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JEL Classification: F10, G01, G30, H57, H60

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March 28, 2020

Abstract

We examine how firms respond to domestic demand shocks using the large and unanticipated shock to government spending in European periphery countries during the 2010-2011 sovereign debt crisis. We find that firms with higher ex-ante exposure to government procurement contracts significantly increase their exports after the shock or exit. Older and larger firms are better able to substitute domestic sales with entry into export markets than younger and smaller firms. Firms with high-skill workers, high productivity and more educated managers are also more likely to start exporting. Our results suggest that mature and high-quality firms drive the response of tradable industries to domestic demand shocks.

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1 Introduction

The 2010-2011 European sovereign debt crisis led to a severe recession in southern economies of the Euro area followed by a protracted recovery. The Euro area as a whole has grown significantly less than the U.S. in the decade following the 2007-2009 financial crisis, with a cumulative real growth gap of 11 percentage points between the two economies between 2008 and 2018, despite large-scale interventions by the European Central Bank (ECB). In fact, the European sovereign debt crisis can be considered "both in its depth and in its consequences, more complex [...] than the recent U.S. recession and its aftermath" (Reis, 2012). Despite the severe domestic recession, export flows of Euro area periphery countries (i.e., Portugal, Spain and Greece) contributed significantly to attenuate the effects of the recession. While domestic demand contracted and credit conditions worsened, the periphery countries experienced a significant increase in exports, referred to as an "export miracle" (Almunia et al., 2018).

This paper makes two contributions to our understanding of how firms respond to a domestic demand shock. First, we use a drop in government spending as a shock to firm demand. Specifically, we use the fiscal austerity measures imposed by the large-scale bailout by the European Commission, the International Monetary Fund (IMF) and the European Central Bank (jointly, the Troika) in Portugal in 2011 as a laboratory. Our empirical tests exploit firm-level variation in pre-bailout exposure to government procurement contracts to estimate the effect of changes in domestic demand on export flows. From an identification perspective, this shock has the advantage of being clearly tied to the Troika's loan bailout package and the country's need of immediate funding to meet short-term obligations.

Second, we provide evidence on *which* firms use excess capacity to start exporting or grow their exports. Recent work shows that new firms and young firm play an important role in employment creation (Haltiwanger et al. (2013)), and how local economies react to exogenous shocks to investment opportunities (Adelino et al. (2017), Decker et al. (2017), Bernstein et al. (2018)). Most of the work on the firms's response to shocks focus on the reaction of the non-tradable sector, primarily for identification reasons. In contrast, we study the response of tradable firms to drops in demand. The decision to start exporting and to grow in exports is especially

interesting because prior work shows that international activities are complex and only viable for the most productive firms in the economy (Bernard et al. (2007) and Bernard et al. (2012)).

We show that firms that are more exposed to government contracts (treatment group) experience larger reductions in domestic sales than less exposed firms to government contracts (control group). Government exposure is measured as the firm-level share of total sales coming from government procurement contracts in 2010 and 2011, just before the implementation of the Troika austerity measures. We find that treated firms (i.e., firms with above-median government exposure) have a 5 percentage points lower growth in domestic sales relative to control firms (i.e., firms with below-median government exposure). Further, this reduction in domestic sales is monotonic in government exposure.

We next show that treated firms increase their exports significantly more than control firms. This growth is mostly driven by an increase in exports by firms that were already exporting in the pre-bailout period (i.e., exporting firms) rather than non-exporting firms entering foreign markets. Exporting firms with above-median government exposure increase their exports by 13.1 percentage points more than exporting firms with below-median government exposure. At the same time, exporting firms with higher exposure to the government are more likely to leave export markets and die altogether. Thus, the fiscal austerity shock increases the variance of outcomes among exporting firms – some firms grow exports substantially and can (partially) offset the reduction in domestic sales, while other firms disappear. We also show that results hold within size, age, and industry categories, and when we make the comparison within firms exporting to the same country and the same product (as in Paravisini et al. (2014)).

A concern with our identification strategy is that unobservable differences across treatment and control groups may explain the results. Our identification strategy and results help to mitigate this concern in several ways. First, we rely on the pre-bailout share of government contracts at a period when a sovereign crisis was largely unexpected until shortly before the Troika bailout. Second, the sample is restricted to firms that have government contracts, which makes them a more homogeneous group compared to the rest of the economy. Third, the drop in domestic sales is monotonic in government exposure, as it is the increase in exports. This means that,

for unobservable differences between firms to drive the results, the effect of those variables on domestic sales would also have to sort monotonically with the importance of the government as a customer. Fourth, the timing of the effect is consistent with a causal effect of government exposure on exports. In fact, before the bailout, exports grow at about the same rate for treated and control firms, and the relative decline for treated firms occurs at the time of the bailout. Fifth, in our most stringent specification, we examine how firms respond to the change in government purchases of specific products *controlling* for the share of government contracts over sales. We again find that the drop in demand and the increase in exports is more pronounced among treated firms, and in particular for firms selling products more affected by the government cuts. Finally, we estimate the range of plausible coefficient given different assumptions about unobservables following Oster (2019) and find that our estimates are stable.

We also examine the heterogeneity of the firm's response to the fiscal austerity along several dimensions such as firm size, firm age, firm quality and productivity. The literature on firms' reaction to local investment opportunities suggests that firm age is an important characteristic, and that young firms may be especially sensitive to changes in investment opportunities. At the same time, a firm selection model into trade a la Melitz (2003) suggests high-skill and high-productivity firms should be more responsible for the aggregate change in exports in the European periphery countries during the crisis.

We find that firm size and firm age are not strong predictors of export growth (i.e., the intensive margin) or exit following the fiscal austerity shock. There is, however, strong heterogeneity in *entry* into exports along these dimensions. Among firms with high government exposure, entry into exports is more likely among both larger and older firms (i.e., those with firm size and age above the median).

We find significant heterogeneity on entry into exports following the fiscal austerity shock along measures of firm quality and productivity. Specifically, we find that among firms with high government exposure, entry into exports is more likely among firms with high-skill workers (as proxied by average cost per employee), firms with higher productivity (as proxied by sales per employee and total factor productivity), and firms with more educated managers (after controlling

for firm age and size fixed effects). Similarly to firm size and age, we do not find differential effects along the intensive margin (i.e., growth in exports for firms that already exported before the bailout) or in exit. Taken together, our results suggest that mature and high-quality firms in the tradable sector are more sensitive to domestic slumps.

Our paper contributes to the understanding of the "venting for exports" phenomenon. Our results are consistent with a "vent-for-surplus" hypothesis as firms use excess capacity to enter new markets (as in Almunia et al. (2018)), rather than a model in which decisions about the domestic market and foreign markets are effectively independent due to constant production costs (as in Melitz (2003)) or even positively related (as in Berman et al. (2015)).

Our paper differs from Almunia et al. (2018) in several ways. First, we rely on a different source of variation as a shock to demand. Almunia et al. (2018) use regional variation in number of vehicles per capita as a proxy for changes in local demand, while we use firm-level variation in government exposure and exploit the sharp drop in government spending. Second, we examine the heterogeneity of the firm's response to the shock in domestic demand. Finally, we investigate whether the growth in exports operates via the intensive or the extensive margins, and find that the extensive margin plays an important role in explaining the heterogeneity in firm response. While continuing exporting firms significantly increase their exports, there are important differences across firms along the extensive margin (i.e., entry into exports).

Our paper also contributes to the literature that studies how firms react to changes in local demand and investment opportunities. Our results highlight the importance of the nature of growth opportunities to understand the firm's response to domestic demand shocks. While previous research on the non-tradable sector shows that new and young firms are more sensitive to a local demand shock (Adelino et al., 2017; Decker et al., 2017; Bernstein et al., 2018), we show that older and larger firms are in better position to use excess capacity to access export markets.

Our findings suggest that the tradable sector have a key role in mitigating the adverse effects of a domestic slump. Although we use the 2010-2011 European sovereign debt crisis and a Euro Area periphery country as a laboratory, our results have broader implications to understand the recovery of economically depressed areas in large economies like the U.S. and the European Union.

2 Empirical Methodology

The analysis in the paper uses firm-level exposure to the government as the primary explanatory variable. Exposure to the government is measured as the proportion that government contracts represent in total firm sales. We use the average of this ratio for 2010 and 2011 for each firm as our main variable of interest (the years just before the onset of the crisis in Portugal). Over 95% of contracts have a one-year duration or less, so firms that obtain a contract in 2011 will see those contracts expire in the next year unless they obtain a new contract in the meanwhile.

