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WHY EXPORTS ADJUST: MISSING IMPORTED INPUTS OR LACK OF CREDIT?

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Abstract

This paper examines the role of imported intermediate inputs and credit constraints on exports adjustment. For identification, we study an episode of capital controls on outflows that exogenously restricted firms' ability to pay for imports and the large-scale credit crunch that followed the imposition of controls in Greece in June 2015. Exploiting within-firm variation across sectors, we find that lack of imported inputs explains the drop in exports at the intensive margin, while lack of long-term credit is associated with adjustments at the extensive margin. Multinationals overcome liquidity constraints because of access to parents' internal funds, but not import constraints because of stronger linkages for specialized inputs abroad. Our findings point to a novel result: the importance of both channels – real and finance – in jointly determining trade adjustment, and the different implications for the margins of trade.

JEL Classifications: F10, F14, F15, F23, F36, F38

Keywords: Firm Exports, Imported Intermediate Inputs, Credit Constraints, Capital Controls, Multinational Activity

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1. Introduction

Imported intermediate inputs are crucial for economic growth (Romer, 1990). Compared to domestic inputs, they are of higher quality and act as a channel of diffusion of technology, which in turn increases productivity and the export performance of firms (e.g. Amiti and Konings, 2007; Feng, Li and Swenson, 2016). Financial markets are equally important in international trade (Manova, 2013). As compared to non-exporters, exporters require external capital to cover trade-related costs, such as product customization, market research, insurance and transportation costs (e.g. Manova and Foley, 2015). Credit provision is thus crucial for firms' exporting activities. While the two channels – real and finance – have been extensively studied in the literature *in isolation*, recent experience suggests that they can operate simultaneously during large trade adjustment periods. For instance, during the 2008-2009 Global Financial Crisis, U.S. exports fell by as much as 13%. At the same time, U.S. imports fell by as much as 18% and total credit to non-financial corporations has contracted by approximately 6% (source: US Census Bureau). Two questions arise: one, to what extent exports adjust because of lack of imported intermediate inputs and to what extent because of lack of credit? And two, are the implications different for the margins of trade?

This paper is the first to *jointly* study the role of imported intermediate inputs and credit constraints on exports adjustment. For identification, we study an episode of controls on capital outflows in Greece in June 2015. Greece introduced a series of administrative restrictions on capital outflows to stabilize the domestic banking system following a period of increased economic and political uncertainty and an extensive bank run (Figure 1).

[Insert Figure 1, around here]

The series of measures, known as capital controls, exogenously restricted the ability of firms to pay for imports. Importers were required to apply to a centralized transactions approval committee, submit extensive documentation that was often not easily accessible and abide by specific thresholds regarding the amounts to be transferred abroad for import-related purposes. Before the approval of an application, the committee scrutinized

the submitted documents to avoid the transfer of funds abroad for unauthorized purposes. Applications were often revised for further documentation or even rejected, which implied additional costs to the importing process. In fact, the primary reason of rejection of an application was the lack of proper documentation, which accounted for 31% of all submitted applications. As such, capital controls were particularly harmful to importers, who were not able to meet contractual obligations with international suppliers of raw materials[1]. During capital controls, imports fell by as much as 30% year-on-year (Figure 2a). At the same time, despite the controls' stabilizing nature, total credit contracted and credit constraints became more, not less, binding. Short-term credit to the manufacturing sector declined by as much as 5% and total credit by as much as 2% (Figure 2b)[2][3]. Because of the extensive bank run that preceded the imposition of capital controls, banks faced severe liquidity and solvency issues, which further added to the lack of credit. To the extent that imported intermediate inputs and credit are embodied in the exported products, exports adjustment would be sizable. As Figure 3 confirms, exports fell by as much as 15% year-on-year following the imposition of capital controls. Importantly, at the time of their imposition, there was no expectation regarding the time of their relaxation. As a result, this policy experiment offers an ideal setup to jointly assess the contribution of each channel – real and finance – on the adjustment of firm exports.

