzing how firms allocated their sales across the foreign and the domestic market and

[4] Abreha et al. (2016) provide evidence for Denmark.

[5] For micro-level evidence regarding the credit shock on exports in the global financial crisis see also Görg and Spaliara (2013) and Paravisini et al. (2014).

which share of their purchases they chose to source from abroad (rather than domestically). In Section 3.4, we take up the issue of firm competitiveness and crisis resilience by investigating performance differences depending on firms' export status. Section 4 provides a discussion of two important factors that are likely to have contributed to the strong export performance of the Spanish economy. Section 5 concludes.

2 Firm-level data

The primary data source for our analysis is the Encuesta Sobre Estrategias Empresariales (ESEE, or Survey on Business Strategies). The ESEE is an annual survey of about 2,000 Spanish manufacturing firms with 10 or more employees. It includes rich information on strategic firm decisions (such as pricing, international trade and investment activities, or innovation strategies) along with key items of firms' balance sheets as well as profit and loss statements. Importantly, the ESEE is a panel data set representative for the Spanish manufacturing sector at large and covering the period 1990-2012. This data set allows us to provide a comprehensive, high-resolution perspective on the micro-structure of international trade, and to portray the evolution of Spanish manufacturing over the years before, during, and after the financial crisis. The initial sampling of the data in 1990 had a two-tier structure, combining exhaustive sampling for firms with more than 200 employees and stratified sampling for firms with 10-200 employees. In later years, special efforts have been devoted to minimizing the incidences of panel exit as well as to including new firms through refreshment samples aimed at preserving the representativeness of the data.[6]

The sample we use for our analysis covers the period 2005-2012 (unless indicated otherwise). It consists of an unbalanced panel of more than 3,100 firms, roughly 800 of which are observed throughout the entire period. The ESEE uses the main activity (industries at the 2-digit level of the NACE Rev. 2 classification)[7] and the size group of firms (in terms of the number of employees) as stratification variables. It distinguishes between 20 different industries and six different size groups defined by the average number of workers employed during the year: 10-20; 21-50; 51-100; 101-200; 201-500; >500. As far as the descriptive analysis is concerned, we employ sampling weights to account for the sampling scheme used to collect the data.[8] When applying regression methods in our analysis, we use fixed effects for the sampling strata (de-

[6] More detailed information on the design, management, and sampling properties of the survey are available from the Spanish Sociedad Estatal de Participaciones Industriales (SEPI) foundation at https://www.fundacionsepi.es/esee/en/epresentacion.asp.

[7] Until 2009, the survey defined industries according to the NACE Rev. 1 classification. We accommodate the two classifications based on concordance information provided by the SEPI foundation.

[8] Sampling weights are based on the composition of the population of Spanish firms in 2010, taken from INE: http://www.ine.es/en/inebmenu/mnu_empresas_en.htm.

fined by pairs of industries and size groups) in order to obtain consistent estimation of the parameters of interest. Summary statistics of the most important variables used in our empirical analysis can be found in Table A.1 in Appendix A. Throughout the paper, we express all value variables in constant 2010 prices using industry-level price indexes from INE (similarly to Guadalupe et al., 2012).

A particularly important variable in our analysis is a firm's total factor productivity (TFP). We obtain TFP as a firm-specific and time-varying residual from industry-specific Cobb-Douglas production functions, which we estimate by the consistent three-step procedure proposed by Olley and Pakes (1996). This procedure derives from a dynamic model of firm behavior incorporating firm-specific productivity differences that exhibit idiosyncratic changes through time. The model tackles a potential endogeneity issue due to simultaneity between input choices and unobserved productivity shocks by using firm-specific capital investments as a proxy variable. In contrast to an alternative approach proposed by Levinsohn and Petrin (2003), the model by Olley and Pakes (1996) also takes into account the issue of sample selection due to firms entering and exiting the market. This is potentially important for the period of economic turbulence considered in our analysis. We estimate industry-specific production functions by using annual ESEE data on a firm's value added, investment, capital stock, labor employment, and market exit decisions over the period 2000-2012. Value added is the sum of the total production value plus other operating income (i.e., income from rent and leasing, industrial property, commissions, and certain services), minus the total expenditure on intermediate inputs and external services. Investment is the total investment value in tangible fixed assets (land, buildings, and equipment). The capital stock is the value of tangible fixed assets. Labor employment is measured in effective working hours. As regards exit decisions of firms, our data allow us to distinguish firms shutting down production from those that stay in the market but exit the ESEE panel for other reasons.[9]

A brief comment on the measure of labor employment that we use in our analysis seems in order. In contrast to many other firm-level data sets used in the literature, the ESEE data include an almost ideal measure of labor employment, namely effective working hours. This reduces the possibility of measurement error and thus mitigates endogeneity concerns in the estimation of firm-level TFP. Since the ESEE data also include a more common measure of labor employment (the average number of workers a firm employs during a year), we can investigate different firm-level margins of labor adjustment, viz. the number of workers (or jobs) and the number of effective working hours. Interestingly, we find very small differences in the within-firm variation between these two variables. This implies that the reductions in effective working

[9] Detailed results from these TFP estimations are available from the authors upon request.

hours observed at the firm level are fully attributable to workers being laid off and jobs being lost.

While the focus of our analysis is on Spain, we occasionally also draw on firm-level survey data from the EFIGE project, which was designed to enhance the understanding of how European firms and economies are affected by the process of globalization (Altomonte and Aquilante, 2012).[10] This data set enables us to compare firms in Spain with firms in six other European countries in the year 2008: Austria, France, Germany, Hungary, Italy, and the UK. It includes 14,444 firms and, importantly, it is also representative of manufacturing firms with more than 10 employees in these countries. The focus of the EFIGE data is on the experience and competition of firms in foreign markets, as well as their responses to the challenges posed by the financial crisis. Among the firm-level information included in the data set are: sales, employment, innovation activities, international investment, and values of imports and exports.[11] The data set also includes some questions on the changes in sales, employment, and trade values in the year 2009.

3 Empirical analysis

3.1 Decomposition of changes in total trade

We start by decomposing changes in both exports and imports in the Spanish manufacturing sector into extensive and intensive margins. We do this along the lines of Bernard et al. (2009) and Behrens et al. (2013) using the ESEE firm-level data set. Total exports in any given year t can be written as the product of the number of exporters (the extensive margin) in t and the average value of exports per exporting firm (the intensive margin) in t: $\textit{exports}_t = \textit{number of exporters}_t \times \textit{average exports}_t$. Hence, we can decompose changes in total exports (and analogously for imports) as follows:

$$\frac{\Delta \textit{exports}_t}{\textit{exports}_{t-1}} \approx \frac{\Delta \textit{number of exporters}_t}{\textit{number of exporters}_{t-1}} + \frac{\Delta \textit{average exports}_t}{\textit{average exports}_{t-1}}, \tag{1}$$

where $\Delta \textit{exports}_t \equiv \textit{exports}_t - \textit{exports}_{t-1}$ (and accordingly for the number of exporters and average exports).

Table 1 shows the decomposition of annual changes in total exports and imports according to Equation (1) over the period 2006-2012. Total trade in the Spanish manufacturing sector contracted in both years 2008 and 2009, with a drop of more than

[10] The EFIGE project is called "European firms in a global economy: Internal policies for external competitiveness."

[11] Altomonte et al. (2012) provide a full-fledged analysis of firms in different countries based on the EFIGE data set. Crespo et al. (2011) use the data to specifically compare firms in Spain with firms in other European countries.

15% in exports and more than 20% in imports in the main crisis year 2009. Importantly, these changes took place almost exclusively at the intensive margin of trade. More specifically, on the export side, average exports per firm decreased by 15% in 2009, which means that the intensive margin almost fully explains the overall drop in exports. On the import side, trade at the extensive margin even increased slightly in 2009, counteracting the drop at the intensive margin. It is interesting that exports quickly recovered in 2010 and 2011, in particular at the intensive margin, while imports had not recovered by the year 2012 (the last year of data we use in our analysis). In 2011, both exports and imports decreased slightly at the extensive margin, but increased again quite spectacularly in 2012.[12]

Table 1: Decomposition of annual changes in total trade in Spanish manufacturing†

	Exports			Imports		
	Total exports	Extens. margin	Intens. margin	Total imports	Extens. margin	Intens. margin
2006	9.74	8.20	-1.09	19.26	6.84	11.39
2007	13.11	0.99	8.15	15.05	0.44	15.08
2008	-0.27	2.59	-2.69	-4.18	-0.86	-2.83
2009	-15.36	-0.47	-15.14	-20.26	0.12	-20.27
2010	6.86	3.26	4.02	5.28	1.91	5.48
2011	10.63	-4.15	15.16	3.74	-2.65	7.25
2012	3.62	13.90	-8.78	-5.32	9.48	-13.79

†Note: This table shows annual percentage changes in total exports and imports in Spanish manufacturing, as well as a corresponding decomposition into extensive and intensive margins. Sampling weights apply. Source: Authors' calculations based on ESEE data.

Two comments on this decomposition exercise are in order. First, the changes at the intensive margin that we examine here are changes that took place at the level of the firm. Hence, they may include adjustments at several additional extensive margins that are only visible at a more disaggregated level: the number of products traded, the number of destination and source countries, and the number of buyers and sellers for each firm. While we cannot disentangle these margins for Spain, Behrens et al. (2013) find in more disaggregated data from Belgium that even within firm-country-product cells the intensive margin accounts for 97% of the overall drop in Belgian exports caused by the crisis.

[12] The decrease in both exports and imports at the intensive margin of trade in 2012 stems in part from the comparatively low volume of trade by foreign market entrants in that year.

Second, in the above decomposition we hold all prices constant, so that changes at the intensive margin of trade are due to changes in the quantities traded (rather than changes in the prices of traded products). To shed some light on the evolution of nominal trade values, we examine annual variations in both sales prices and input prices. We find that on average firms lowered their sales prices in 2009, but only by 0.59%.[13] In contrast, the prices of inputs continued to rise in 2009, though at a lower rate (1.70%) than before or after 2009. Overall, we can thus say that nominal trade values dropped sharply in 2009, but that this drop is due to a reduction in the quantities traded rather than a decline in prices.

3.2 Foreign market entry and exit

In this section, we focus on the extensive margin of trade. What share of firms in the Spanish manufacturing sector is active on foreign markets? And how did this share develop over the recent period of financial and economic turmoil? When looking at the full sample of firms, we find that in the pre-crisis period 2005-2008 on average 46% of all firms were exporters, while 43% were importers; see Figure 2a. We observe significant overlap between exporter and importer status, reflected in 30% of firms in 2005 being engaged in both exporting and importing at the same time (not depicted). This suggests that exporting and importing are complementary activities at the level of the firm, an issue that has been taken up in recent research and to which we will return below. Two observations stand out. First, there was only a very small decrease in the shares of exporting and importing firms in 2009, following the peak of the financial crisis. Second, both shares rose sharply in the subsequent years. By 2012, the shares of exporters and importers had both grown to all-time highs of 57% and 51%, respectively.[14]

While these numbers suggest a growing tendency among firms to serve foreign markets, they partly reflect firm entry into and exit from production, as well as changes in the sample composition over time (due to sample attrition caused by nonresponse of firms, as well as due to the inclusion of new firms through refreshment samples). For this reason, in Figure 2b, we balance the sample on firms that are observed in each year from 2005 to 2012. This allows for a clean view on changes at the extensive margin of trade among incumbent and surviving firms.[15] The figure confirms that,

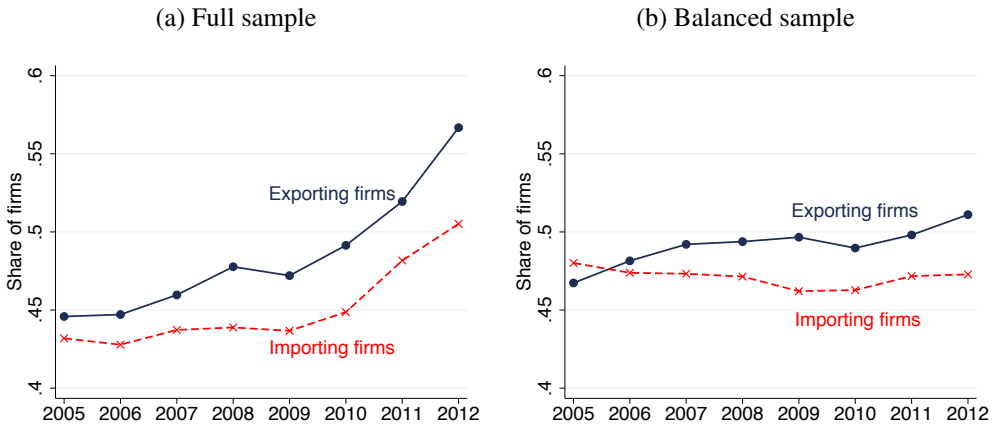
[13] This drop was only slightly larger for exporters (-0.71%) than for non-exporters (-0.48%).