We focus only on firms that obtain contracts from the government, which is a small subset of the economy (about 6% of firm-year observations). Relative to firms that do not have government contracts, this group of firms are larger and generally share more observable characteristics. Given that they are able to apply and be granted contracts, our assumption is that they also share unobservable characteristics, including features tied to eligibility for contracts.

The main outcome variables of interest are both the growth in domestic sales and the growth in exports. We focus on the period between 2011 and 2014 as this is the period of deepest recession and lowest growth associated with the crisis. 2014 is the first year of positive GDP growth after the signing of the Economic Adjustment Program with the Troika in May of 2011.

The tests using growth in domestic sales or exit from the domestic market as the dependent variables serve as a "first stage" of the empirical strategy, as they allow us to verify that firms with more exposure to the government indeed experience larger losses of revenue in the years of the crisis. Our identification strategy relies on two main assumptions: (1) cross-sectional variation in government exposure is correlated with changes in domestic sales of firms; and (2) firm-level government exposure is not correlated with export performance during this period through channels other than domestic sales of firms.

To compute the growth of a variable, we use the change in that variable from t to $t + \tau$ over the average of the variable in the two periods:

$$\tilde{x}_{i,t+\tau,t} := \frac{x_{i,t+\tau} - x_{i,t}}{\frac{x_{i,t+\tau}+x_{i,t}}{2}} \tag{1}$$

This symmetric growth rate (see e.g. Davis et al. (1998)) is bounded between -2 and $+2$.

We estimate the regressions of growth in domestic revenues or exports on government exposure:

$$Y_{i,2014,2011} = \alpha_i + \beta Government/Sales_{i,2011} + \eta_{Size,i} + \eta_{Age,i} + \eta_{NACE4,i} + \epsilon_i \tag{2}$$

where i stands for the firm and $Government/Sales$ is measured as the value of government contracts obtained in 2011-2010 as a share of total firm revenues in 2011-2010, either in continuous form or split into categories (firms above and below the median or quartiles). η_i represent 4-digit NACE industry, size quartiles and age quartiles fixed effects. We cluster standard errors at the industry level. We use NACE four-digit industry classifications throughout the paper, which gives 471 industries in total.[1] The financial, insurance and public sectors are excluded from our sample.

In each table, we present the estimates for three type of outcome variables (Y): the growth of firms that remain in the sample, entry and exit. The "survivor firm" sample contains firms that exist in both 2011 and 2014 for the domestic sales analysis and firms that exported both in 2011 and in 2014 in the export analysis. The "Entry into exports" sample contains all firms that exist in 2011 irrespective of whether they export or not. In this sample, the dependent variable the *Entry* dummy variable that takes a value of one if the firm exports in 2014 but did not export in 2011, and zero otherwise. Finally, "Exit from exports" contains all the firms that exported in 2011. In this sample, the dependent variable is the *Exit* dummy variable that takes a value of one if the firm does not export in 2014, and zero otherwise.

In one set of tests (Table 7), we employ a shift-share design that interacts the government exposure variable with the product-level growth in purchases by the government. The idea is

[1]NACE is the standard classification of economic activities in the European Union (EU). By way of comparison, there are 313 distinct NAICS codes (the standard in the U.S.) using the 2007 definitions.

that, while government should matter on average, we would expect the effect most pronounced for firms that sell products that suffered a larger drop in demand from the government. To the extent that the austerity measures were not homogeneous across sectors, we can use this source of variation as an additional identification strategy. The specification is:

$$Y_{i,2014,2011} = \beta_1 Gov/Sales_{i,2011} + \beta_2 GProd_{i,2011} + \beta_3 Gov/Sales_{i,2011} \times GProd_{i,2011} + \eta_{Size,i} + \eta_{Age,i} + \eta_{NACE,i} + \epsilon_i \quad (3)$$

where $GProd_{i,2011}$ is the sales-weighted growth of government purchases for the products sold by the company to the government in the pre-period. $\eta_{Size,Age,NACE,i}$ are fixed effects for size, age and industry as before.

2.1 The European Sovereign Debt Crisis in Portugal

After the Great Recession, Europe suffered a sovereign debt crisis through a combination of problems in the banking system, rising wages, reduced competitiveness and accumulating debt in both the private and public sectors (Reis, 2013). The crisis affected primarily periphery countries, specifically Greece, Ireland, Italy, Portugal, and Spain, but through sovereign debt holdings of the banking system (Acharya et al., 2014, 2018) and both expectations and real spillovers also impacted the rest of Europe.

In the case of Portugal, a combination of slow growth, aggressive public investment and rising unemployment (Blanchard, 2007) led to a dramatic growth in gross public debt from 60% of GDP in 2002 to 114.4% in 2011.[2] Faced with rising credit spreads and the inability to issue debt, the Portuguese government was forced to request a bailout from the European Commission, the European Central Bank, and the International Monetary Fund (the Troika) of €78 billion in April 2011. This bailout was accompanied by aggressive fiscal austerity measures meant to improve the sustainability of Portugal's debt. The agreement was reached and approved in May 2011.

[2]Data retrieved from https://www.pordata.pt/en/Subtheme/Portugal/Debt+and+Deficit-366

From its peak in 2008, Portugal's real GDP fell by an accumulated 7.2% in the following six years. During the same period, government final consumption expenditures contracted by 10.1% and private final consumption expenditure contracted by 3.5%. The unemployment rate increased dramatically from 7.6% to 16.2%. Despite this domestic slump, Portuguese exports demonstrated an amazing resilience. Total exports of goods tumbled 18.4% during the global trade collapse of 2008-2009, they quickly recovered growing by an accumulated 51.6% between 2009 and 2014. Overall, Portuguese exports of goods grew by an accumulated 23.7% during the 2008-2014 period, while exports in the rest of the euro area increased by only 12.7% during the same period. Thus, Figure 1 shows that the share of Portugal in euro area exports increased sharply during this period, despite the contemporaneous decline in the share of Portugal in euro area government consumption and GDP. The contraction in government spending was a direct result of the externally-imposed fiscal austerity.

After this intervention, Portugal reduced government expenditures from around €50.5 billion in 2010 to around €48.7 billion from 2011 until 2015. The country's GDP dropped 1.7%, 4.06%, and 0.92% in 2011, 2012, and 2013 respectively, before growing 0.79% in 2014. The unemployment increased from 10.8% in 2010 to 16.2% in 2013, reaching 38% among the young (those under 25 years old).

2.2 Data and Summary Statistics

Our analysis focuses on the reaction of firms facing a shock to domestic demand. Specifically, we use the dramatic reduction in government expenditures following the Troika intervention as the shock to domestic demand, and exploit the cross-sectional variation in pre-intervention firm-level exposure to government procurement. We examine how domestic sales and exporting behavior of firms changed between 2011 and 2014 as a function of their pre-intervention government exposure.

We obtain firm-level data from three different sources. We use the IES (Informação Empresarial Simplificada), which contains detailed firm-level accounting information. From IES we also obtain data on firm characteristics as well as the decomposition of sales into domestic sales and exports. We restrict the sample to incorporated firms.

To identify the economic relationship between firms and the government, we collect data on contracts signed between firms and the public administration. This data is available in the BASE database from the Institute of Public Markets, Real Estate and Construction.[3] The data contain information about the price of the contract, the date it was signed celebration, the duration of the contract, and the tax identifiers of buyers and sellers. As this data contains the tax identifier, and the IES database does not, we match the data using the firm-level database SABI (Sistema de Análisis de Balances Ibéricos) provided by Bureau van Dijk. This database is based on information collected by IES, and we use revenue and total assets for the matching. We use our full dataset from 2008 to 2015 in order to maximize the matches, which allows us to match 46% of the firms in IES but we are able to find 100% of the firms in the contract database. The contract data often reports more than one buyer for the same contract (different governmental organizations) and sometimes (though less often) also multiple sellers, as well as the total value of the transaction. When there is more than one seller (i.e., more than one firm providing the goods or services), we divide the total value of the contract equally by the number of sellers before aggregating by each selling firm.

One of our productivity measures is the Total Factor Productivity (TFP). We compute TFP using an industry level Cobb-Douglas production function where α is a parameter at the two-digit industry level (NACE). We obtain this variable from the data for Portugal in the EU KLEMS database (Jaeger, 2017). Finally, to counter the fact that larger and more productive firms are weighted more in equilibrium on the aggregate variables (Queiró, 2018), we adjust our Cobb Douglas function using $\sigma = 3$ following Hsieh and Klenow (2014).