[Insert Figure 2, around here]

[Insert Figure 3, around here]

We identify the two channels by studying the *within*-firm *f* exports adjustment of products *p* that belong to sectors *s* that differentially rely on imported inputs and credit. In other words, each (multi-product) firm *f* exports products that are pooled into sectors that differ on their use of imported intermediate inputs and credit. We employ the foreign

[1] Contractual obligations with domestic suppliers could still be met since payments were taking place within the Greek banking system.
[2] Rousakis and Priftis (2017) provide an analytical overview of these later stages of the Greek crisis.
[3] Controls on capital outflows have a signaling effect regarding the government's future policies (Bartolini and Drazen, 1997) and deter capital inflows because of the irreversibility of investments (Laban and Larrain, 1993).

value-added share of a sector's gross exports as a proxy for the imports channel, which we label real channel. Building on the work of Hummels, Ishii and Yi (2001), the measure calculates the *Import Content of Exports*, in other words the direct and indirect participation of imported intermediate inputs in a sector's gross exports. We employ the *Inventories Ratio* of a sector as a proxy for the finance channel. The measure reflects a sector's dependence on short-term working capital needs and, thus, is mainly associated with the intensive margin of trade (Raddatz, 2006; Kroszner, Laeven and Klingebiel, 2007; Manova, Wei and Zhang, 2015). When both channels are operational, we find that sectoral exports with higher import content before capital controls drop more during capital controls. Economically, a one standard deviation increase in a sector's dependence on imported intermediate inputs is associated with approximately 4pp lower export growth during capital controls. Although credit constraints become more binding during this period, we document a robust finding that exports drop because of lack of imported inputs rather than because of lack of credit. Our findings point to the importance of imported intermediate inputs above and beyond bank loans in the exporting process and is in line with the trade literature that documents the benefits of imported inputs in terms of productivity (e.g. Kasahara and Rodrigue, 2007; Halpern, Koren and Szeidl, 2015), higher product scope (e.g. Goldberg, Khandelwal, Pavcnik and Topalova, 2010) and exports performance (e.g. Chevassus-Lozza, Gaigne and Mener, 2013; Feng, Li and Swenson, 2016).

A concern with sector-level proxies of the real and finance channels is whether a clean identification is feasible. In particular, it could be the case that exports of import-intensive sectors decline because there is lack of credit to finance imports rather than because capital restrictions put constraints on import payments. In other words, the finance channel could contaminate the real channel, which makes identification difficult. To this end, and in the absence of detailed data on the actual amount of credit devoted to imports, production and exports, we exploit a *unique* feature of the capital controls policy, namely the characterization of a set of imported goods as high-priority and, as such, their exemption from any administrative restrictions on capital outflows for reasons

of public safety and health[4]. We show that, when considered separately from the restricted products, the real channel (i.e. the coefficient of *Import Content of Exports*) neutralizes in the exports adjustment of the non-restricted products. This result holds both when we compare exempted to restricted products *across* sectors and when we compare exempted to restricted products *within* sectors, thus mitigating concerns that the set of exempted products might differ in certain sectoral dimensions. This counterfactual exercise suggests that the two channels are not mixed and, as such, evaluating the contribution of each channel is feasible.

At the extensive margin, we find that a sector's long-run investment needs, which we proxy by a sector's *External Finance Dependence* (Rajan and Zingales, 1998; Kroszner, Laeven and Klingebiel, 2007; Manova, Wei and Zhang, 2015) and is associated with the production capacity of firms and the exit/entry decisions to export, are the sole determinant in exports adjustment. A one standard deviation higher dependence on external capital is associated with 3.7pp lower number of products exported (product scope of exports), 5.5pp lower number of export markets served (destination scope of exports) and 5.7pp lower number of product-destination pairs (product-destination scope of exports).

Taken together, our findings point to a novel result that has not been documented in the prior literature. While the real and finance channels do matter for exports adjustment, when *both* channels are operational, lack of imported intermediate inputs is associated with adjustments at the intensive margin, while lack of long-term credit is associated with adjustments at the extensive margin of exports.

Finally, we explore multinational activity and how it relates with import and credit constraints. In particular, we compare the exports adjustment of multinationals, as compared to domestic firms, in sectors with differential dependence on imported inputs and credit needs. We find that multinational firms overcome credit constraints because of access to a deep internal credit market or parents' funds, but do not overcome import constraints because of stronger linkages to purchase specialized inputs abroad. These findings are in line with insights that emanate from the literature of multinational activity

[4] These are medicinal products, petroleum products, electric machinery and food products, as we explain in more detail in the text.

and liquidity constraints (e.g. Manova, Wei and Zhang, 2015) and multinational activity and linkages with domestic suppliers of inputs (e.g. Rodrigeuz-Clare, 1996).