[14] These are the highest trade participation shares observed over the period 1990-2012 (i.e., the period for which ESEE data were available at the time of writing this paper); see http://www.fundacionsepi.es/investigacion/esee/en/salgunos_resultados.asp.

[15] Note that the sample used in Figure 2b is thus not representative for the manufacturing sector at large. It is in fact biased towards larger firms (in terms of output and employment), as these were more likely to survive the crisis. This bias explains why trade participation rates in 2005 are higher in the balanced sample than in the full sample.

whether we look at exporting or at importing, the financial crisis had a very small impact on the extensive margin of trade in 2009. Instead, we see constant or rising trade participation rates over time. The share of exporters has been subject to a slight upward trend that was only shortly interrupted in 2010, but accelerated thereafter and reached more than 51% in 2012 (up from less than 47% in 2005). Import participation, in contrast, has not changed much in the balanced sample. Before the financial crisis, the share of importers stood at about 47%. In 2009, the year following the peak of the financial crisis, this share decreased by one percentage point. Although it has been increasing in each year thereafter, import participation has not returned to its pre-crisis level by 2012. In any case, the figure shows that the overall changes that we find around the crisis years are rather small for incumbent and surviving firms. Importantly, the apparent differences in the evolution of trade participation rates across the full sample and the balanced sample (Figures 2a and 2b) can be reconciled by differential firm survival rates across trading and non-trading firms. We will take this issue up in Section 3.4, where we show that firms that entered the crisis as exporters had higher chances to survive the crisis than firms that were confined to the domestic market.

Figure 2: Trade participation, 2005-2012†



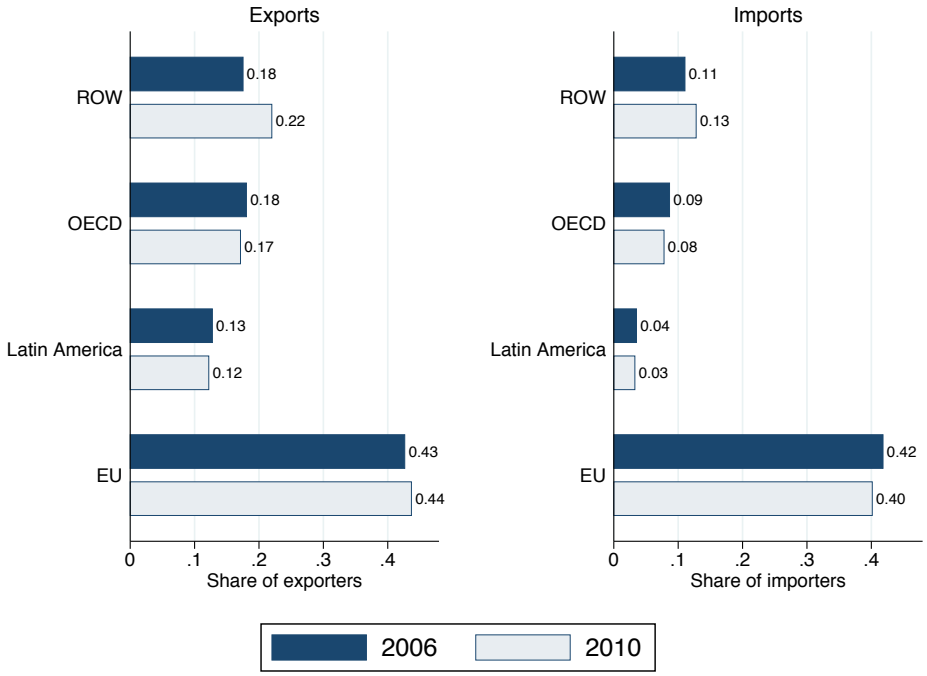
†Note: In Figure 2a we use the full sample of firms, whereas in Figure 2b we balance the sample on 782 firms that are observed in each year from 2005 to 2012. Sampling weights apply. Source: Authors' calculations based on ESEE data.

Do these numbers mask important variation across source and destination countries? A regional decomposition of trade available for 2006 and 2010 allows us to provide a preliminary answer to this question.[16] In Figure 3, where we balance the sample on firms that are observed in both years, we see very little time variation in export participation for most world regions that we can distinguish in our data: the European Union (EU), Latin America, the rest of the OECD, and the rest of the world

[16] Information on the composition of imports and exports by world region is available in ESEE every four years.

(ROW, a residual category, including all of Africa, Eastern Europe, and Asia except Japan and South Korea). 43-44% of all firms exported to the EU, 12-13% exported to Latin America, and 17-18% exported to other OECD countries. This cross-sectional pattern is broadly consistent with a gravity model of trade in which distance and market size play important roles. The largest change over time can be observed for exports to the ROW, where export participation increased by more than one fifth (from 18% in 2006 to 22% in 2010). Hence, the average exporting firm started to penetrate new markets over the crisis years, and thus diversified its export portfolio. This observation is consistent with the behavior observed for Danish firms, which started to enter new markets (especially in Asia) during the recovery after the financial crisis (Abreha et al., 2016).[17] We find similar changes over time for imports as we do for exports. However, the overall share of firms importing from regions other than the EU is relatively small, especially compared to that of exporters: in 2010, it was 3% for Latin America, 8% for other OECD countries, and 13% for the ROW (up from 11% in 2006).

Figure 3: Trade participation by region, 2006 and 2010†



†Note: The sample is balanced on 1,247 firms observed in both years 2006 and 2010. In this sample, 780 (780) firms reported positive exports (imports) in 2006, and 797 (770) reported positive exports (imports) in 2010. Sampling weights apply. Source: Authors' calculations based on ESEE data.

[17] Similar evidence is provided for Chile and Italy by Álvarez and Sáez (2014) and Costa et al. (2014), respectively.

How do the numbers we find for Spain compare with those observed for other European countries? To answer this question, we exploit the EFIGE data set, which provides consistent trade participation shares for seven European countries in 2008. We find, perhaps surprisingly, that among these countries, export participation is lowest in Germany (41%) and France (45%), closely followed by Spain (48%), while Austria and the UK have much higher exporter shares (56%), exceeded only by Italy (63%). German firms also report the lowest importer share (25%), followed by Italy (35%) and Spain (40%).[18] The highest import participation is found for France, where more than half of all firms engage in importing.

We next estimate a series of probability models for both exporting and importing. This allows us to narrow down the factors that were crucial for trade participation over the crisis years. To do so, we distinguish between those factors that are directly related to the financial crisis and subsequent recession (i.e., macro-level changes taking place outside the firm and captured in our analysis by year dummies) and those related to the evolution of firm-specific characteristics (i.e., micro-level changes taking place inside the firm). The latter also capture indirect effects of the financial crisis (e.g. if some firms experienced a decline in their productivity over time). In order to account for (and exploit) possible complementarities between exporting and importing at the firm level, we estimate two equations simultaneously in a bivariate Probit framework. More specifically, we define two indicator variables, one for the export status of a firm, *Exporter*$_{it}$, and one for its import status, *Importer*$_{it}$. The variable *Exporter*$_{it}$ is equal to one if firm i reports positive exports at time t (and zero otherwise), and accordingly for *Importer*$_{it}$. We assume that a firm exports if current and expected revenues from exporting are greater than costs:

$$\textit{Exporter}_{it} = \begin{cases} 1 & \text{if } \Pi^e_{it} > 0 \\ 0 & \text{otherwise,} \end{cases}$$

where Π^e_{it} is the unobserved (latent) net present value of current and expected profits from exporting. We assume that these can be linearly approximated as follows:

$$\Pi^e_{it} = \boldsymbol{\gamma}^e \cdot \mathbf{X}^e_{it} + \delta^e_t + \delta^e_i + \delta^e_{ks} + \varepsilon^e_{it}, \tag{2}$$

where $\mathbf{X}^e_{it}$ is a column vector collecting time-varying firm characteristics, $\boldsymbol{\gamma}^e$ is a vector of parameters to be estimated, δ^e_t is a year fixed effect, δ^e_i is a firm-specific effect,[19] δ^e_{ks} is a constant specific to the industry-size-group combination corresponding to firm i in year t (with industries being indexed by k and size groups by s), and ε^e_{it} is a

[18] As far as imports are concerned, the EFIGE data tend to underestimate trade participation, as the questionnaire is limited to imports of goods and services that are used in the production process.

[19] We impose different assumptions on the firm-specific effect δ^e_i, as we shall detail below.

firm-and-year-specific stochastic profit shock. An expression similar to Equation (2) is assumed for importing:

$$\Pi_{it}^{i} = \boldsymbol{\gamma}^{i} \cdot \mathbf{X}_{it}^{i} + \delta_{t}^{i} + \delta_{i}^{i} + \delta_{ks}^{i} + \varepsilon_{it}^{i}. \tag{3}$$

In contrast to much of the existing literature, we estimate the decisions of exporting and importing jointly. This strategy is motivated by recent evidence on fixed and sunk cost complementarity between the two activities (Kasahara and Lapham, 2013).[20] We thus assume that the stochastic profit shocks are drawn from a bivariate normal distribution:

$$\begin{bmatrix} \varepsilon_{it}^{e} \\ \varepsilon_{it}^{i} \end{bmatrix} \sim \mathcal{N}\left(\begin{bmatrix} 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 & \chi \\ \chi & 1 \end{bmatrix} \right),$$

where χ is a parameter measuring the (residual) correlation between exporting and importing. Allowing (and testing) for $\chi > 0$ is important in our analysis, as it tells us whether a firm-specific negative effect of the crisis that directly affected one activity spilled over to the other activity (and thus entailed more harmful consequences than the direct effect alone).

In the model described above, we are mainly interested in the year fixed effects, $\delta_{05}^{\ell}, \ldots, \delta_{12}^{\ell}$, $\ell \in \{e, i\}$, as these indicate changes in the profitability of exporting and importing over time that cannot be explained by the firm-specific variables collected in $\mathbf{X}_{it}^{\ell}$. The year fixed effects thus pick up the (net) macro-level effects driven by changes in both demand-side and supply-side factors. The variables contained in $\mathbf{X}_{it}^{\ell}$ are: labor productivity (value added over effective working hours, in logs) to control for the firm's level of competitiveness;[21] capital intensity (tangible fixed assets over the number of workers, in logs); R&D intensity (R&D expenses over sales, in logs); skill intensity (number of graduate workers over total number of workers, in logs); foreign ownership (as dummy variables indicating the share of foreign capital in the firm's joint capital: 0%, >0% & <=50%, or >50%); multinational corporation (MNC) status (as a dummy variable indicating whether the firm has a foreign affiliate); the type of good produced (as dummy variables indicating final goods, intermediate goods, or not defined); and, in the case of exporting, internet presence (as a dummy variable indicating whether the firm is operating a website). Including a dummy for internet presence in the equation for exports, but not for imports, is based on the idea that a website is important as part of the firm's marketing and distribution strategy, but has no impact on the firm's purchasing and sourcing activities. Importantly, the fact that $\mathbf{X}_{it}^{e} \neq \mathbf{X}_{it}^{i}$ leads to efficiency gains in the estimation.

[20] Aristei et al. (2013) also investigate the two-way relationship between exporting and importing.

[21] In alternative specifications we use estimated TFP (rather than labor productivity) to control for the firm's competitiveness, to find that our main results do not change with this modification.

In our first estimation of the bivariate Probit model in Equations (2) and (3), we treat δ_i^ℓ as a random variable that is uncorrelated with the other covariates. We compute marginal effects evaluated at the sample means of all regressors. For the year dummies for 2006-2012, the effects can be interpreted as conditional differences in trade participation compared to the base year 2005. Statistical inference is based on robust standard errors clustered at the firm level, which allows for arbitrary forms of heteroskedasticity and accounts for the autocorrelation implied by the firm-specific effect δ_i^ℓ.

Columns (1) and (2) of Table 2 report the estimation results. In line with the descriptive evidence presented in Table 1 and Figure 2, there is no indication of a significant decline in import or export participation in the years surrounding the financial crisis (2007-2009). On the contrary, our results suggest that macro-level developments in the aftermath of the financial crisis (those beyond the influence of individual firms) have prompted more firms to access foreign markets. We find that the probability of exporting is 4.1 percentage points (or 9.1%) higher in 2012 than it was in the base year 2005. The same number for importing is 3.2 percentage points (7.3%). Statistically significant differences between pre- and post-crisis export and import participation are first visible in 2012. These differences cannot be explained by the firm-level characteristics that the literature has consistently identified to influence both exports and imports at the extensive margin (such as productivity), as these are controlled for in the estimation. Regarding these firm-specific control variables, we find that the results accord well with known stylized facts. We find that those firms that are more productive as well as those more intensive in capital, R&D, and skills are more inclined to both exporting and importing. Moreover, we see large and significant differences (with a two-digit margin) between foreign-owned and domestically owned firms, as well as between MNCs and non-MNCs. Finally, the results demonstrate strong firm-level complementarities between exporting and importing ($\hat{\chi} = 0.525$, significant at the 1% level).