We also use the Quadros de Pessoal (QdP) database, which is a comprehensive employer-employee database from the Portuguese Ministry of Labor that collects data from the universe of firms in Portugal with at least one employee. The survey includes a wide range of worker characteristics, including age, education, seniority and job position level. We construct averages of years of education and age for the top management team.

Finally, we use data from the Comércio International (CI) database. This database — provided

[3]http://www.base.gov.pt/Base/pt/Homepage

by the National Institute of Statistics (INE) — records exports at the transaction level. The data contain the shipping value, the firm involved in the transaction, whether the flow is import or export and the country of origin or destination.

Our sample includes all incorporated firms in the IES database (with at least one employee) that have a contract with the government in 2010 or 2011 (a total of 18,804 firms), representing a 6% of the firms represented in our database for 2011.[4] Table 5 presents summary statistics of our variables. The average exposure to the government of firms with a contract is 13%.

To further characterize our sample, we group firms into quartiles of the government exposure variable, and we also show the descriptive statistics for the set of firms without a contract. Table 2 shows that firms with contract tend to be larger – in number of employees and total sales — than those without a contract, and that firms in the highest exposure quartile have an average of almost 40% of their sales from government purchases. On the other hand, the average government exposure in the lowest quartile is only 0.4% of sales.

The fact that smaller firms are more exposed than larger ones is intuitive – a contract of a given size represents a larger fraction of sales for smaller firms. One consequence of this fact is that, while firms without a government contract are clearly smaller than those that have a contract, the relationship between size and the exposure variable is monotonically decreasing when the exposure is positive. In addition, within firms with government contracts, firms with higher exposure also tend to be younger. The average age of the firm in the first quartile is above 21 years, while the average age in the highest quartile is slightly above 11 years.

While we do not observe a marked difference in manager age between these groups of firms, we do observe that managers of firms with a contract have a higher level of education than firms that do not have exposure to the government. We also observe that the average cost with employees for firms with government contracts is higher than for that of firms with no government contract. When considering firms with government exposure, the higher quartiles of exposure have monotonically lower average cost with employees, which is also consistent with the findings on firm size and age.

[4]See table IA.1 on the Internet Appendix for details.

3 Effect of Government Exposure on Domestic Sales

The first set of tests examines whether firms that are more exposed to the government have lower growth in total domestic sales between 2011 and 2014. We also test whether firms are more likely to exit altogether. Our measure of government exposure is the value of the contracts signed between the firm and the government in 2010 and 2011 as a share of total sales (and the sample only includes firms for whom this measure is positive, i.e. the ones that have government contracts). We use firm characteristics in 2011 as controls and our outcome variables are the change along the intensive margin and the changes in the extensive margin for both domestic sales and exports.

Table 3 shows the results. We run three sets of regressions using different outcome variables. Columns (1)-(3) present estimates of regressions of the growth in domestic sales for surviving firms to examine the effects at the intensive margin. Columns (4)-(6) present estimates of linear probability models (i.e., extensive margin) in which the dependent variable is a dummy variable that takes a value of one if a firm exits between 2011 and 2014, and zero otherwise. Columns (7)-(9) present estimates of regressions of the growth in domestic sales for all firms in which firms that exit between 2011 and 2014 are included with a -100% growth rate. Thus, the estimates in columns (7)-(9) examine both the intensive and extensive margins. We do not present estimates for firm entry because we require all sample firms to be exposed to the government in 2010-2011, so there no new firms entering the sample after 2010.

We present estimates for three specifications in terms of the government exposure variable, our main explanatory variable. A first specification uses the continuous version of the government exposure variable, i.e., the ratio of the value of government contracts to total sales (*Government Sales*). A second specification uses a dummy variable that takes a value of one if a firm has *Government Sales* above the median, and zero otherwise. A third specification that includes dummies for each quartile of the distribution of *Government Sales* (the omitted category is the bottom quartile). All our regressions include granular industry controls (with NACE four-digit fixed effects representing 471 industries), as well as fixed effects for firm size and firm age quartiles. Standard errors are clustered at the four-digit NACE level to account for correlation of domestic sales growth within industries.

Column (1) shows that a one standard deviation increase in government exposure (0.19) is associated with a 3.1 percentage points lower growth rate in domestic sales. Column (2) shows that the dummy variable for firms with government exposure above the median is negative and significant. Firms with above-median government exposure have a 5.2 percentage points lower growth rate than firms with below-median government exposure. Column (3) shows that the effect of government exposure on domestic sales growth is negative and monotonic. The effect is small and insignificant for firms in the second quartile (relative to firms in the first quartile), while the effect is negative and significant for firms in the third and fourth quartiles. Firms in the third and fourth quartiles have 5.1 percentage points and 7 percentage points lower growth than firms in the first quartile, respectively.

Columns (4)-(6) show significant effects of government exposure on firm exit. Column (4) indicates that a one standard deviation increase in government exposure increases the exit rate between 2011 and 2014 by 1.9 percentage points (the average probability of firm exit in the sample is 11%). Column (5) shows that firms with above-median government exposure have a 2.1 percentage point higher exit rate relative to firms in the bottom quartile. Column (6) shows that the effect on exit is monotonic in government exposure but only firms in the top quartile have statistically significantly higher exit rates at 3.7 percentage points relative to firms in the bottom quartile.

Columns (7)-(9) combine the effects of firm sales growth (intensive margin) with firm exit (extensive margin). We find that firms experience lower growth in domestic sales by 5.1 percentage points for a one standard deviation increase in government exposure. Firms with above-median government exposure have a 7.2 percentage points higher exit rate than firms with below-median government exposure. The effects are also monotonic in the government exposure variable and are larger (in absolute terms) and significant for the top quartiles.

4 Government Exposure and Firm Exports

4.1 Main Effect

In this section, we examine how firm exports react to the reduction in domestic sales due to their exposure to the government following the adoption of the fiscal austerity measures in 2011. Specifically, we estimate the regression of the exports growth rate, entry into exports and exit from exports on the government exposure variables using equation (2).

Table 4 shows the estimates. We run three sets of regressions using different outcome variables. Columns (1)-(3) present estimates of regressions of the growth rate in exports for surviving firms to examine the effects at the intensive margin. Columns (4)-(6) present estimates of linear probability models (i.e., extensive margin) in which the dependent variable is a dummy variable that takes a value of one if a firm starts exporting between 2011 and 2014, and zero otherwise. Columns (7)-(9) present estimates of linear probability models (i.e., extensive margin) in which the dependent variable is a dummy variable that takes a value of one if a firm exits from export markets between 2011 and 2014, and zero otherwise. The specifications are similar to those in Table 3.

Columns (1)-(3) show that firms that already export react by using the excess capacity to export more. The effects are statistically significant and economically large. Column (1) indicates that for firms that were already exporters before the intervention and remain being exporters after the shock (i.e., intensive margin), a one standard deviation increase in government exposure is associated with 12.1 percentage points higher growth in exports. Column (2) shows that the above-median government exposure dummy variable coefficient is positive and significant. Firms with above-median government exposure have a 13.1 percentage points lower export growth rate than firms with below-median government exposure. Similar to the effect on domestic sales, column (3) shows that a higher government exposure monotonically leads to a stronger effect on exports. Exporting firms in the top quartile of exposure, which corresponds to an average of 39% of sales coming from government contracts in 2010 and 2011, have a higher growth rate in their exports by 22.8 percentage points relative to those firms in the bottom quartile (the mean growth rate is 23%.).

Figure 2 shows the evolution of average exports for firms with above-median government exposure ad firms with below-median government exposure around the domestic demand shock (i.e., bailout and fiscal austerity measures starting in 2011). One can see that the average exports of firms with above-median government exposure increased significantly more than that of firms with below-median government exposure in the three years after the 2011 bailout. Moreover, we find that the two groups of government exposure follow parallel trends before the 2011 bailout, mitigating concerns about preexisting differential trends.

We then turn to measure the extensive margin response. Columns (4)-(6) show a small average effect on firm entry into exports due to government exposure. While column (4) shows a significant effect on firm entry when exposure is used as a continuous variable, this effect is insignificant when we compare firms above and below the median in terms of government exposure. The effects on firm entry into exports are also statistically insignificant across quartiles of government exposure. Taken together, the evidence in columns (4)-(6) suggests that there is either a small effect or no effect on average of higher government exposure during the fiscal austerity period. As we will see below, this hides large heterogeneity in the types of firms that indeed start exporting after the shock and those that do not.

Columns (7)-(9) show the estimates for the exit from export markets. We find in general statistically insignificant effects of government exposure on exit for exporters. We only find a statistically significant effect when we separate the sample in below and above median government exposure. Firms above the median in government exposure are more likely to stop exporting (mostly due to exit) by 2 percentage points relative to firms in the bottom quartile (the mean exit probability is 21.5%).

To test if our estimates might be biased by omitted variables, we present bias adjusted estimates for our regressions using quartiles for the explanatory variable following Oster (2019). Table 5 presents the equivalent to Table 5 in Oster (2019), in which we report the estimates without controls, with controls, and then the adjusted betas using two different methodologies. The reported adjusted βs reinforce the conclusions taken from our estimates for the intensive margin, while confirming the lack of significance when looking at our analysis on the average effects along

the extensive margin.

One possible confounding factor in our regressions is that matching between firms and export markets may partly explain our results. In order to control for a potential demand side explanation, we use data at the transaction level on product and destination country from the Comércio Internacional (International Trade) database from INE.[5] This data allow us to run a similar exercise to Table 4, but including a fixed effect in which we interact the industry at the four-digit NACE with the destination country. This means that we are comparing firms who export the same product to the same destination country but have different exposures to the government (similar to Paravisini et al. (2014)). Table 6 shows the results. The intensive margin effects in columns (1) - (3) are in line with those in Table 4 without controlling for country fixed effects. If anything, the effects are economically stronger when we include country-by-industry fixed effects. We also examine the effect of government contracts on the extensive margin of exports. In this set of regressions we define entry as observing a new combination of product-country for a given firm. Columns (4) - (6) show that higher government exposure leads to a significantly higher probability of entry into a new product-country combination for a given firm. Exporting firms in the third and fourth quartiles of government exposure have significantly higher probabilities of starting to export a product to a new country at 6.8 percentage points and 12 percentage points relative to firms in the bottom quartile.

We implement a shift-share identification by interacting government exposure and product-level growth in government purchases. Table 7 presents the results. The hypothesis underlying this test is that both the drop in domestic demand and the growth in exports should be stronger for the group of firms that are exposed to the government *and* sell products that were most hit by the fiscal austerity measures. Consistent with this prediction, Table 7 shows that the drop in demand is larger in the third and fourth quartiles of the interaction between the exposure variable and the (firm-level sales-weighted) growth in government purchases by product. Similarly, we find a larger increase in exports for firms in the top quartile of the interaction variable (column (4)), as well as a statistically significant effect on entry into export in the top quartile (of 2.6 percentage

[5]Instituto Nacional de Estatística (National Statistics Institute).

points relative to the bottom quartile).

Table IA.2 in the Internet Appendix report the results of the export regressions when we include destination country fixed effects and four-digit NACE fixed effects separately. The estimates are similar to those in Table 6 in which we interact country-by-industry fixed effects. Tables IA.3 and IA.4 in the Internet Appendix report the results of the export regressions when we split the sample between EU and non-EU destinations. As expected, we find a stronger effect for exports to the EU than to non-EU destinations. This is plausibly explained by the higher fixed costs of exporting to outside the EU such as bureaucracy, tariffs and distance.

4.2 Firm Heterogeneity

In this section, we interact the government exposure variable with firm characteristics. We explore firm heterogeneity in terms of several characteristics such as firm size, firm age, average cost per employee, sales per employee, and total factor productivity (TFP). We also consider management characteristics such as education (Queiró, 2018) and age. Finally, we consider the role of geographical clusters by including the percentage of exporting firms in the same 5km-wide square.

The dependent variables are the same as in Table 4, i.e., growth of exports (intensive margin) and entry into and exit from exports (extensive margin). We use two alternative specifications in terms of the interaction terms. We use a dummy variable for firms with above-median government exposure. For firm characteristics, we consider either a continuous variable or a dummy variable for firms above the median of the distribution of each firm characteristic. All specifications include firm size quartile, firm age quartile, and industry fixed effects

We first interact the government exposure variables with firm size as proxied by the number of employees. Table 8 present the estimates. While the firm size does not seem to be relevant to explain the export response of firms more exposed to the government either along the intensive margin or in the probability of exit (i.e. stopping to export), it does have a strong effect for explaining the decision to start exporting in columns (3) and (4). The interaction term coefficient $Government/sales > P50 \times Firm\ size > P50$ is positive and significant. Among firms with high government exposure, those above the median in firm size are 3.3 percentage points more likely

to react to the shock by becoming exporters. The $Government/sales > P50$ coefficient is now negative and significant, which indicates that small firms with high government exposure actually are less likely to become exporters. The interaction term is also positive and significant when we use a continuous variable for firm size.

Table 9 shows similar estimates when we study firm heterogeneity using firm age. Firm age is not an important determinant of the export response of firms more exposed to the government along the intensive margin and in terms of exit. In contrast, firm age is an important determinant of the decision to start export among firms with high government exposure. The interaction term coefficient $Government/sales > P50 \times Firm\ age > P50$ is positive and significant. This indicates that older firms (i.e., those over 9 years old) with high government exposure are 2.9 percentage points more likely to become exporters when compared with younger firms. The interaction term is also positive and significant when we use a continuous variable for firm size. We conclude that older and larger firms have a key role in alleviating the effects of a domestic demand slump by starting to export.

Table 10 presents the estimates of the interaction term coefficient for the remaining firm characteristics. We consider three different measures that are plausibly related to firm productivity and quality: average cost per employee, sales per employee, and total factor productivity (TFP). For the average cost per employee, we find weakly significant effects on the intensive margin, while we find a strong positive and significant effect in the probability of becoming an exporter among firms with high government exposure. The probability of starting to export is higher by 3.6 percentage points for firms with above median cost per employee and high government exposure. There is no significant effect on the probability of stopping to export.

We find similar results when we use both sales per employee and TFP. We do not observe any significant effects for the intensive margin for these variables. In contrast, we find that the probability of becoming an exporter increases for firms high sales per employee and high TFP that are highly exposed to the government. There is also some evidence that the probability of exiting from exporting markets is lower among firms with higher productivity.

We also consider how management characteristics such as education and age influence the

response of exports to a domestic demand shock. Manager age seems to increase the probability of exiting from exports for firms with sales to the government representing a share of their sales above the median, while no significant effect is observed for the intensive margin or for entry into exports. We also find that firms highly exposed to the government with more educated managers are more likely to react to the drop in domestic demand by turning to foreign markets. We do not find that management education influences exports in the intensive margin or the probability of stopping to export.

We examine whether geographic clusters of exporting firms can affect the reaction of exports to the domestic demand shock. We split Portugal into squares of 5-by-5 kilometers (25 Km^2), and associate each firm with the square the majority of the area of their postal code belongs to. Then, we compute the ratio of the number of exporting firms over the total number of firms within that square. We do not find that having more exporting neighbors increases the responsiveness of firms exposed to the government. If anything we find some suggestive evidence of the opposite effect. These results are in contrast with previous results showing that a higher proportion of exporting neighbours increases the probability of becoming an exporter (Koenig, 2009; Koenig et al., 2010; Fernandes and Tang, 2014). This indicates that the fiscal austerity shock is dominant in our sample.

We also examine whether financial policy affects the reaction of firms to the domestic demand shock. We argue that firms were more likely to react if they kept having access to financing as the demand shock was accompanied by a deterioration of the access to credit. To test this hypothesis, we interact the government exposure variable with the the changes in leverage between 2011 and 2014, which corresponds to the same period during which we measure the reaction of exports. We find some evidence that firms with higher government exposure had a stronger growth in exports (intensive margin) when they simultaneously had access to more credit. This suggests that access to financing seems to go hand in hand with the ability to react to a domestic demand shock by increasing exports.

5 Conclusion

We study the firm's response to a domestic demand slump driven by fiscal austerity measures. We use firm-level data for Portuguese firms during the country's bailout following the European sovereign debt crisis. Specifically, we measure the exposure of firms to government procurement using the value of government contracts obtained by firms in 2010 and 2011 as a fraction of their total sales. We find that domestic sales and exports decisions are interconnected for firms more exposed to the government when there is a fiscal austerity shock.