One important limitation of the bivariate Probit model is that identification is based on between-firm variation in the data, and that the model thus assumes firm-specific unobserved heterogeneity (denoted by δ_i^ℓ above) to be uncorrelated with the other covariates. However, it is likely that unobserved firm characteristics with strong serial correlation (such as managerial ability) do not only affect a firm's decision to access foreign markets, but that they are also correlated with the other covariates in the model (e.g. productivity). Addressing this issue by estimating firm fixed effects in the Probit framework suffers from the incidental parameters problem and would hence result in inconsistent estimation of all model parameters. We therefore estimate a system of seemingly unrelated regression equations with fixed effects (SUR FE), where each

Table 2: Probability model for trade participation†

	Bivariate Probit Model		SUR Fixed Effects Model	
	Exporter	*Importer*	*Exporter*	*Importer*
	(1)	(2)	(3)	(4)
Year dummy 2006	-0.00773	0.00407	0.00769	0.0175***
	(0.00715)	(0.00785)	(0.00547)	(0.00670)
Year dummy 2007	-0.00925	-0.00499	0.00930	0.0157**
	(0.00829)	(0.00895)	(0.00616)	(0.00757)
Year dummy 2008	-0.00521	-0.00292	0.00951	0.0181**
	(0.00936)	(0.00966)	(0.00648)	(0.00787)
Year dummy 2009	-0.00716	-0.0135	0.00989	0.0116
	(0.0107)	(0.0107)	(0.00720)	(0.00851)
Year dummy 2010	0.000998	-0.0202*	0.00881	0.0114
	(0.0112)	(0.0116)	(0.00698)	(0.00876)
Year dummy 2011	0.0186	0.00836	0.0196***	0.0275***
	(0.0120)	(0.0121)	(0.00738)	(0.00898)
Year dummy 2012	0.0406***	0.0317**	0.0323***	0.0426***
	(0.0126)	(0.0128)	(0.00773)	(0.00977)
Labor productivity (in logs)	0.0486***	0.0657***	0.0144***	0.0210***
	(0.00817)	(0.00797)	(0.00490)	(0.00641)
Capital intensity (in logs)	0.0404***	0.0471***	-0.00330	-0.0275***
	(0.00684)	(0.00592)	(0.00792)	(0.00972)
R&D intensity (in logs)	1.218***	1.596***	-0.0604	-0.00165
	(0.364)	(0.318)	(0.160)	(0.244)
Skill intensity (in logs)	0.0604	0.127***	-0.00109	-0.0317
	(0.0394)	(0.0437)	(0.0204)	(0.0286)
Multinational dummy	0.261***	0.112***	0.00199	0.0591**
	(0.0313)	(0.0259)	(0.0170)	(0.0274)
Type of good: intermediate good	0.0587***	0.00696	0.0171	0.0276
	(0.0185)	(0.0173)	(0.0139)	(0.0171)
Type of good: not defined	-0.0228	-0.0591***	0.00808	0.0364**
	(0.0181)	(0.0164)	(0.0135)	(0.0179)
Foreign ownership: > 0% & <= 50 %	0.0490	0.00693	-0.0255	-0.00557
	(0.0588)	(0.0478)	(0.0273)	(0.0360)
Foreign ownership: > 50%	0.212***	0.174***	0.00840	0.0179
	(0.0289)	(0.0264)	(0.0182)	(0.0184)
Internet dummy	0.124***		0.0309**	
	(0.0127)		(0.0124)	
Industry-size-group fixed effects	Yes		Yes	
Firm fixed effects	No		Yes	
Number of observations	14,887		13,209	
Number of firms	2,860		2,601	
Cross-equation correlation	0.525***		0.112***	
R^2			0.0071	0.0127

†Note: This table presents estimated marginal effects on both export and import probabilities obtained from fitting a bivariate Probit model (columns (1) and (2)), as well as a system of seemingly unrelated regression equations (SUR) with fixed effects (columns (3) and (4)). The dependent variables are dummy variables indicating positive exports or imports, respectively. For dummy variables as regressors we report the effects of a discrete change from zero to one. In the bivariate Probit model, marginal effects are evaluated at the sample means of all regressors. Robust standard errors (clustered at the firm level) are given in parentheses. *,**,*** denote significance at the 10%, 5%, 1% levels, respectively. Source: Authors' estimations based on ESEE data.

equation describes a linear probability model rather than a non-linear Probit model. On the one hand, this model may deliver implausible predictions for the trading probabilities outside the unit interval. On the other hand, it has the advantage of controlling for unobserved firm-specific heterogeneity through firm fixed effects. Identification of the parameters of interest then comes from within-firm variation in the data, i.e., changes in export and import participation over time.[22]

The estimation results for the SUR FE model are reported in columns (3) and (4) of Table 2. The main conclusions drawn from the bivariate Probit model are upheld in this model. In particular, there is no evidence that the financial crisis had any detrimental effect on trade participation. On the contrary, the probability of exporting increased by 3.2 percentage points over the period 2005-2012 due to macro-level effects (statistically significantly at the 1% level). On the import side, we find positive and significant effects in the years 2006 to 2008, but again the probability of importing was significantly higher in 2012 than in any pre-crisis year (by 4.3 percentage points compared to 2005). In contrast to the results obtained from the bivariate Probit model, the only firm-specific variable that consistently and significantly increases the probability of both exporting and importing is productivity. Hence, a firm that experiences a productivity gain over time is more likely to enter foreign markets.[23] This finding adds to the overwhelming evidence emphasizing the importance of firm heterogeneity in the study of international trade, and it is consistent with the seminal work by Melitz (2003). Finally, the positive and significant (residual) correlation between exporting and importing is confirmed in the SUR FE model.

Thus far, we have assumed that any persistence in export status over time stems from possible autocorrelation in the independent variables (including firm fixed effects) and the errors. Similar to other firm-level data sets, persistence in export status is indeed a salient feature of our data. Balancing the panel on 1,037 firms that are observed in each year from 2005-2010, we find that 601 firms exported in each and every year, while 276 firms never exported. Hence, a vast majority of 84.6% of all firms maintained their export status throughout the six-year period considered.

There are at least two sources of persistence in export participation that we have not considered in the models described above and that are reviewed and modeled in Roberts and Tybout (1997) and Bernard and Jensen (1997). The first is learning by doing, which refers to the accumulation of knowledge (through production and ex-

[22] Our data set includes information about unusual events that can change the scale and nature of the firm, such as mergers, acquisitions, and divestments. We exclude such firms from the sample whenever we exploit the within-firm variation in our analysis. This leads to a reduced sample size in the corresponding regressions.

[23] There is strong evidence in the literature for self-selection of the more productive firms into exporting as well as importing; see e.g. Bernard and Jensen (1999), Smeets and Warzynski (2013), and Kohler and Smolka (2014). There is also some evidence for both exporting and importing to increase productivity; see e.g. De Loecker (2007), Halpern et al. (2015), and Feng et al. (2012).

porting) that reduces future costs of production and exporting. The second are sunk costs for foreign market entry, for example in the form of information and distribution costs. Similar ideas apply to importing. While we cannot separately identify these two channels, we may hypothesize based on the above considerations that the firm's current and expected profits from exporting will depend positively on past export status:

$$\Pi^e_{it}(\textit{Exporter}_{it-1} = 1, \cdot) - \Pi^e_{it}(\textit{Exporter}_{it-1} = 0, \cdot) > 0.$$

In such a dynamic framework, a negative transitory shock to foreign demand due to the financial crisis would generate a negative effect on export participation that carries over to future time periods (implying gradual adjustment of the probability to export).

To allow for dynamics in trade participation, we specify the following model for exporting:

$$\textit{Exporter}_{it} = \rho^e \cdot \textit{Exporter}_{it-1} + \boldsymbol{\gamma}^e \cdot \mathbf{X}^e_{it} + \delta^e_t + \delta^e_i + \delta^e_{ks} + \varepsilon^e_{it}, \tag{4}$$

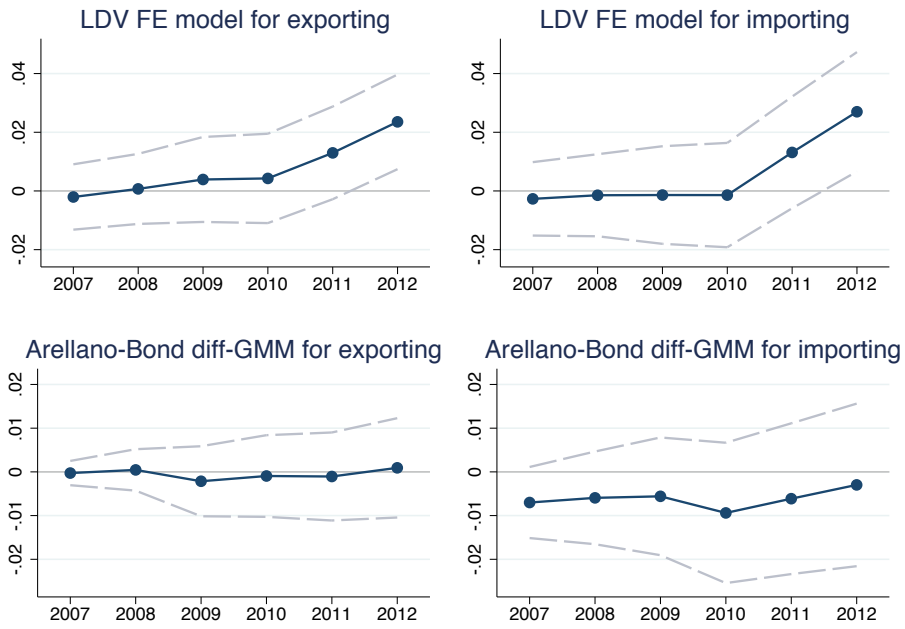
and accordingly for importing. Of course, the larger the autoregressive parameter (i.e., the coefficient of the lagged dependent variable), the stronger (i.e., long-lasting) is the dynamic effect. First, we estimate these models by the standard fixed effects approach with the right-hand side of the equation including the lagged dependent variable (LDV FE model). Second, we use the first-differenced general method of moments (diff-GMM) approach developed by Arellano and Bond (1991).

In the LDV FE models, we apply the within-transformation to the data in order to get rid of the firm fixed effects δ^e_i and δ^i_i, respectively. Estimates of ρ^ℓ in the LDV FE models serve as lower bounds for the true parameter values.[24] We find values of $\hat{\rho}^e \approx 0.237$ and $\hat{\rho}^i \approx 0.193$ (both significant at the 1% level) in the LDV FE models. In the diff-GMM approach, the model is estimated in first differences to cancel the firm fixed effects. In addition to the lagged dependent variable, we treat labor productivity, capital intensity and foreign ownership as endogenous variables, and R&D and skill intensity along with MNC status as pre-determined variables. Lagged levels of the dependent variable, the predetermined variables, and the endogenous variables are used as internal instruments. We allow for the maximum number of available lags for use as instruments. To accommodate heteroskedasticity, we use the two-step version of the diff-GMM estimator. We estimate values of $\hat{\rho}^e \approx 0.382$ and $\hat{\rho}^i \approx 0.373$ (both

[24] The Nickell bias for the autoregressive parameter, ρ^ℓ, is $\text{plim}_{N\to\infty}\left(\widehat{\rho^\ell} - \rho^\ell\right) \approx \frac{-(1+\rho^\ell)}{T}$, with $\ell \in \{e, i\}$ and $T = 7$ in our application.

significant at the 1% level) in the diff-GMM models.[25]

Figure 4: Dynamic probability models for trade participation[†]



[†]Note: This figure shows estimated coefficients of year dummies in dynamic probability models as specified in Equation (4) for the exporter dummy (left-hand side) and importer dummy (right-hand side), respectively, alongside 90% confidence intervals. The effects are changes in the probability to export and import, respectively, relative to 2006. Source: Authors' estimations based on ESEE data.

Figure 4 summarizes the coefficients of the year dummies in these models estimated by both approaches. The LDV FE models confirm the increase in both probabilities for exporting and importing after the crisis (both significant at 5% for 2012). The diff-GMM estimations, in contrast, cannot identify any statistically significant effect of the financial crisis and subsequent recession on trade participation. Importantly, none of our dynamic estimation approaches provides any evidence of a detrimental crisis effect on the extensive margin of trade.

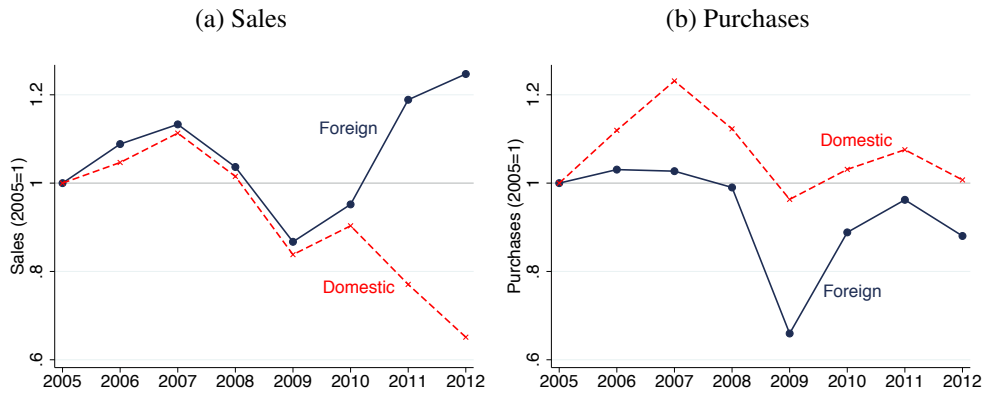
3.3 Export and import intensity

Next, we analyze the evolution of firms' trade *volumes* (i.e., the intensive margin of international trade). Over the pre-crisis period, the average exporter was shipping

[25] Neither for exporting ($p = 0.8969$) nor for importing ($p = 0.5363$) can we reject the null hypothesis that the overidentifying restrictions are valid (Hansen specification test of the instrument condition). For both exporting and importing, the Arellano-Bond test for zero autocorrelation in first-differenced errors of order one is rejected ($p = 0.000$), while that of order two cannot be rejected ($p = 0.1733$ for exporting and $p = 0.5363$ for importing).

goods and services worth 11.2 million € abroad (per year), and the average importer was purchasing goods and services worth 7.8 million € from abroad (per year). Figure 5 depicts real export values for those firms that were continuous exporters over the period 2005-2012 (Figure 5a), and real import values for those that were continuous importers (Figure 5b). The solid lines demonstrate that the financial crisis had a very strong negative effect at the intensive margin of international trade. Real trade values of both exporting and importing plummeted drastically from 2007 to 2009, but recovered partly in 2010, and further so in 2011. While exports had fully recovered by 2011 and increased further in 2012, imports had not returned to their pre-crisis level by 2012. These findings are in line with our insights from the decomposition exercise above.

Figure 5: Sales and purchases, 2005-2012†



†Note: In Figure 5a (Figure 5b), the sample is balanced on 456 (412) firms that are continuously exporting (importing) over the period 2005-2012. Foreign and domestic sales (Figure 5a) as well as foreign and domestic purchases (Figure 5b) are normalized to one in 2005. Sampling weights apply. Source: Authors' calculations based on ESEE data.

How strong were the adjustments in 2008 and 2009 compared to the concurrent drop in domestic activities? The dashed lines in Figure 5 show that while imports experienced a much stronger decline than domestic purchases (-36% versus -22% from 2007 to 2009), the drop in domestic sales was equally pronounced as the drop in exports (-24%). Thus, speaking of a great trade collapse in the Spanish case, while justified for firm-level imports, seems unwarranted when looking at firm-level exports. Most noteworthy, however, is the shift in sales that we observe in the years after 2010, away from the domestic market towards the foreign market. Within just two years, exports *increased* by 29%. Domestic sales, in contrast, *decreased* by 28%. Hence, it seems that firms were compensating for the collapse in aggregate demand in Spain (in the course of the events associated with the European sovereign debt crisis) by channeling their sales into the export market. This was possible because other countries like France and Germany, the two largest economies in Europe and the top export des-

tinations for Spain, had positive economic growth in each year from 2010 to 2012. Spain, in contrast, had negative economic growth over the same period.[26] The finding that firms substituted domestic with foreign sales accords well with macro-level evidence by Belke et al. (2015). We will return to this issue in our discussion in Section 4. Importantly, the observation that the foreign market has gained in importance relative to the domestic market has no correspondence on the import side, where domestic and foreign purchases were largely moving in parallel to one another.

We now use regression analysis to investigate the factors influencing the *trade intensity* of firms, defined as the share of exports in total sales or the share of imports in total purchases, over the period 2005-2012. We should like to emphasize the difference between these *shares* and the *levels* of firms' trade volumes; the latter we have used to isolate changes at the 'intensive margin' in the decomposition exercise in Section 3.1. There are three reasons for using the trade intensity rather than the log of exports or imports in our estimations. First, the trade intensity is an important measure of globalization at the firm level, which indicates how strongly firms are integrated into the global economy through international trade.[27] Second, the trade intensity is defined not only for exporters or importers, but also for firms that do not engage in international trade. This allows us to circumvent an obvious selection problem that arises when non-trading firms are excluded from the sample.[28] Third, we can use the full sample of firms to investigate how export and import intensity are intertwined by estimating the two equations (one for export intensity and one for import intensity) simultaneously. This also leads to efficiency gains in the estimation. For these three reasons it is both convenient and meaningful to use trade intensities as dependent variables in our regression analysis. However, for the interpretation of our results we must keep in mind that these regressions are not suitable for showing evidence on the great trade collapse as such, simply because domestic activity in Spain dropped substantially as well (as is clear from Figure 5).

We estimate a SUR model, where the first equation is specified as:

$$\mathit{ExpInt}_{it} = \boldsymbol{\gamma}^e \cdot \mathbf{X}^e_{it} + \delta^e_t + \delta^e_i + \delta^e_{ks} + \varepsilon^e_{it}, \tag{5}$$

with ExpInt_{it} denoting the export intensity (exports over total sales) of firm i in year t, and accordingly for the second equation with ImpInt_{it} (imports over total purchases)

[26] Source: Eurostat at http://ec.europa.eu/eurostat/.

[27] Behrens et al. (2013, p. 703) also examine ratios of international activity over total activity and point out that analyzing "the recent trade collapse using firm-level data on both trade and domestic operations [...] is necessary to gauge whether international activity has been disproportionately hit by the crisis."

[28] We explicitly model the process governing selection into exporting or importing in a robustness analysis discussed below.

as the dependent variable.[29] As we did above in the model for trade participation, we assume $E[\varepsilon^e_{it}\ \varepsilon^i_{jt}|\cdot] = 0$ whenever $i \neq j$, whereas $E[\varepsilon^e_{it}\ \varepsilon^i_{it}|\cdot] = \chi$. In a first specification, we treat the firm effects, δ^e_i and δ^i_i, as random variables that are not correlated with the other covariates, and thus exploit between-firm variation in the data. In a second specification, we relax this assumption by treating the firm effects as fixed effects that are explicitly controlled for, and we identify the parameters of interest from within-firm variation in the data by using SUR FE estimation.

Overall, the regression results reported in Table 3 are consistent with the evolution of trade intensities shown in Figure 5. Importantly, we do not find evidence that firms decreased their trade intensities due to the financial crisis. Hence, while both foreign and domestic activity declined sharply, firms did not become less 'globalized' in the crisis. On the contrary, we find a steady increase in the export intensity of firms over the post-crisis period 2009-2012, as documented by $\hat{\delta}^e_t > \hat{\delta}^e_{t-1}$ for $t \geq 09$. In the SUR FE model, the year-to-year differences that we find are statistically significant at the 1% level for $t \geq 10$. The rise in the export intensity identified in the data is not accompanied by a contemporaneous rise in import intensity, where we find no significant differences across years.

To substantiate these results, and to address similar concerns as in the previous section, we also consider the following dynamic specification of the model for exporting:

$$\mathit{ExpInt}_{it} = \rho^e \cdot \mathit{ExpInt}_{it-1} + \boldsymbol{\gamma}^e \cdot \mathbf{X}^e_{it} + \delta^e_t + \delta^e_i + \delta^e_{ks} + \varepsilon^e_{it}, \tag{6}$$

and accordingly for importing. The models are estimated alternatively by LDV FE and diff-GMM. In the LDV FE models, we find values of $\hat{\rho}^e \approx 0.220$ (significant at the 1% level) and $\hat{\rho}^i \approx 0.0132$ (not statistically significant). In the two-step diff-GMM estimations, we choose the same endogenous and pre-determined variables as well as the same number of lags as in Section 3.2. We estimate values of $\hat{\rho}^e \approx 0.182$ and $\hat{\rho}^i \approx 0.038$ (both significant at the 1% level) in the diff-GMM models.[30]

Figure 6 shows the estimated coefficients of the year dummies in dynamic models for the export intensity (left part) and the import intensity (right part), respectively, alongside 90% confidence intervals. The effects are changes in the trade intensities relative to 2006. Irrespective of the estimator we use, we find that the export intensity of firms has been on the rise ever since 2007, and continuously throughout the years of the financial crisis and subsequent recession. In line with the results obtained from our

[29] The parameters in these equations are of course different from the ones in Equations (2) and (3), but for convenience we use the same notation as before.

[30] Neither for exporting ($p = 0.3758$) nor for importing ($p = 0.1364$) can we reject the null hypothesis that the overidentifying restrictions are valid (Hansen specification test of the instrument condition). For both exporting ($p = 0.000$) and importing ($p = 0.012$), the Arellano-Bond test for zero autocorrelation in first-differenced errors of order one is rejected, while that of order two cannot be rejected ($p = 0.7233$ for exporting and $p = 0.1752$ for importing).

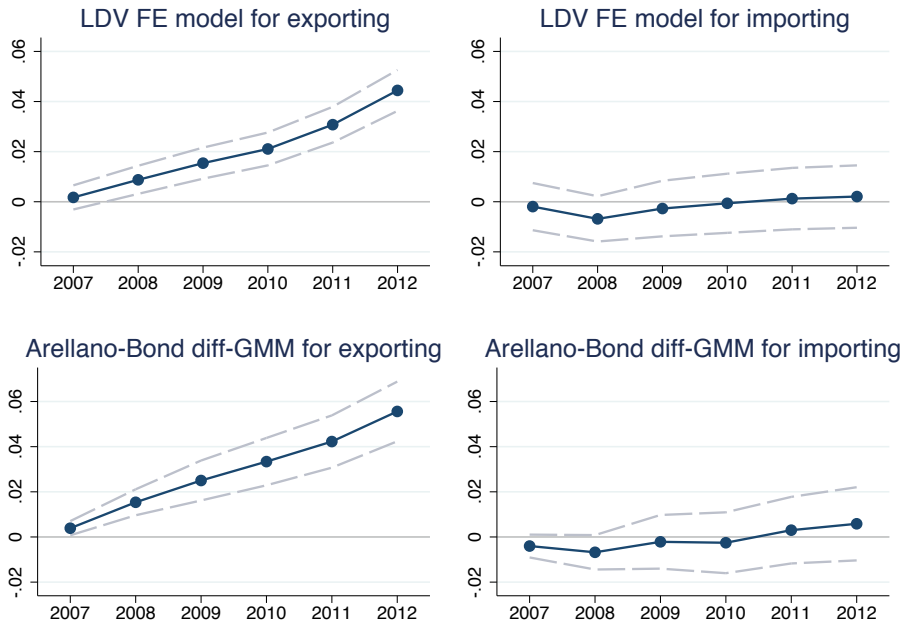
Table 3: Model for trade intensity†

	SUR Model		SUR Fixed Effects Model	
	Export intensity	*Import intensity*	*Export intensity*	*Import intensity*
	(1)	(2)	(3)	(4)
Year dummy 2006	-0.00276	-0.00672	-0.00157	0.000339
	(0.00353)	(0.00871)	(0.00252)	(0.00889)
Year dummy 2007	-0.00501	-0.0132	-0.00151	-0.00423
	(0.00417)	(0.00897)	(0.00257)	(0.00893)
Year dummy 2008	-0.00521	-0.0149	-0.000320	-0.00471
	(0.00492)	(0.00945)	(0.00294)	(0.00850)
Year dummy 2009	0.00124	-0.0122	0.00566*	-0.00292
	(0.00586)	(0.00969)	(0.00302)	(0.00794)
Year dummy 2010	0.0106*	-0.0146	0.00871***	-0.00248
	(0.00632)	(0.00990)	(0.00319)	(0.00786)
Year dummy 2011	0.0260***	-0.00565	0.0198***	-0.000175
	(0.00688)	(0.0100)	(0.00345)	(0.00775)
Year dummy 2012	0.0453***	-0.00348	0.0358***	0.000513
	(0.00758)	(0.0103)	(0.00399)	(0.00785)
Labor productivity (in logs)	0.0111**	0.0304***	-0.000243	0.00654**
	(0.00541)	(0.00413)	(0.00265)	(0.00304)
Capital intensity (in logs)	0.0281***	0.0220***	0.00428	-0.00315
	(0.00401)	(0.00338)	(0.00304)	(0.00551)
R&D intensity (in logs)	0.527***	0.396**	0.0752	0.219
	(0.178)	(0.184)	(0.0755)	(0.299)
Skill intensity (in logs)	-0.0232	0.0399**	-0.00532	0.00647
	(0.0189)	(0.0176)	(0.0123)	(0.0124)
Multinational dummy	0.110***	0.0263*	0.00142	0.0194*
	(0.0182)	(0.0140)	(0.0125)	(0.0112)
Type of good: intermediate good	0.0403***	-0.0145	0.00210	-0.0233
	(0.0106)	(0.0114)	(0.00700)	(0.0173)
Type of good: not defined	0.0366***	-0.0282***	0.00584	-0.00172
	(0.00981)	(0.0107)	(0.00726)	(0.0122)
Foreign ownership: > 0% & <= 50 %	0.00137	0.0195	0.00899	0.00266
	(0.0343)	(0.0244)	(0.0181)	(0.0236)
Foreign ownership: > 50%	0.104***	0.209***	0.00731	0.0436
	(0.0168)	(0.0154)	(0.0146)	(0.0294)
Internet dummy	0.0352***		-0.00253	
	(0.00829)		(0.00510)	
Industry-size-group fixed effects	Yes		Yes	
Firm fixed effects	No		Yes	
Number of observations	14,902		13,209	
Number of firms	2,861		2,601	
Cross-equation correlation	0.1148***		0.0146*	
R^2	0.370	0.289	0.0276	0.0042

†Note: This table presents estimated coefficients from fitting a system of seemingly unrelated regression equations (SUR) for export and import intensities (both without and with firm fixed effects). The dependent variables are export and import intensities, respectively. Robust standard errors (clustered at the firm level) are given in parentheses. *,**,*** denote significance at the 10%, 5%, 1% levels, respectively. Source: Authors' estimations based on ESEE data.

static models, the dynamic models do not indicate any significant change in the import intensity over time.