We find that government exposure is strongly predictive of the change in domestic sales, consistent with both the importance of fiscal austerity measures and the share of government contracts in total sales. Next, we find that firms more exposed to the government (partly) offset the reduction in local sales by growing in foreign markets, particularly those firms that were already exporters (intensive margin). However, firms that are more exposed to the government are also more likely to die altogether if they are not able to export more using their excess capacity.

We show that firm heterogeneity is important to explain the reaction of the tradable sector to domestic demand shocks. There is significant firm heterogeneity in the decision of firms to start exporting, but less so in the decision to increase exports among exporting firms. We find that older and larger firms more exposed to the government are more likely to become exporters as a result of the fiscal austerity measures. In addition, we find that high-government exposure firms with high-skill workers, higher productivity and more educated managers are more likely to become exporters.

Our results show the importance of the *venting out* mechanism for firms with high government exposure when there is a fiscal shock. Our results also show that firm age and firm size do not seem to affect the cross-section of firm response when they are already exporters (intensive margin) but affect the decision to start exporting. We also contribute to the literature on how firms respond to demand shocks. While previous research shows that younger and smaller firms (in non-tradable industries) react more to local demand shocks, we show that older, larger and more productive firms (in tradable industries) are more likely to start exporting as a response to local demand shocks.

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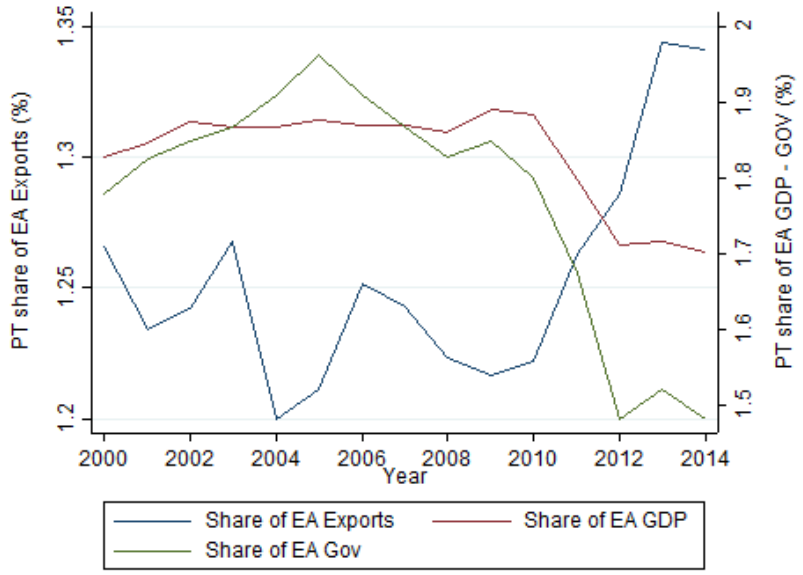
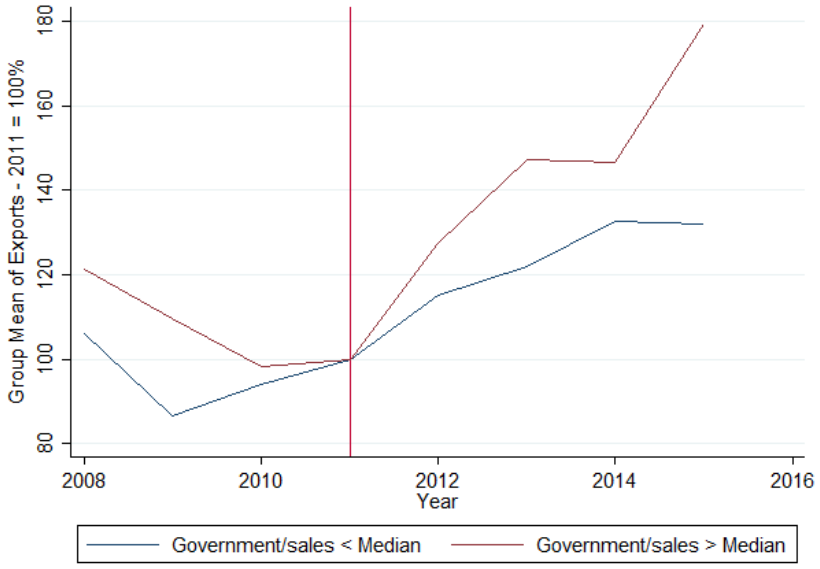
Figure 1: GDP, government consumption, and exports of Portugal as a share of the Euro Area



The graph shows have nominal GDP, Total Exports, and Government Consumption for Portugal divided by the aggregate of those variables for the countries in the Euro Area (EA). Data comes from the AMECO database.

Figure 2: Exports of firms by government exposure



The figure shows average exports by year for firms above and below the median of the government exposure variable (measured as government contracts divided by total firm sales). Firms are split in 2011 and mean exports for both groups are normalized to 2011. Data comes from IES and government contracts databases as described in the text.

Table 1: Summary statistics

	Mean	Median	Std. Dev.	P5	P95	Obs.
Firm age	15.72	12.00	14.23	1.00	41.00	18,804
Num. emp.	37.35	7.00	332.46	1.00	96.00	18,804
Total sales (€ thousand)	5,737.50	407.29	69,457.24	28.79	12,949.78	18,804
Domestic sales (€ thousand)	5,077.41	389.78	64,600.83	27.78	11,754.24	18,736
Total exports (€ thousand)	2,330.15	47.38	34,074.56	0.44	4,364.68	5,475
Signed contract	1.00	1.00	0.00	1.00	1.00	18,804
Value of contracts w/G (€ thousand)	246.02	28.32	1,647.50	1.92	764.36	13,281
Government/sales	0.13	0.05	0.19	0.00	0.52	18,804
Avg. emp. cost	16,843.97	14,119.76	15,597.42	112.00	38,472.00	18,804
TFP (€ thousand)	2,699.53	766.35	11,007.53	26.27	9,667.05	16,955
Mgmt. age	46.21	46.00	8.68	33.00	61.00	11,789
Mgmt. educ.	12.13	12.00	4.27	4.00	17.00	11,810
% exp. 5km	9.37	7.88	7.63	3.69	20.25	18,451
Δ Leverage	0.02	0.00	0.58	-0.28	0.33	17,170

Summary statistics for firms with government contracts in 2011. Data comes from IES, Sabi, QdP and government contracts databases as described in the text.

Table 2: Summary statistics by government exposure

	No contract	Qtile 1	Qtile 2	Qtile 3	Qtile 4
	(1)	(2)	(3)	(4)	(5)
Firm age	12.387	21.122	16.471	13.899	11.388
Num. emp.	6.466	83.678	30.569	20.521	14.641
Total sales (€ thousand)	673.187	17,223.789	3,103.195	1,516.394	1,106.629
Domestic sales (€ thousand)	543.952	15,192.853	2,645.280	1,335.824	1,093.463
Total exports (€ thousand)	947.977	4,668.709	1,368.099	746.945	154.353
Value of contracts w/G (€ thousand)	248.329	56.412	139.363	205.553	514.573
Government/sales	.	0.004	0.028	0.099	0.393
Avg. emp. cost	10,513.340	21,213.425	17,603.953	15,731.185	12,827.322
TFP (€ thousand)	1,526.539	4,513.971	2,396.766	2,027.254	1,647.890
Mgmt. age	45.758	46.811	46.311	45.708	45.674
Mgmt. educ.	10.126	12.167	11.724	12.290	12.487
% exp. 5km	9.120	8.947	9.342	9.489	9.716
Δ Leverage	0.234	0.009	0.006	0.010	0.048
Observations	254,987	4,701	4,701	4,701	4,701

The table shows averages for different groups of firms in 2011. Column (1) contains averages of different variables for firms without signed government contracts in 2010 or 2011. Columns (1) - (4) contain averages for first, second, third and fourth quartile of government exposure (measured as government contracts over total sales of 2011) given that they have at least one signed contract in 2010 or 2011. Data comes from IES, Sabi, QdP and government contracts databases as described in the text.

Table 3: Domestic sales by level of government exposure

	Δ_2014 − 2011 domestic sales (survivor firms)			Exits (dummy)			Δ_2014 − 2011 domestic sales (including exit)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Gov/sales	-0.164***			0.099***			-0.268***		
	(0.057)			(0.023)			(0.065)		
P50 < Gov/sales		-0.052***			0.021***			-0.072***	
		(0.014)			(0.006)			(0.015)	
P25 < Gov/sales < P50			-0.010			-0.001			-0.017
			(0.012)			(0.006)			(0.016)
P50 < Gov/sales < P75			-0.051***			0.009			-0.060***
			(0.015)			(0.007)			(0.016)
P75 < Gov/sales			-0.070***			0.037***			-0.115***
			(0.022)			(0.008)			(0.024)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Size FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,123	17,123	17,123	18,815	18,815	18,815	18,815	18,815	18,815
R-squared	0.056	0.056	0.056	0.056	0.054	0.055	0.060	0.059	0.059

The table shows OLS regressions at the firm level of dependent variables related to domestic sales. The first three columns use the growth in domestic sales for surviving firms, columns 4-6 use exit, and columns 7-9 combine intensive and extensive margins (where exit is measured as -100% growth in sales). Government/sales is measured as the average of the share of government contracts in total firm sales in 2010 and 2011. Industry FE are NACE 4-digit industry fixed effects (471 industries total). Size and age FE represent quartile fixed effects for both variables. Data comes from the IES and government contracts databases described in the text. Standard errors clustered at the 4-digit NACE industry level are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 4: Exports by level of government exposure

	Δ_2014 − 2011 exports (survivor firms)			Entry into exports (dummy)			Exit from exports (dummy)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Gov/sales	0.655***			-0.045***			0.086		
	(0.202)			(0.014)			(0.061)		
P50 < Gov/sales		0.131***			-0.005			0.018	
		(0.050)			(0.005)			(0.012)	
P25 < Gov/sales < P50			0.013			0.004			-0.001
			(0.047)			(0.007)			(0.016)
P50 < Gov/sales < P75			0.103*			0.004			0.011
			(0.055)			(0.007)			(0.016)
P75 < Gov/sales			0.228***			-0.011			0.031
			(0.077)			(0.008)			(0.022)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Size FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,825	3,825	3,825	18,815	18,815	18,815	7,234	7,234	7,234
R-squared	0.071	0.071	0.072	0.033	0.033	0.033	0.066	0.066	0.066

The table shows OLS regressions at the firm level of dependent variables related to exports. The first three columns use the growth in exports for firms that export in both 2011 and 2014, columns 4-6 use entry into exports (including all firms that are alive in 2011), and columns 7-9 consider exit from exports where exit is measured as -100% growth in exports. Government/sales is measured as the average of the share of government contracts in total firm sales in 2010 and 2011. Industry FE are NACE 4-digit industry fixed effects (471 industries total). Size and age FE represent quartile fixed effects for both variables. Data comes from the IES and government contracts databases described in the text. Standard errors clustered at the 4-digit NACE industry level are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 5: Omitted variables bias correction

	Baseline effect (Std. Error) (1)	Controlled effect (Std. Error) (2)	Bias-adjusted β $R_{max} = \tilde{R} + (\tilde{R} - \mathring{R})$ (3)	Bias-adjusted β $R_{max} = 1.3\tilde{R}$ (4)
Δ 2014-2011 exports (survivor firms)				
P25 < Gov/sales < P50	0.012 (0.043)	0.013 (0.047)	0.014	0.013
P50 < Gov/sales < P75	0.082 (0.050)	0.103* (0.055)	0.123	0.109
P75 < Gov/sales < P100	0.192*** (0.063)	0.228*** (0.077)	0.263	0.239
Entry into exports (dummy)				
P25 < Gov/sales < P50	0.003 (0.008)	0.004 (0.007)	0.005	0.004
P50 < Gov/sales < P75	-0.002 (0.008)	0.004 (0.007)	0.010	0.006
P75 < Gov/sales < P100	-0.025*** (0.008)	-0.011 (0.008)	0.003	-0.006
Exit from exports (dummy)				
P25 < Gov/sales < P50	0.028* (0.014)	-0.001 (0.007)	-0.030	-0.011
P50 < Gov/sales < P75	0.053*** (0.014)	0.011 (0.007)	-0.031	-0.003
P75 < Gov/sales < P100	0.096*** (0.022)	0.031 (0.008)	-0.035	0.009

The table implements the bounding exercise for the importance of unobservables as Table 5 of Oster (2019). Column (2) shows the coefficients estimated in Table 4, as well as the standard errors for each coefficient (in parentheses). Column (1) shows the same coefficients when we run the regression without controls (specifically, the age, size and industry fixed effects). In Columns (3) and (4) we show the omitted variables bias adjusted estimator using two alternative assumptions for the importance of unobservables following Oster (2019). Standard errors clustered at the 4-digit NACE industry level are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 6: Growth of exports within destination country and industry

	Δ_2014 − 2011 exports (survivor firms)			Entry into export destination(dummy)			Exit from export destination(dummy)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Gov/sales	1.467***			0.551***			-0.119		
	(0.462)			(0.101)			(0.0861)		
P50 < Gov/sales		0.0927*			0.0791***			-0.0287	
		(0.0529)			(0.0222)			(0.0186)	
P25 < Gov/sales < P50			0.0862			0.0190			0.0471**
			(0.0649)			(0.0265)			(0.0184)
P50 < Gov/sales < P75			0.0914			0.0684**			0.0120
			(0.0668)			(0.0288)			(0.0212)
P75 < Gov/sales			0.223***			0.120***			-0.0116
			(0.0762)			(0.0278)			(0.0241)
Size FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country × Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,270	3,270	3,270	11,031	11,031	11,031	11,031	11,031	11,031
R-squared	0.284	0.281	0.283	0.289	0.288	0.290	0.267	0.268	0.269

The table shows OLS regressions at the firm level of dependent variables related to firm exports by country. The first three columns use the growth in exports for firms that export in both 2011 and 2014, columns 4-6 use entry into an export destination (including all exporting firms in 2011), and columns 7-9 consider exit from an exporting destination where exit is measured as -100% growth in exports at the firm-by-country level. Government/sales is measured as the average of the share of government contracts in total firm sales in 2010 and 2011. Industry FE are NACE 4-digit industry fixed effects (471 industries total) and are interacted with destination country. Size and age FE represent quartile fixed effects for both variables. Data comes from the IES, international commerce and government contracts databases described in the text. Standard errors clustered at the 4-digit NACE industry level are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 7: Firm response to government exposure and product-level demand

	Δ_2014 − 2011 domestic sales (survivor firms) (1)	Exits (dummy) (2)	Δ_2014 − 2011 domestic sales (including exit) (3)	Δ_2014 − 2011 exports (survivor firms) (4)	Entry into exports (dummy) (5)	Exit from exports (dummy) (6)
Gov/sales	-0.162***	0.107***	-0.263***	0.371	-0.066***	0.111*
	(0.057)	(0.028)	(0.064)	(0.268)	(0.013)	(0.066)
CPV Shock	0.011	0.022*	-0.021	-0.052	-0.017	0.041*
	(0.025)	(0.011)	(0.029)	(0.089)	(0.011)	(0.021)
P25 < Gov/sales × CPV Shock < P50	-0.031	-0.005	-0.012	0.123*	0.008	-0.018
	(0.022)	(0.010)	(0.024)	(0.073)	(0.009)	(0.017)
P50 < Gov/sales × CPV Shock < P75	-0.046*	-0.005	-0.028	0.135	0.012	-0.005
	(0.025)	(0.010)	(0.028)	(0.088)	(0.009)	(0.022)
P75 < Gov/sales × CPV Shock	-0.037	-0.012	-0.022	0.260**	0.026***	-0.029
	(0.026)	(0.012)	(0.030)	(0.119)	(0.010)	(0.027)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Size FE	Yes	Yes	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,123	18,815	18,815	3,825	18,815	7,234
R-squared	0.057	0.056	0.060	0.074	0.033	0.067

The table shows OLS regressions at the firm level of dependent variables related to domestic sales (first three columns) and exports (last three columns). Intensive margin does not consider entry or exits, except Intensive (inc. exits) in which exits are included as a -100% drop. Entries (exits) is a dummy variable 0 - 1 indicating 1 if the firm entered (exited) the market and 0 if not. Shock CPV represents the weighted impact on the firm of the drop in demand by the government of contracts for the family of products with a particular CPV code, aggregated at the 3 digit level. Government/sales is measured as the average of the share of government contracts in total firm sales in 2010 and 2011. Industry FE are NACE 4-digit industry fixed effects (471 industries total). Size and age FE represent quartile fixed effects for both variables. Data comes from the IES and government contracts databases described in the text. Standard errors clustered at the 4-digit NACE industry level are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 8: Growth of exports by firm size