Figure 6: Dynamic models for trade intensity[†]



[†]Note: This figure shows estimated coefficients of year dummies in dynamic models as specified in Equation (6) for the export intensity (left-hand side) and the import intensity (right-hand side), respectively, alongside 90% confidence intervals. The effects are changes in the export intensity and import intensity, respectively, relative to 2006. Source: Authors' estimations based on ESEE data.

Notice that we include both exporters (importers) and non-exporters (non-importers) in the above estimations. An implicit assumption underlying this approach is that the intensive margin of trade is governed by the same factors (and in the same way) as the extensive margin. However, it is not clear theoretically why this should be the case. For example, in the Melitz (2003) model, the workhorse model of international trade with heterogeneous firms, the foreign and domestic sales of a firm react proportionally to changes in the firm's productivity, conditional on exporting. Hence, while productivity gains are expected to increase the likelihood of a firm to export, they need not increase the export intensity of a firm that already exports.[31] To address this issue, we also model the selection into exporting and importing explicitly by using a two-stage Heckman selection model with skill intensity as an exclusion restriction in the

[31] This could help explain why productivity enters insignificantly in the fixed effects specification above, since changes in the export status over time are rare, while changes in the export intensity of exporters are frequent.

first-stage equation.[32] The results (not reported) indicate a selection bias for the export intensity (by a significant coefficient of the inverse Mills ratio in the second-stage equation), but not for the import intensity. While the effects of a few control variables on the export intensity (e.g. productivity) change with the selection correction compared to the SUR model, the year fixed effects hardly change at all.

3.4 Firm competitiveness and crisis resilience

According to our data, in the pre-crisis period 2005-2008, exporting and importing firms alone were responsible for about 85% of total output, and about 74% of all jobs in Spanish manufacturing. These numbers are considerably higher in 2012 (92% for output and 82% for jobs), which attests to a growing importance of the global economy for the manufacturing sector in Spain. This development is partly explained by new firms entering foreign markets in recent years, as shown in Section 3.2, but it might also be the result of an exceptional degree of competitiveness and crisis resilience of those firms that had already been active on foreign markets before the financial crisis. Exploring this issue in greater detail is the purpose of this section.

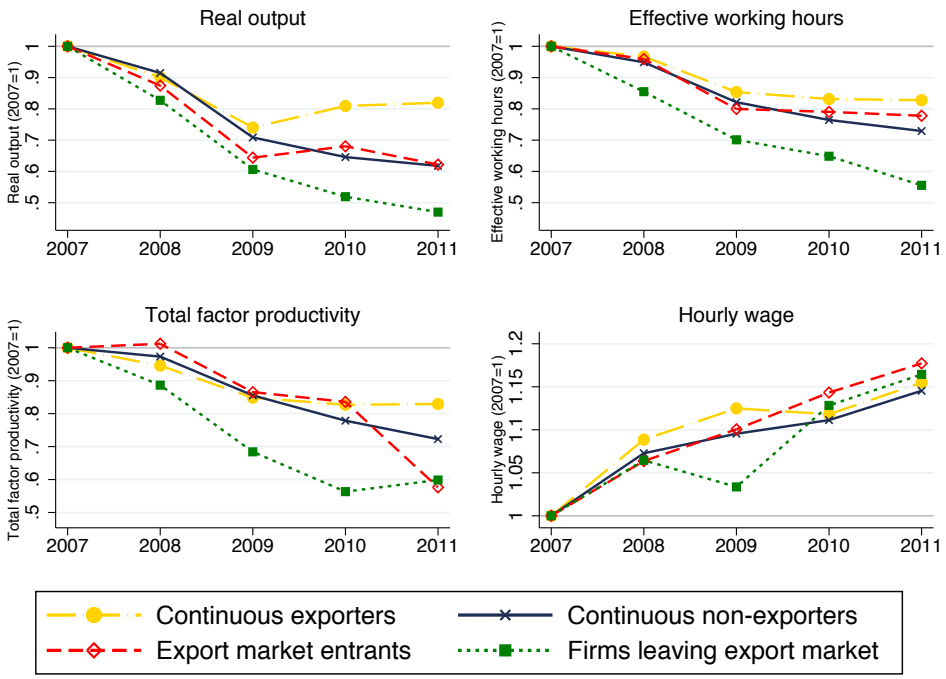
Figure 7 depicts the evolution of various measures of firm performance over the period 2007-2011 depending on the firm's export status. We look at four different firm characteristics that are informative for the analysis of firm behavior in the financial crisis: real output, effective working hours[33], total factor productivity (TFP), and the (average) hourly wage paid by the firm. Moreover, we distinguish between four different groups of firms[34]: continuous exporters (henceforth called exporters), export market entrants, firms leaving the export market, and continuous non-exporters (henceforth called non-exporters). To abstract from the effects of entry into and exit from production (which is analyzed separately below) as well as changes in sample composition due to nonresponse of firms and refreshment samples, we focus on the pre-crisis cohort and balance the sample on firms that are observed in each year over the period considered. All values are normalized to one in 2007.

[32] The underlying assumption is that the skill intensity of the firm determines the firm's trade status (i.e., the decision to export or import), but does not have a partial effect on the intensity of trade.

[33] As explained in Section 2, effective working hours is our preferred measure of employment and should be interpreted as an input-based indicator of firm size, not as a measure of productivity. All results reported in this section look almost identical if we use the number of employees (head count) instead.

[34] The precise definition of each group is given in the note to Figure 7.

Figure 7: Firm competitiveness and crisis resilience, 2007-2011[†]



[†]Note: The sample is balanced on firms that are observed in each year from 2007 to 2011. Continuous exporters are 671 firms that export in each of the years from 2005 to 2012 (if observed); continuous non-exporters are 310 firms that do not export in any of the years from 2005 to 2012 (if observed); export market entrants start exporting in one of the years from 2009 to 2012 and stay in the export market after entry (43 firms); firms leaving the export market stop exporting in one of the years from 2009 to 2012 and do not re-enter after exit (21 firms). All variables are normalized to one in 2007. Sampling weights apply. Source: Authors' calculations based on ESEE data.

There are several insights to be gained from Figure 7. First, firm output and employment were under strong pressure during the financial crisis and contracted sharply for all groups of firms. Both exporters and non-exporters reduced their output by more than 25% from 2007 to 2009. Those firms leaving or entering the export market reduced their output even more drastically (by more than 35%). The reductions in employment were smaller than those in output for all groups, ranging from 15% to 30%, but we observe the same ranking across firms with different export status.

Second, output and employment stabilized after 2009, but this development is fully attributable to exporters and export market entrants. Non-exporters and firms leaving the export market, in contrast, continued to shrink further. More generally, it turns out that a firm's export status is a good indicator for how well firms did both during and after the peak of the financial crisis, as exporters outperformed all other firms over the period 2007-2011. The cumulative differences that we find between exporters and non-exporters are remarkable. For example, we find that non-exporters produced 38%

less in 2011 than in 2007, while for exporters the reduction was 18%. Similarly, non-exporters destroyed 27% of their jobs from 2007 to 2011, whereas for exporters the same number is 17%.[35]

Third, the evolution of TFP shows marked differences between exporters and non-exporters. While from 2007 to 2009 the TFP of both types of firms declined similarly by about 15%, the trajectory *after* 2009 correlates strongly with the firm's export status. For exporters, the level of TFP was about the same in 2011 as it was in 2009. For non-exporters, in contrast, the level of TFP had deteriorated by another 15% in 2011 relative to 2009. Hence, after the financial crisis, non-exporters have lost part of their technical and managerial efficiency in production (i.e. their ability to transform inputs into outputs).[36] This is a remarkable observation that is likely to shape the dynamics of the Spanish manufacturing sector over the next couple of years. To gauge the importance of this development for aggregate performance, we have used our firm-level estimates of TFP to compute changes in industry-level productivity. Aggregate productivity is influenced not only by firm-level TFP, but also by the allocation of factors across firms. Low-productivity firms exiting the market and freeing up resources to be used by high-productivity firms leads to aggregate productivity gains. We have computed industry-level productivity as the market-share weighted average of firm-level TFP and found strong heterogeneity in the evolution of aggregate TFP over the period 2005-2012, with some industries experiencing a drastic decline in TFP by more than 65% in response to the financial crisis (such as the industries "computer, electronic and optical products" or "ferrous and non-ferrous metals"), and very few showing a positive performance (such as "other transportation equipment"). The overall performance at the industry-level was poor: in 18 out of 20 industries TFP declined between 2007 and 2012. While beyond the scope of this paper, analyzing these issues in more detail might prove fruitful in future research (see Hospido and Moreno-Galbis, 2015, for a first study in this direction).

Fourth, the (nominal) hourly wage paid by firms increased on average by around 7.5% from 2007 to 2008 and by a compound annual growth rate of about 2.3% thereafter.[37] Importantly, although wage moderation efforts are visible during the financial crisis, *real* wages continued to increase even after 2007, given a compound annual

[35] Not surprisingly, firms leaving the export market in one of the years 2009-2012 performed weakest in terms of real output and employment throughout the period from 2007 to 2011.

[36] One might be tempted to argue that firm-specific input and output price changes are responsible for this observation. However, firm-level input and output pricing information available in the ESEE data allow us to demonstrate that this is not the case, as we find hardly any differences in the evolution of prices between exporters and non-exporters; see Figure A.1 in Appendix A.

[37] Due to data limitations we cannot distinguish wages by different types of workers (e.g. high-skilled vs. low-skilled workers). Hence, the observed wage changes at the firm level may be due to adjustments in both the wages of continuously employed individuals and the composition of employment (e.g. in terms of skills, types of contracts, or migration background).

inflation rate of 1.6% over the period 2008-2011.[38] Overall, the evolution of wages is very similar across the four different groups of firms. For exporters, real wages declined slightly after 2009, making Spanish exports more competitive internationally.

Putting these insights together, we may reflect that the Spanish labor market adjusted first and foremost through a contraction in labor demand causing a sharp increase in involuntary unemployment. Owing to the dual nature of the Spanish labor market (highly protected permanent vs. poorly protected temporary workers),[39] this took the form of massive lay-offs of low-skilled and medium-skilled workers with temporary contracts, rather than a reduction of the employment intensity of individual workers.[40] The observed development can entail negative effects for future economic growth, as the skills of unemployed workers erode substantially, especially for longer unemployment spells.[41]

A particularly important and fundamental dimension of firm performance is firm survival. Looking into firm survival in the context of our paper is interesting, because the challenges posed by a crisis as severe as the one in 2008/09 are more demanding than the ones associated with the usual business cycle. Figure 8 serves to illustrate differences in firm survival depending on firms' export status. The figure follows two different firm cohorts over a five-year period, and depicts the share of surviving firms in each cohort (separately for exporters and non-exporters): the first cohort refers to firms observed in 2003 (Figure 8a) and the second cohort to firms observed in 2007 (Figure 8b). We define market exit (or, equivalently, firm death) as going out of business or terminating manufacturing activities (and we exclude firms that ceased to collaborate, did not respond to the questionnaire, or could not be localized). For simplicity, we examine only continuous exporters and continuous non-exporters.

Consider first Figure 8b, which follows the 2007 cohort of firms through the crisis period 2007-2011. The figure shows that the share of surviving firms decreases significantly faster for non-exporters than for exporters throughout this period. Out of 100 firms that were producing and selling *only* in the domestic market in 2007, 43 firms had exited the market by 2011. In contrast, out of 100 exporters observed in 2007, only 29 had exited the market over the same period. Hence, those firms entering

[38] The inflation data are elicited from consumer price data provided by the OECD at http://stats.oecd.org/Index.aspx?DataSetCode=MEI_PRICES.

[39] This peculiarity of the Spanish labor market is heavily criticized by leading Spanish economists; see for instance chapter four in Garicano (2014).

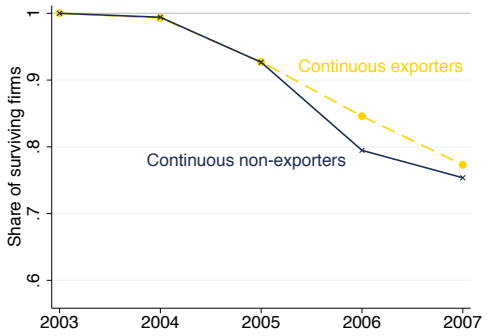
[40] The opposite happened in Germany, where the unemployment rate hardly increased at all through the crisis years. Burda and Hunt (2011) discuss this issue as "the German Labor Market Miracle".

[41] Gregory and Jukes (2001) provide empirical evidence on this mechanism by estimating the effect of unemployment on earnings following re-employment for British men over the period 1984-1994. However, one of the conclusions that can be drawn from their analysis is that human capital depreciation is lowest for young and low-paid workers and highest for middle-aged and high-paid workers. This might ameliorate concerns about the future growth of the Spanish economy, as the crisis caused an increase in unemployment mainly among less experienced and unskilled workers.

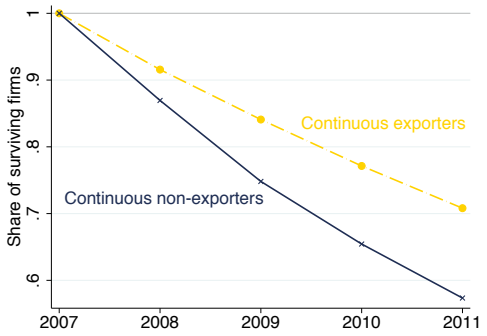
the crisis as exporters (and staying in the export market) had higher chances to survive the crisis than those starting out as non-exporters. For the sake of comparison, consider next Figure 8a, which conducts the same exercise by following the 2003 cohort of firms through the pre-crisis period 2003-2007. We find that in this earlier period survival rates are higher and very similar across exporters and non-exporters. To conclude this part of our analysis, we may thus state that exporters were more resilient than non-exporters to the exceptional economic distress associated with the financial crisis and the subsequent recession.

Figure 8: Firm survival, before (2003-2007) and during the crisis (2007-2011)†

(a) 2003 cohort of firms



(b) 2007 cohort of firms



†Note: In Figure 8a, the sample is restricted to the 2003 cohort of firms; continuous exporters are 714 firms that export in each of the years from 2001 to 2008 (if observed); continuous non-exporters are 341 firms that do not export in any of the years from 2001 to 2008 (if observed). In Figure 8b, the sample is restricted to the 2007 cohort of firms; continuous exporters are 949 firms that export in each of the years from 2005 to 2012 (if observed); continuous non-exporters are 544 firms that do not export in any of the years from 2005 to 2012 (if observed). Source: Authors' calculations based on ESEE data.

We next address the issue of performance differences between exporters and non-exporters in a more rigorous way by using econometric methods. It is a well-known fact that exporters have a competitive edge over non-exporters. Bernard and Jensen (1999) and others have shown that exporters are on average more productive than non-exporters, have higher sales, and employ more workers. These differences have been quantified in terms of so-called *exporter premia*. We estimate *time-varying* exporter premia for several measures of firm performance and document the evolution of these premia during the financial crisis and subsequent global recession. We also identify (and quantify) the advantage of exporters regarding the likelihood to survive the crisis.

Building on the methodology established in the literature, we estimate variants of the following econometric model:

$$Performance_{it} = \lambda_t \cdot Exporter_{it} + \boldsymbol{\theta} \cdot \mathbf{Z}_{it} + \phi_t + \phi_{ks} + \varepsilon_{it}, \tag{7}$$

where $Performance_{it}$ is one of the following four variables: real output (total produc-

tion value, in logs), effective working hours (in logs), TFP (in logs), and survival (as a dummy variable indicating that the firm is still active and producing *in the following year*). As above, the variable $Exporter_{it}$ is a dummy variable for positive exports, λ_t represents the coefficients of interest (with $t = 05, \ldots, 12$), ϕ_t is a year fixed effect, ϕ_{ks} is an industry-size-group fixed effect, and ε_{it} is the error term. The vector $\mathbf{Z}_{it}$ collects a number of firm-specific and time-varying control variables, and the vector $\boldsymbol{\theta}$ includes the corresponding parameters to be estimated. This setup allows us to estimate the evolution of *conditional* performance differences between exporters and non-exporters, as we control for the industry-size-group combination corresponding to the firm, as well as a common set of firm-level characteristics (identical to those used in the previous section, but excluding the performance variables themselves). We estimate Equation (7) by OLS without firm fixed effects, which allows us to identify the *levels* of different exporter premia as well as their evolution over time.

Figure 9 displays our estimates of the year-specific exporter premia $\hat{\lambda}_t$ for the different performance variables. In terms of output, employment, and productivity, our results demonstrate that exporters were outperforming non-exporters throughout the period of analysis. Furthermore, these differences have been increasing over time, in particular in the years 2011 and 2012, so exporters magnified their size and productivity advantages after the financial crisis. More precisely, in 2007, exporters were on average 22% larger in terms of output and 6% larger in terms of employment compared to non-exporters. These differences had widened to more than 50% for output and 15% for employment by 2012. Similarly, exporters increased their TFP premium from 5% to 13% between 2007 and 2012.

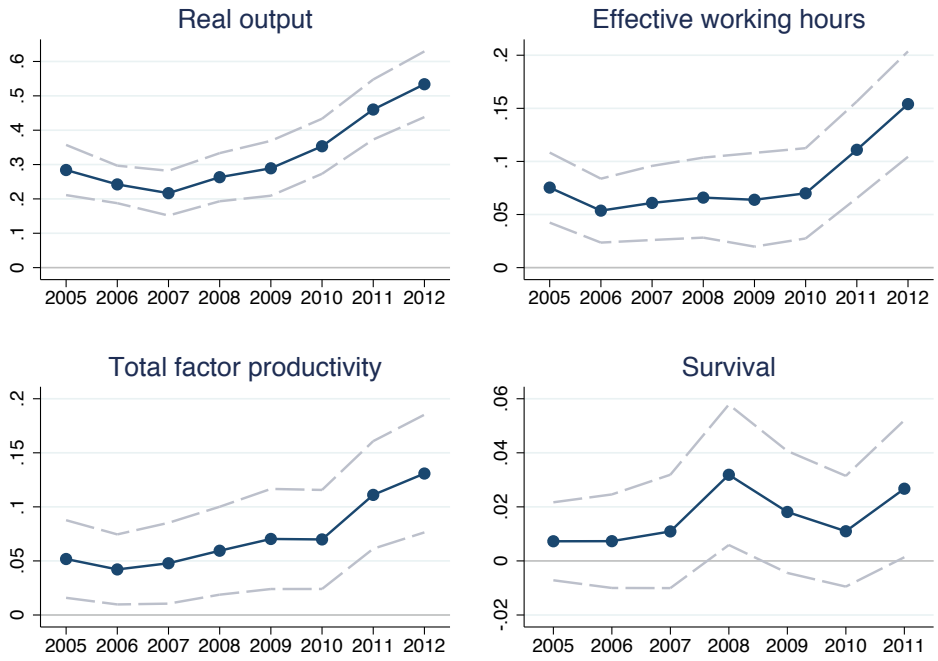
Two comments on these results are in order. First, the estimated exporter premia accord well with the evolution of real output, employment, and TFP depicted in Figure 7. As the performance of exporters was less detrimentally affected by the crisis than the performance of non-exporters, the performance premia of exporters consequently increased over the crisis period. Second, the levels of, and the changes in, the estimated exporter premia are arguably determined by a host of different factors.[42] An investigation into these factors is beyond the scope of our analysis. In a similar vein, while our estimates show significant and increasing performance differences between exporters and non-exporters and thus point to extra benefits of exporting in times of crisis, we must emphasize that our regressions do not allow for a *causal* interpretation. It seems at least conceivable that exporting firms fared better during the crisis than non-exporting firms due to factors that gained in importance in the crisis but are not

[42] The usual explanation for observing positive exporter premia is that success leads to exporting (based on the idea that only the 'good' and successful firms are able to cover the additional costs associated with exporting) or that exporting leads to success (due to technology or knowledge spillovers and learning by exporting). These explanations are of course not mutually exclusive.

directly related to exporting (such as superior management quality or a more flexible and efficient labor force). A rigorous analysis of these different factors and the question of whether exporting was *causally* associated with a stronger performance in the crisis is left for future research.

As for the estimated exporter premium for firm survival in Figure 9, we find that it is positive throughout, but small and insignificant in the pre-crisis period. It is significantly positive for the first time in 2008, where it reaches its peak of 3.2 percentage points. This estimate suggests that exporters were more likely than non-exporters to survive the peak of the crisis and still be producing in 2009. In the subsequent years, the survival premium remains above the pre-crisis level, but is only significantly different from zero in 2011. Again, this finding is in line with the analysis in Figure 8 and suggests that exporting was beneficial for firm survival in the crisis.

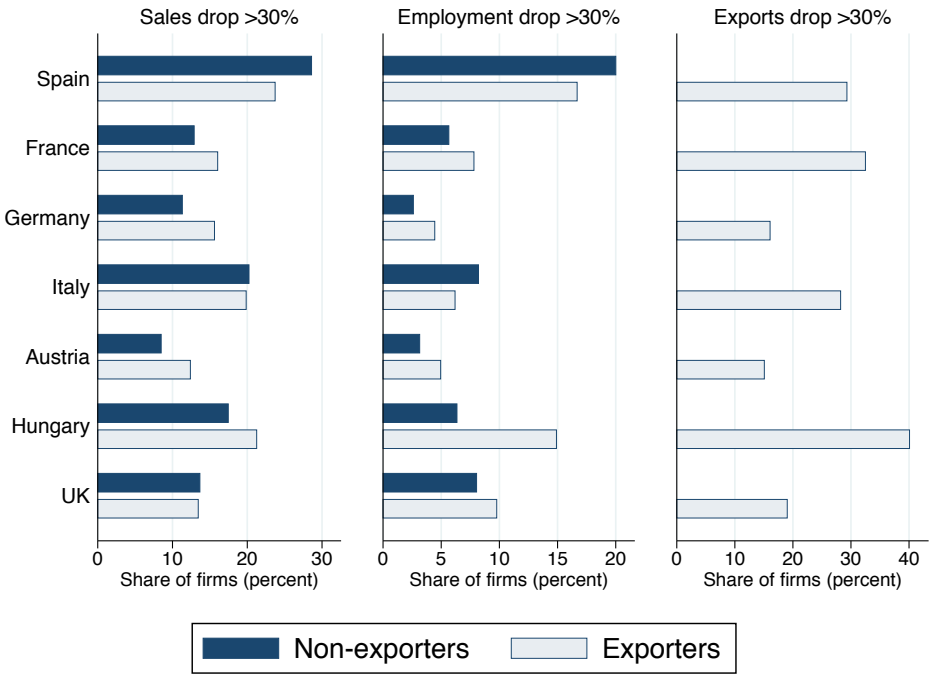
Figure 9: Exporter premia, 2005-2012[†]



[†]Note: The figure shows estimates of λ_t in Equation (7) for $t = 05, \ldots, 12$, alongside 95% confidence intervals. These estimates can be interpreted as year-specific exporter premia for the variables indicated in the subfigures. For output, effective working hours, and TFP, the exporter premia are given in percentages. For survival, the premium is given in percentage points. The estimated premia are conditional on the share of foreign capital in the firm's joint capital (0%; $> 0\%$ & $\leq 50\%$; $> 50\%$), the firm's capital intensity, R&D intensity, skill intensity, type of good produced (intermediate good; final good; not defined), multinational status, as well as the industry-and-size-group cluster to which the firm belongs. Confidence intervals derive from robust standard errors clustered at the firm level. Source: Authors' estimations based on ESEE data.

Is the fact that exporters were so much more resilient to the crisis than non-exporters special to the case of Spain, or do we observe a similar pattern in other European countries too? To answer this question, we exploit direct questions on firms' export status and their crisis performance in the EFIGE data set. As indicators of crisis performance, we compute the shares of firms (by country and export status) that reduced their sales, employment, and exports by at least 30% in 2009 compared to 2008.[43]

Figure 10: Firms' crisis performance across European countries[†]



[†]Note: This figure reports the share of firms (by country and export status, in percent) that reduced their sales, employment, and exports by more than 30% in 2009 (compared to 2008). The number of firms reporting changes in sales are 2,832 for Spain, 2,973 for France, 2,929 for Germany, 3,021 for Italy, 439 for Austria, 488 for Hungary, and 2,046 for the UK. The number of firms for all other variables are slightly smaller. Sampling weights apply. Source: Authors' calculations based on EFIGE data.