	Δ_2014 − 2011 exports (survivor firms)		Entry into exports (dummy)		Exit from exports (dummy)	
	(1)	(2)	(3)	(4)	(5)	(6)
Num. emp. > P50	0.099	0.088	0.006	0.004	-0.087***	-0.074***
	(0.061)	(0.060)	(0.007)	(0.008)	(0.012)	(0.014)
Gov/sales	0.313		-0.086***		0.111	
	(0.351)		(0.014)		(0.071)	
Num. emp. > P50 × Gov/sales	0.598		0.107***		0.017	
	(0.473)		(0.034)		(0.084)	
P50 < Gov/sales		0.045		-0.024***		0.041**
		(0.082)		(0.008)		(0.018)
Num. emp. > P50 × P50 < Gov/sales		0.129		0.033***		-0.030
		(0.087)		(0.012)		(0.024)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,825	3,825	18,815	18,815	7,234	7,234
R-squared	0.071	0.071	0.031	0.030	0.062	0.062

The table shows OLS regressions at the firm level of dependent variables related to exports. The first two columns use the growth in exports for firms that export in both 2011 and 2014, columns 3-4 use entry into exports (including all firms that are alive in 2011), and columns 5-6 consider exit from exports where exit is measured as -100% growth in exports. Government/sales is measured as the average of the share of government contracts in total firm sales in 2010 and 2011 and used as a dummy variable (above median, columns 1, 3 and 5) and as a continuous variable (columns 2, 4 and 6). Num. emp. > P50 is a dummy variable for whether the firm has above-median number of employees. Fixed effects are defined as in Table 4. Data comes from the IES and government contracts databases described in the text. Standard errors clustered at the 4-digit NACE industry level are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 9: Growth of exports by firm age

	Δ_2014 − 2011 exports (survivor firms)		Entry into exports (dummy)		Exit from exports (dummy)	
	(1)	(2)	(3)	(4)	(5)	(6)
Firm age > P50	-0.159***	-0.148***	-0.018***	-0.024***	0.009	0.010
	(0.054)	(0.052)	(0.006)	(0.006)	(0.011)	(0.013)
Gov/sales	0.653*		-0.066***		0.066	
	(0.350)		(0.014)		(0.065)	
Firm age > P50 × Gov/sales	0.007		0.069***		0.057	
	(0.488)		(0.023)		(0.076)	
P50 < Gov/sales		0.151**		-0.019***		0.014
		(0.071)		(0.006)		(0.016)
Firm age > P50 × P50 < Gov/sales		-0.034		0.029***		0.008
		(0.089)		(0.009)		(0.019)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Size FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,825	3,825	18,815	18,815	7,234	7,234
R-squared	0.070	0.069	0.033	0.033	0.066	0.066

The table shows OLS regressions at the firm level of dependent variables related to exports. The first two columns use the growth in exports for firms that export in both 2011 and 2014, columns 3-4 use entry into exports (including all firms that are alive in 2011), and columns 5-6 consider exit from exports where exit is measured as -100% growth in exports. Government/sales is measured as the average of the share of government contracts in total firm sales in 2010 and 2011 and used as a dummy variable (above median, columns 1, 3 and 5) and as a continuous variable (columns 2, 4 and 6). Firm age > P50 is a dummy variable for whether the firm has above-median age. Fixed effects are defined as in Table 4. Data comes from the IES and government contracts databases described in the text. Standard errors clustered at the 4-digit NACE industry level are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 10: Firm heterogeneity and the effect of government exposure

	Δ_2014 − 2011 exports (survivor firms)		Entry into exports (dummy)		Exit from exports (dummy)	
	(1)	(2)	(3)	(4)	(5)	(6)
Avg. emp. cost > P50 × Gov/sales	-0.342		0.111***		-0.112	
	(0.508)		(0.024)		(0.084)	
Avg. emp. cost > P50 × P50 < Gov/sales		-0.168*		0.036***		-0.026
		(0.096)		(0.010)		(0.023)
Observations	3,825	3,825	18,815	18,815	7,234	7,234
R-squared	0.071	0.072	0.035	0.034	0.068	0.067
Sales/employee > P50 × Gov/sales	-0.487		0.056***		-0.105	
	(0.385)		(0.021)		(0.074)	
Sales/employee > P50 × P50 < Gov/sales		-0.097		0.022**		-0.038*
		(0.083)		(0.009)		(0.019)
Observations	3,825	3,825	18,815	18,815	7,234	7,234
R-squared	0.073	0.072	0.035	0.035	0.073	0.073
TFP > P50 × Gov/sales	0.050		0.069**		-0.021	
	(0.400)		(0.034)		(0.087)	
TFP > P50 × P50 < Gov/sales		0.054		0.028**		-0.034
		(0.092)		(0.012)		(0.022)
Observations	3,718	3,718	16,907	16,907	6,898	6,898
R-squared	0.071	0.071	0.032	0.032	0.059	0.059
Mgmt. educ. > P50 × Gov/sales	-0.124		0.047		0.078	
	(0.534)		(0.030)		(0.112)	
Mgmt. educ. > P50 × P50 < Gov/sales		0.003		0.029***		-0.023
		(0.098)		(0.010)		(0.022)
Observations	3,073	3,073	11,761	11,761	5,370	5,370
R-squared	0.083	0.082	0.038	0.038	0.077	0.076
Mgmt. age > P50 × Gov/sales	-0.040		-0.023		0.124	
	(0.457)		(0.032)		(0.090)	
Mgmt. age > P50 × P50 < Gov/sales		-0.045		-0.004		0.052**
		(0.099)		(0.012)		(0.023)
Observations	3,071	3,071	11,740	11,740	5,364	5,364
R-squared	0.087	0.087	0.038	0.038	0.078	0.078
% exp. 5km > P50 × Gov/sales	0.032		-0.034		-0.067	
	(0.299)		(0.023)		(0.091)	
% exp. 5km > P50 × P50 < Gov/sales		-0.040		-0.020**		-0.038
		(0.077)		(0.009)		(0.024)
Observations	3,825	3,825	18,462	18,462	7,210	7,210
R-squared	0.071	0.071	0.033	0.033	0.068	0.069
Δ Leverage > P50 × Gov/sales	0.621*		0.004		-0.041	
	(0.358)		(0.022)		(0.077)	
Δ Leverage > P50 × P50 < Gov/sales		0.047		-0.003		-0.010
		(0.081)		(0.009)		(0.023)
Observations	3,825	3,825	17,137	17,137	6,922	6,922
R-squared	0.073	0.072	0.036	0.036	0.074	0.074

The table shows interaction coefficients in OLS regressions at the firm level of dependent variables related to exports. Dependent variables and "Government/sales" are defined as in Tables 8 and 9. The variable "Government/sales" is interacted both as a dummy variable and in continuous form with dummy variables for whether a variety of firm

Internet Appendix

Table IA.1: Summary statistics for complete database in 2011

	Mean	Median	Std. Dev.	P5	P95	Num
	(1)	(2)	(3)	(4)	(5)	(6)
Firm age	12.54	9.00	12.69	0.00	37.00	305,512
Num. emp.	7.83	2.00	87.14	1.00	21.00	305,512
Total sales (€ thousand)	1,021.00	105.34	20,041.63	6.76	2,212.83	273,791
Domestic sales (€ thousand)	859.38	99.96	18,048.24	6.00	1,912.66	269,280
Total exports (€ thousand)	1,124.84	40.80	17,653.46	0.44	2,709.77	42,786
Signed contract	0.06	0.00	0.24	0.00	1.00	305,512
Value of contracts w/G (€ thousand)	246.23	29.17	1,629.60	1.99	771.15	13,674
Government/sales	0.13	0.05	0.19	0.00	0.52	18,879
Avg. emp. cost	10,050.33	8,978.00	10,423.78	0.00	24,811.90	305,512
TFP (M)	1,612.65	338.99	34,311.83	2.06	4,876.16	216,426
Mgmt. age	45.83	45.75	9.54	30.67	62.00	131,759
Mgmt. educ.	10.32	9.00	4.35	4.00	17.00	132,139
% exp. 5km	9.18	7.88	7.22	3.63	19.00	299,835
Δ Leverage	0.72	0.00	73.27	-0.39	0.66	256,803

Table IA.2: Exports on government exposure — with destination country fixed effects