Figure 10 suggests that Spain is indeed a special case, at least in two dimensions. First, we see that, whether we look at exporters or non-exporters, firms in Spain were hit the hardest by the crisis in terms of overall performance.[44] The share of firms that drastically reduced their sales and their employment was larger in Spain than in any

[43] The results are qualitatively similar when examining the shares of firms that experienced any reduction at all instead of applying the 30% threshold.

[44] Due to data limitations, the export status refers to the year 2008 instead of 2009, but it is highly persistent in the EFIGE sample. More than 97% of exporters, but virtually none of the non-exporters, had exported before 2008 (as reported by firms in the data set).

other country covered by the EFIGE data. For example, one fifth of all non-exporting firms in Spain shed more than 30% of their labor in 2009, more than twice the share observed in any other country in our sample.

The second insight from Figure 10 is that the superior crisis performance of exporters over non-exporters seems to be the exception rather than the rule in Europe. Not only do the EFIGE data confirm our previous findings that in Spain it was the non-exporting firms that suffered the most in 2009; the data also show that it is *only* in Spain that a significantly larger share of non-exporters than of exporters saw their sales plummet. The same holds true for the strong reductions in employment (with Italy being the only exception and showing a pattern similar to Spain, although on a much lower level). It would be interesting to investigate these cross-country differences (and the underlying causes) in more detail in future work.

We finally notice that in terms of export reductions Spain ranks in the middle of the seven-country sample. This is perhaps surprising in light of the strong relative export performance described in the introduction and depicted in Figure 1. A possible explanation may be that in Spain it is very few very successful firms that are responsible for the increase in exports over the last couple of years (as suggested by Antràs, 2011). Moreover, one should keep in mind that in Figure 10 we only look at changes between 2008 and 2009, whereas Figure 1 describes the evolution of exports over the entire period 2007-2013.

4 Discussion

4.1 Improved aggregate competitiveness

The analysis provided in this paper is a micro-level analysis emphasizing the role of firm heterogeneity in international trade during the crisis years. Yet, the economic and political discussions surrounding the recent performance of the Spanish economy are often couched in terms of what is vaguely referred to as "international competitiveness" or "aggregate competitiveness". Can recent improvements in competitiveness explain the exceptionally strong export performance of the Spanish economy? We now provide a brief look into relevant data that allow us to give a tentative answer to this question. At this point it proves useful to recall some insights of standard macroeconomic theory. The key assumption is some nominal imperfection in the short run (e.g. price stickiness), such that the real wage does not instantaneously adjust to fluctuations in aggregate demand. This implies that the short-run aggregate supply curve is not vertical, so that a negative shock to aggregate consumption or investment leads to lower output and involuntary unemployment. For a country like Spain, which is well integrated into the global economy, international trade can provide a remedy for

such a negative demand shock. This can happen through a nominal depreciation of the Euro vis-à-vis other currencies (over the short and medium run), as well as through differential price changes that improve the Spanish terms of trade within the Eurozone (over the medium and long run). We find evidence that both channels are likely to have played a significant role in the favorable development of Spanish exports.

As for the first channel, nominal exchange rate depreciation, we examine the two most important non-Eurozone destinations for Spanish exports: the United Kingdom (the fifth largest importer of Spanish goods in 2013) and the United States (the sixth largest importer).[45] When we look at the relevant period from January 1, 2009, to December 31st, 2013, the Euro depreciated relative to both the Pound sterling and the US dollar (in each case by 5% when comparing yearly averages). As a result, Spanish products became less expensive in the UK and the US, whereas imports from these two countries became more expensive for Spain. This development seems to be reflected in the trade data: from 2009 to 2013, total Spanish exports to the UK and the US increased by a remarkable 55%, whereas total imports increased by just 9%. In contrast, when considering the Eurozone countries among the top six export destinations (France, Germany, Portugal, and Italy), for which nominal depreciation did not play any role, total Spanish exports increased by much less (viz. by 24%), while imports increased at a similar rate (viz. by 7%).

To offer a more systematic view of the issue, we examine the evolution of nominal *effective* exchange rates for Spain. Nominal effective exchange rates are weighted averages of the usual bilateral nominal exchange rates, where the weights reflect the importance of trading partners in terms of their volume of international trade with Spain (considering only trade in manufacturing goods). It turns out that, irrespective of the details of the weighting scheme applied, we observe a depreciation of Spain's nominal effective exchange rate (EER) over the period 2009-2013, and thus a corresponding improvement of its competitive position. For example, for the ECB EER-38 group of currencies plus the latest composition of the Eurozone, the index for Spain's nominal effective exchange rate decreased from 107.5 in 2009 to 104.8 in 2013 (having normalized the index to 100 in 1999).[46] This observation corroborates the presumption that nominal depreciation has contributed to boosting Spanish exports, while it has made imports from outside the Eurozone more expensive (on average).

[45] All data mentioned in this paragraph are readily accessible through the website of INE.

[46] The depreciation is not monotonic over the period considered and has its minimum in 2012 at 102.6. The countries in the ECB EER-38 group of currencies are the non-Eurozone EU member states (Bulgaria, Czech Republic, Denmark, Hungary, Poland, Romania, Sweden, and the United Kingdom), plus Algeria, Argentina, Australia, Brazil, Canada, Chile, China, Croatia, Hong Kong, Iceland, India, Indonesia, Israel, Japan, Malaysia, Mexico, Morocco, New Zealand, the Philippines, Russia, Norway, Singapore, South Africa, South Korea, Switzerland, Taiwan, Thailand, Turkey, the United States, and Venezuela. All data on nominal and real exchange rates come from the Statistical Data Warehouse of the ECB: http://sdw.ecb.europa.eu/.

As for the second channel, differential price changes may improve the competitive position of Spain even within the Eurozone, where nominal exchange rates are fixed at unity. Since the drop in aggregate demand was stronger in Spain than in most other Eurozone countries (see Figure 10 for supporting evidence), we should see a change in *real* exchange rates improving Spain's competitive position vis-à-vis other Eurozone countries (especially those that quickly returned to economic growth after the financial crisis). To investigate this possibility, we first examine real effective exchange rates (REER) based on the ECB's harmonized index of consumer prices (HICP). We find that the HICP-based index for Spain's REER vis-à-vis the latest composition of the Eurozone plus the ECB EER-12 group of currencies decreased only slightly from 114.8 in 2009 to 113.6 in 2013.[47] Moreover, a similar or even more pronounced decrease in this index is observed for many other Eurozone countries as well (e.g. Germany, France, Greece, and Italy). Hence, differences in the development of consumer prices within the Eurozone are not a relevant channel when it comes to explaining the recent export performance of Spain.

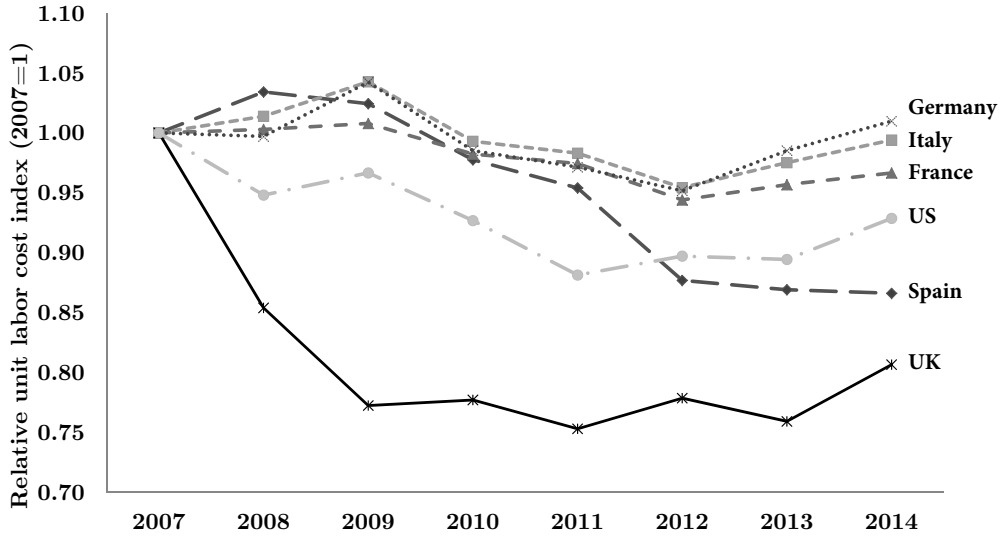
One issue with the HICP-based REER is that the evolution of consumer prices might not accurately reflect changes in a country's competitive position in international trade. The reason is that a significant share of consumption expenditure is on non-tradable goods and services, while many tradable goods are not included in the consumption basket (e.g. capital goods). Hence, an important alternative to looking at consumer prices is to focus on unit labor costs. It turns out that for Spain this distinction is extremely important. In particular, the index for Spain's REER based on unit labor costs (but otherwise defined as above) decreased from 119.5 in 2009 to 105.8 in 2013, while it basically stagnated for Germany, Italy, and France. Only Greece, arguably the Eurozone country that experienced the most adverse shock to aggregate demand, showed a development comparable to that of Spain. Hence, Spain has become more competitive internationally through internal devaluation (i.e., real wages growing less than productivity relative to other Eurozone countries).

One way to summarize this discussion is to look at the evolution of *relative unit labor costs*, a broad competitiveness measure that reflects both nominal exchange rate depreciation and internal devaluation at the same time. Figure 11 shows that, unlike other countries such as Germany, Italy, France, the UK, or the US, Spain has experienced a *steady decline* in relative unit labor costs since 2008. The decrease in relative unit labor costs was particularly pronounced in 2012, the year for which we have estimated the strongest conditional difference in both export participation and export intensity compared to the pre-crisis period (see Tables 2 and 3). Interestingly, the

[47] The countries in the ECB EER-12 group of currencies are Australia, Canada, Denmark, Hong Kong, Japan, Norway, Singapore, South Korea, Sweden, Switzerland, the United Kingdom, and the United States.

development since 2008 is in stark contrast to the one before 2008. Antràs (2011) describes how exports from Spain fared surprisingly well in spite of *deteriorating* competitiveness observed prior to the crisis. Hence, the evolution of relative unit labor costs may play a role in explaining the strong export performance of Spain in the years after 2008, while it is more difficult to reconcile with the export performance over the previous decade. It should be noted, however, that the largest firms in Spain experienced a more favorable development of unit labor costs than many of their European competitors already before 2008 (as pointed out by Antràs, 2011).[48] Because the large firms are responsible for the lion's share of a country's exports, it seems plausible that this development had a positive impact on aggregate exports also before 2008.

Figure 11: Relative unit labor costs, 2007-2014†



†Note: Competition-weighted relative unit labor costs for the overall economy in US dollar terms. Competition weights take into account the structure of competition in both export and import markets of the goods sector of 49 countries. An increase in the index indicates a real effective appreciation and a corresponding deterioration of the competitive position. The index accounts for annual shifts in the composition of trade flows. Source: OECD Economic Indicators. See also OECD Economic Outlook Sources and Methods at http://www.oecd.org/eco/sources-and-methods.htm.

It emerges from our micro-level analysis that the factors underlying the observed increase in aggregate competitiveness in Spain are unrelated to technological improvements or a more efficient resource allocation, as a large majority of manufacturing industries in Spain experienced a *decrease* in aggregate TFP (as demonstrated above). Rather, the enhanced competitiveness of Spain seems closely linked to the country's problematic labor market performance. Record unemployment rates around 25% in

[48] In a similar vein, Antràs (2011) argues that in terms of productivity the largest firms in Spain outperform not only their domestic peers, but also their European competitors.

2012 and 2013 put downward pressure on real wages.[49] In the face of downward nominal wage rigidity and overall low inflation rates, however, it is to a significant extent the increase in real wages in some of Spain's most important trading partners that boosted Spain's competitive position. For example, real wages in Germany increased by 3.6% (while unemployment decreased) over the period 2010-2013. This is by far the largest increase the country has experienced over any three-year period in the recent past.[50] Exports from Spain have thus clearly benefited from the cross-country differences in labor market adjustments within Europe.

An interesting implication of our analysis in Section 3.4 is that exporting firms contributed the most to enhanced aggregate competitiveness in terms of relative unit labor costs. These firms increased their output after 2009, while at the same time reducing both their employment and their real wages. While our data show that this development is not driven by technological improvements within the firm,[51] it is in sharp contrast to non-exporting firms, which continued to reduce their output and saw their productivity decline even after the financial crisis.

4.2 Substituting domestic with foreign sales

Another explanation for the strong export performance of Spain that we want to discuss in some detail is directly tied to the fact that aggregate demand was more strongly adversely affected in Spain than in many other countries in the aftermath of the financial crisis and through the subsequent years.[52] As mentioned in the introduction, Spain went through a double-dip recession in 2009 and 2011-13. The findings of our microdata analysis, in particular the observations that more firms entered the export market after the financial crisis, while existing exporters increased their share of exports in total sales, suggest that firms in Spain substituted domestic with foreign sales.

Under which conditions can we expect firms to treat domestic and foreign sales as substitutes? Not necessarily under the conditions of standard trade theory (e.g. Melitz, 2003), where firms maximize profits in the domestic and the export market independently of one another. Moreover, failure in one market might actually trigger failure in the other market, for example when liquidity constraints take hold (as sales in the domestic market might generate the extra liquidity necessary to generate sales in the foreign market). However, two recent papers construct theoretical models that help rationalize a substitutive rather than complementary relationship between domestic

[49] See Eurostat data available at http://ec.europa.eu/eurostat/web/lfs/data/database.

[50] See the (real) wage data available from the OECD at http://stats.oecd.org/.

[51] As shown in Figure 7, exporting firms had about the same level of TFP in 2009 as in 2011.

[52] For example, GDP data from INE as well as the data depicted in Figure 10 suggest that the drop in aggregate demand in 2009-2012 was more dramatic in Spain than in most of its major trading partners.

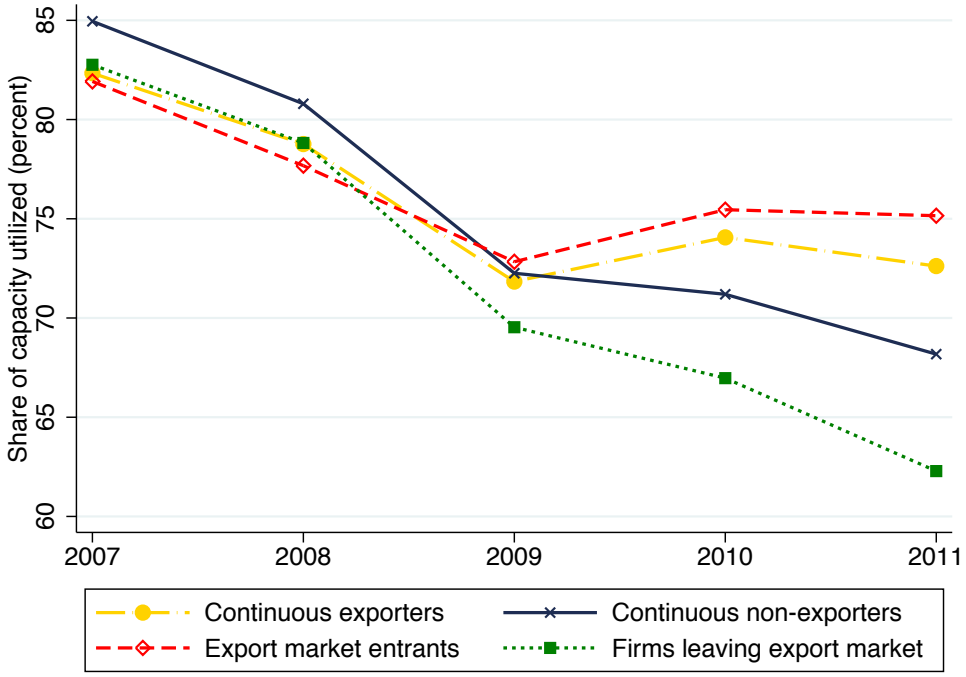
and foreign sales. Both papers are based on the assumption of production costs being convex in the short run; we briefly discuss both of these papers in turn and argue that they are likely to be relevant in the Spanish case.

A first explanation is advanced by Vannoorenberghe (2012). In his model with labor as the only factor of production, firms face increasing marginal costs of production in the short run, as it becomes increasingly expensive for the firm to employ more labor. This implies a negative correlation between foreign and domestic sales within the firm, and a negative domestic demand shock will induce the firm to sell larger quantities on the export market in the short run. The overall rigidity and dual nature of the Spanish labor market, granting high job protection to permanent employees, makes such cost convexities very likely, as they might rule out the first-best response of firms to demand shocks (in terms of adjusting the labor input). Hence, the theory by Vannoorenberghe (2012) might partly explain the significant increase in the export intensity of incumbent exporters over the crisis period that we have identified in Table 3.

Can a slump in domestic demand also trigger the entry of new firms into the export market that we observe in Spain after 2009? Focusing on the extensive margin, Blum et al. (2013) set up a Melitz (2003) model in which firms face capacity constraints due to investments in fixed capital ex ante (i.e., before demand shocks in the domestic and the export market are known to the firm).[53] This assumption again implies convex production costs in the short run. In response to an adverse shock to domestic demand, their model predicts not only a shift of sales to the foreign market within exporters (as in Vannoorenberghe, 2012), but also export market entry of firms that were previously confined to the domestic market. The intuition for this prediction is that if capacity is utilized below a certain threshold, it is optimal for the firm to bear the cost of exporting. For some firms, exporting then essentially serves as a means to survive the shock. Extreme changes in domestic demand, like the deep recession in Spain, can thus push more firms into the export market in the short run. This intuition is also in line with the findings by Belke et al. (2015), who provide empirical support for a substitutive relationship between domestic and foreign sales in their analysis of macro data for several Eurozone countries. The evidence is particularly strong for the southern European countries Italy, Portugal, and Spain.

[53] See Soderbery (2014) for a model that yields similar predictions based on linear demand and capacity constraints.

Figure 12: Capacity utilization, 2007-2011[†]



[†]Note: The sample is balanced on firms that are observed in each year from 2007 to 2011. Capacity utilization is measured in percentage points. For the definition of the different groups of firms, see the note to Figure 7. Sampling weights apply. Source: Authors' calculations based on ESEE data.

Figure 12 demonstrates that our micro data are consistent with an explanation based on capacity constraints and hence convex production costs in the short run. It depicts the evolution of average capacity utilization by groups of firms defined according to their export status (in analogy to Figure 7). From 2007 to 2009, capacity utilization dropped from above 82% to below 73% for all groups of firms. A reduction of this size seems large enough to trigger the above-mentioned adjustments. Of particular interest is the heterogeneity in this drop and the development during the later years. On the one hand, for continuous non-exporters, capacity utilization continued to decline after 2009, giving rise to an accumulated loss of 17 percentage points (20%) for the period from 2007 to 2011.[54] For continuous and new exporters, on the other hand, capacity utilization not only declined by less from 2007 to 2009, but it also increased again after 2009. Interestingly, export market entrants show the most favorable development over the observed period, which suggests that starting to export indeed helped these firms to exploit otherwise unused (and costly) capacities. Taken together, the available evidence suggests that cost convexities might have contributed to the fact that firms

[54] Firms leaving the export market experienced an even larger decline of 20 percentage points (25%).

rely more on exports today than before the financial crisis, as we have documented in our main analysis.

5 Conclusion

We have explored a rich firm-level data set from Spain to provide novel evidence on firm behavior during and after the 2008 financial crisis. We have investigated changes at the extensive and intensive firm-level margins of trade, as well as performance differences (jobs, productivity, and firm survival) between exporting and non-exporting firms. We find that the trade collapse in 2009 is almost fully explained by adjustments at the intensive margin. The number of firms that were forced to exit the export market due to the crisis is negligible, and firms allocated a larger fraction of their sales to foreign markets, especially in the years after 2010. Moreover, we find a growing performance gap between exporters and non-exporters, which shows that exporters proved to be more resilient to the economic challenges they were facing during the global financial crisis and subsequent recession. Exporters now account for a larger share of output and jobs, and they contribute more to aggregate productivity than before the financial crisis. However, we observe a decline in the aggregate productivity of the manufacturing sector as a whole over the crisis period. These findings are of direct relevance for the ongoing political debate about the current and future economic situation in Spain.

We conclude by pointing out some interesting similarities between the current situation in Spain and the situation observed more than a decade ago in Germany.[55] From the mid-1990s and into the 2000s, Germany suffered from high unemployment and poor economic growth. However, relative unit labor costs had set out to decrease in 1995, boosting German exports through a gradual improvement of the country's competitive position in the global economy. The same seems to be currently happening in Spain. At the time of the financial crisis, Germany had already been the world champion of exports for several years, economic growth had returned, and unemployment had been brought down. Germany had transformed itself from the "sick man of Europe" into an "economic superstar" (Dustmann et al., 2014).

A compelling narrative behind this development, advanced by Dustmann et al. (2014), is that German labor market institutions were flexible enough to allow for a significant decentralization of the wage-setting process, away from the industry level towards the firm level. This decentralization, largely triggered by the fall of the iron curtain and the pressures of economic globalization, translated into a considerable decline in real wages at the lower end of the wage distribution, and ultimately to a

[55] See also the article "Spain's economy: Not yet the new Germany," published on March 9th, 2013, by The Economist.

more competitive economy. It was one of the principal aims of the 2012 labor market reform in Spain to widen the scope of collective bargaining at the firm level (OECD, 2014). Future research will need to show whether this reform can contribute to a better-functioning labor market that can mimic the German success and further enhance the international competitiveness of Spanish exports.

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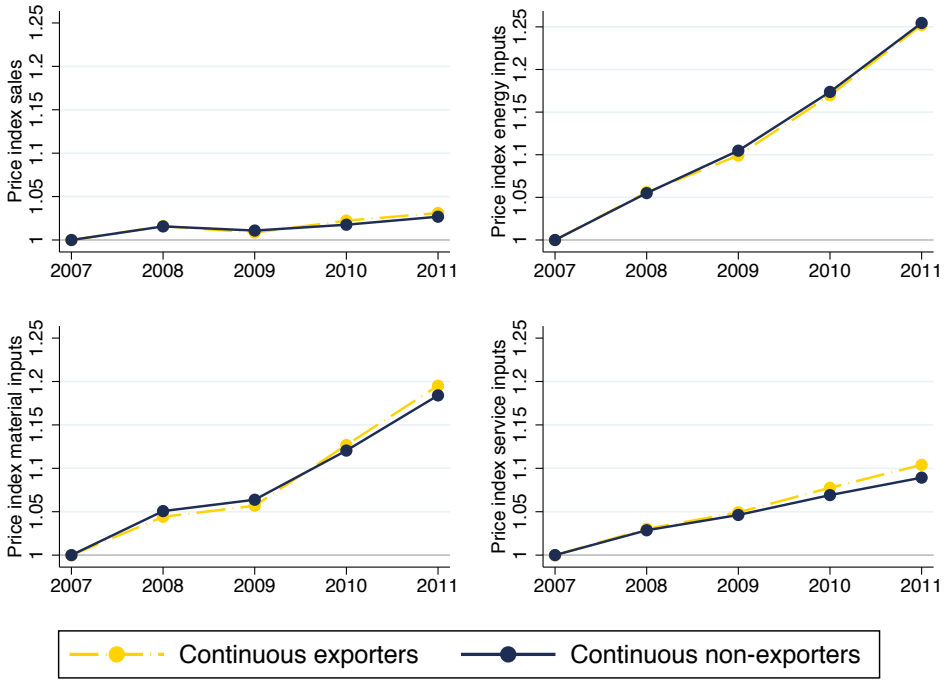
A Appendix

Table A.1: Summary statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Exporter dummy	15,074	0.641	0.48	0.000	1.000
Importer dummy	15,051	0.63	0.483	0.000	1.000
Export value (1,000 EUR in prices of 2010)	15,074	26,270	205,000	0	7,731,165
Domestic sales (1,000 EUR in prices of 2010)	15,074	39,065	167,334	0	6,058,877
Import value (1,000 EUR in prices of 2010)	15,051	16,417	124,840	0	3,780,449
Domestic purchases (1,000 EUR in prices of 2010)	15,048	35,744	179,316	0	5,463,883
Market exit	12,433	0.033	0.179	0.000	1.000
Multinational dummy	15,074	0.090	0.286	0.000	1.000
Foreign ownership: =0%	15,060	0.846	0.361	0.000	1.000
Foreign ownership: >0% & <=50%	15,060	0.021	0.142	0.000	1.000
Foreign ownership: >50%	15,060	0.133	0.340	0.000	1.000
Labor productivity (in logs)	14,935	12.268	1.696	2.785	19.16
Capital intensity (in logs)	15,043	4.357	1.140	-2.303	9.013
R&D intensity (in logs)	15,042	0.008	0.032	0.000	2.636
Skill intensity (in logs)	14,629	0.192	0.253	0.000	2.760
Type of good: final good	14,743	0.162	0.368	0.000	1.000
Type of good: intermediate good	14,743	0.264	0.441	0.000	1.000
Type of good: not defined	14,743	0.574	0.494	0.000	1.000
TFP (in logs)	14,914	-0.105	1.371	-4.947	5.555
Real output (in logs)	15,074	15.887	1.969	9.921	22.765
Effective working hours (in logs)	15,051	11.563	1.416	7.496	17.029
Hourly wage (in logs)	14,996	2.853	0.406	0.397	4.825
Internet dummy	15,060	0.774	0.418	0.000	1.000

Figure A.1: Evolution of firm-level output and input prices, 2007-2011[†]



[†]Note: The sample is balanced on firms that are observed in each year from 2007 to 2011. Continuous exporters are 671 firms that export in each of the years 2005 to 2012 (if observed); continuous non-exporters are 310 firms that do not export in any of the years 2005 to 2012 (if observed). All variables are normalized to one in 2007. Sampling weights apply. Source: Authors' calculations based on ESEE data.