	Δ_2014 − 2011 exports (survivor firms)			Entry into exports (dummy)			Exit from exports (dummy)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Gov/sales	0.989**			0.415***			-0.0413		
	(0.400)			(0.106)			(0.0959)		
P50 < Gov/sales		0.0738*			0.0702***			-0.0171	
		(0.0443)			(0.0228)			(0.0189)	
P25 < Gov/sales < P50			0.0328			-0.00231			0.0569***
			(0.0557)			(0.0257)			(0.0162)
P50 < Gov/sales < P75			0.0626			0.0485*			0.0264
			(0.0555)			(0.0290)			(0.0203)
P75 < Gov/sales			0.137**			0.0935***			0.00836
			(0.0613)			(0.0280)			(0.0222)
Size FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5,102	5,102	5,102	14,996	14,996	14,996	14,996	14,996	14,996
R-squared	0.094	0.093	0.094	0.133	0.134	0.135	0.101	0.102	0.103

The table shows OLS regressions at the firm level of dependent variables related to firm exports by country. The first three columns use the growth in exports for firms that export in both 2011 and 2014, columns 4-6 use entry into an export destination (including all exporting firms in 2011), and columns 7-9 consider exit from an exporting destination where exit is measured as -100% growth in exports at the firm-by-country level. Government/sales is measured as the average of the share of government contracts in total firm sales in 2010 and 2011. Industry FE are NACE 4-digit industry fixed effects (471 industries total). Size and age FE represent quartile fixed effects for both variables. Standard errors clustered at the 4-digit NACE industry level are in parentheses. Data comes from the IES, international commerce and government contracts databases described in the text. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table IA.3: Exports on government exposure - EU

	Δ_2014 − 2011 exports (survivor firms)			Entry into exports (dummy)			Exit from exports (dummy)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Gov/sales	1.097***			-0.067***			0.201***		
	(0.278)			(0.013)			(0.076)		
P50 < Gov/sales		0.183***			-0.013***			0.024*	
		(0.054)			(0.004)			(0.014)	
P25 < Gov/sales < P50			-0.051			0.002			0.001
			(0.063)			(0.008)			(0.014)
P50 < Gov/sales < P75			0.112*			-0.002			0.007
			(0.066)			(0.007)			(0.017)
P75 < Gov/sales			0.290***			-0.026***			0.065**
			(0.103)			(0.007)			(0.029)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Size FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,815	2,815	2,815	18,815	18,815	18,815	5,823	5,823	5,823
R-squared	0.083	0.081	0.083	0.041	0.040	0.041	0.077	0.076	0.077

The table shows OLS regressions at the firm level of dependent variables related to exports to the European Union. The first three columns use the growth in exports for firms that export in both 2011 and 2014, columns 4-6 use entry into exports (including all firms that are alive in 2011), and columns 7-9 consider exit from exports where exit is measured as -100% growth in exports. Government/sales is measured as the average of the share of government contracts in total firm sales in 2010 and 2011. Industry FE are NACE 4-digit industry fixed effects (471 industries total). Size and age FE represent quartile fixed effects for both variables. Standard errors clustered at the 4-digit NACE industry level are in parentheses. Data comes from the IES and government contracts databases described in the text. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table IA.4: Exports on government exposure - Non EU

	Δ_2014 − 2011 exports (survivor firms)			Entry into exports (dummy)			Exit from exports (dummy)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Gov/sales	0.489*			-0.106***			0.075		
	(0.254)			(0.020)			(0.070)		
P50 < Gov/sales		0.043			-0.023***			0.019	
		(0.054)			(0.007)			(0.014)	
P25 < Gov/sales < P50			0.023			0.006			0.019
			(0.069)			(0.009)			(0.016)
P50 < Gov/sales < P75			-0.010			-0.007			0.024
			(0.071)			(0.008)			(0.016)
P75 < Gov/sales			0.235***			-0.037***			0.042*
			(0.089)			(0.011)			(0.025)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Size FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,280	2,280	2,280	18,139	18,139	18,139	6,284	6,284	6,284
R-squared	0.100	0.099	0.101	0.073	0.072	0.072	0.122	0.122	0.122

The table shows OLS regressions at the firm level of dependent variables related to exports to outside of the European Union. The first three columns use the growth in exports for firms that export in both 2011 and 2014, columns 4-6 use entry into exports (including all firms that are alive in 2011), and columns 7-9 consider exit from exports where exit is measured as -100% growth in exports. Government/sales is measured as the average of the share of government contracts in total firm sales in 2010 and 2011. Industry FE are NACE 4-digit industry fixed effects (471 industries total). Size and age FE represent quartile fixed effects for both variables. Standard errors clustered at the 4-digit NACE industry level are in parentheses. Data comes from the IES and government contracts databases described in the text. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table IA.5: Size heterogeneity - P75

	Δ_2014 − 2011 exports (survivor firms)		Entry into exports (dummy)		Exit from exports (dummy)	
	(1)	(2)	(3)	(4)	(5)	(6)
Num. emp. > P75	0.098**	0.090*	-0.010	-0.013	-0.075***	-0.066***
	(0.046)	(0.048)	(0.009)	(0.008)	(0.012)	(0.014)
Gov/sales	0.518*		-0.082***		0.148**	
	(0.274)		(0.013)		(0.068)	
Num. emp. > P75 × Gov/sales	0.244		0.112***		-0.024	
	(0.456)		(0.032)		(0.095)	
P50 < Gov/sales		0.095		-0.021***		0.041***
		(0.064)		(0.006)		(0.015)
Num. emp. > P75 × P50 < Gov/sales		0.072		0.035***		-0.035
		(0.081)		(0.012)		(0.023)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,825	3,825	18,815	18,815	7,234	7,234
R-squared	0.070	0.070	0.030	0.029	0.061	0.061

The table shows OLS regressions at the firm level of dependent variables related to exports. The first two columns use the growth in exports for firms that export in both 2011 and 2014, columns 3-4 use entry into exports (including all firms that are alive in 2011), and columns 5-6 consider exit from exports where exit is measured as -100% growth in exports. Government/sales is measured as the average of the share of government contracts in total firm sales in 2010 and 2011 and used as a dummy variable (above median, columns 1, 3 and 5) and as a continuous variable (columns 2, 4 and 6). Num. emp. > P75 is a dummy variable for whether the firm has above percentile 75 number of employees. Fixed effects are defined as in Table 4. Data comes from the IES and government contracts databases described in the text. Standard errors clustered at the 4-digit NACE industry level are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table IA.6: CPV Shock decomposition

	Δ_2014 − 2011 domestic sales (survivor firms) (1)	Exits (dummy) (2)	Δ_2014 − 2011 domestic sales (including exit) (3)	Δ_2014 − 2011 exports (survivor firms) (4)	Entry into exports (dummy) (5)	Exit from exports (dummy) (6)
Constant	-0.242***	0.098***	-0.382***	0.143***	0.097***	0.199***
	(0.012)	(0.003)	(0.012)	(0.026)	(0.004)	(0.006)
CPV3 < P50 × Gov/Sales > P50	-0.057***	0.022***	-0.070***	0.176***	-0.010	0.031**
	(0.016)	(0.006)	(0.019)	(0.066)	(0.007)	(0.015)
CPV3 > P50 × Gov/Sales < P50	-0.018	0.012*	-0.027	0.093**	0.004	0.019
	(0.017)	(0.007)	(0.019)	(0.044)	(0.006)	(0.012)
CPV3 > P50 × Gov/Sales > P50	-0.065**	0.032***	-0.099***	0.181***	0.003	0.025*
	(0.026)	(0.006)	(0.022)	(0.067)	(0.007)	(0.014)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Size FE	Yes	Yes	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,123	18,815	18,815	3,825	18,815	7,234
R-squared	0.056	0.054	0.059	0.072	0.033	0.066

The table shows OLS regressions at the firm level of dependent variables related to domestic sales (first three columns) and exports (last three columns). Intensive margin does not consider entry or exits, except Intensive (inc. exits) in which exits are included as a -100% drop. Entries (exits) is a dummy variable 0 - 1 indicating 1 if the firm entered (exited) the market and 0 if not. Shock CPV represents the weighted impact on the firm of the drop in demand by the government of contracts for the family of products with a particular CPV code, aggregated at the 3 digit level. Government/sales is measured as the average of the share of government contracts in total firm sales in 2010 and 2011. Industry FE are NACE 4-digit industry fixed effects (471 industries total). Size and age FE represent quartile fixed effects for both variables. Data comes from the IES and government contracts databases described in the text. Standard errors clustered at the 4-digit NACE industry level are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.