2. Motivation and contribution

2a. The trade literature: imported intermediate inputs and exports

The positive effect imported intermediate inputs have on economic growth is well documented in theory (Ethier, 1982; Romer, 1987, 1990). The idea is that imported inputs are of higher quality and act as a channel of diffusion of technology as compared to domestic inputs, which in turn enhance firm productivity and trade performance. Empirical literature has provided strong support to this theoretical insight. For example, Kasahara and Rodrigue (2007) show that the use of imported intermediate inputs increase firm productivity in a panel of manufacturing plants in Chile in period 1979-1996. A similar conclusion is obtained in Halpern, Koren and Szeidl (2015) who study manufacturing firms in Hungary. Economically, the effect is meaningful. Halpern, Koren and Szeidl (2015) attribute more than one-quarter of Hungarian productivity growth in period 1993-2002 to imported intermediate inputs. The substantial gains from imported intermediate inputs in terms of higher domestic firms product scope have also been documented in Goldberg, Khandelwal, Pavcnik and Topalova (2010), who study an episode of trade reform that reduced input tariffs in India in 1991. Bas (2012), Chevassus-Lozza, Gaigne and Mener (2013), Bas and Strauss-Kahn (2015) and Feng, Li and Swenson (2016) have all documented the positive effect imported intermediate inputs have on firms export performance. Bas (2012) exploits input tariff reductions and shows that expansion in the use of imported intermediate inputs in Argentina facilitates the entry of firms into export markets. Bas and Strauss-Kahn (2015) show that similar imported input tariff reductions in China are associated with an increase in the quality of imported and exported goods. Similar findings are obtained in Feng, Li and Swenson (2016) who employ an instrumental variables approach to show that imported input tariff reductions are associated with an increase in the scale and breadth of firms' participation in export markets. By exploiting data at different levels of disaggregation and studying episodes in a wide range of countries, this strand of the literature has provided robust evidence on the

positive effect of imported intermediate inputs on firm productivity and export performance.

2b. The finance literature: credit constraints and exports

A different strand of the literature has long documented the crucial role of financial development in international trade. From a theoretical point of view, Kletzer and Bardhan (1987) show that access to external capital in the presence of financial frictions can be a source of comparative advantage. More recently, Manova (2013) introduces credit constraints in the seminal work of Melitz (2003) to show that, when constraints bind, only firms above a certain productivity cutoff enter exporting or increase sales abroad because they are able to cover the fixed and variable trade-related costs respectively. Financial development mitigates these frictions with the effect being more pronounced in financially vulnerable industries, that is sectors with high dependence on external capital. These theoretical insights receive support from the empirical literature. For example, at the aggregate level, Beck (2003) and Slaveryd and Vlachos (2005) find that financially advanced countries do export more in sectors that require more external finance and hold fewer tangible assets. Evidence from micro data confirms these findings (e.g. Muuls, 2008; Minetti and Zhu, 2011). More recently, scholars have exploited natural experiments to overcome the endogenous relationship between credit availability and trade performance. For example, in the context of the Japan crisis in the 1990s, Amiti and Weinstein (2011) show how shocks in banks' health affect the export performance of firms. Paravisini, Rappoport, Schnabl and Wolfenzon (2015) reach similar conclusions by studying exports of Peruvian firms after the 2008-2009 Global Financial Crisis. They show that bank credit is used to finance firms' working capital and as a consequence the intensive, but not the extensive, margin of trade. Manova, Wei and Zhang (2015) also document that credit constraints impair international trade by exploiting variation of exports across sectors with different levels of financial vulnerability and across firms of different ownership types. In particular, they show that exports of multinational firms outperform exports of private domestic firms especially in sectors at high levels of financial vulnerability. This is due to the fact that multinational firms have access to parents' internal funds, which helps them overcome financial frictions. Overall, the

finance literature has provided robust evidence on the role of credit constraints on international trade.

2c. Contribution to the literature

This paper, for the first time, *jointly* evaluates the importance of import and credit constraints during large trade adjustments. This is motivated by the recent experience following the 2008-2009 Global Financial Crisis. For identification, we study an episode of capital controls on outflows in Greece in June 2015. Controls on capital outflows exogenously restricted the ability of firms to pay for imported raw materials, which are then used in the production stage and export process. At the same time, outflow controls signal a government's future policies (Bartolini and Drazen, 1997) and deter capital inflows because of the irreversibility of investments (Laban and Larrain, 1993). We address endogeneity concerns by studying within-firm changes in sectoral exports with differential dependence on imported inputs and credit needs. A series of robustness checks, alternative assumptions and alternative specifications suggest that our quasi-natural experiment along with our empirical approach is suitable and identification is feasible.

Secondly, this paper is also the first to look at how capital controls affect international trade from a micro perspective. Previous literature has focused on cross-country analysis using gravity models to study the impact of capital controls on trade. Tamirisa (1999) studies the effects of capital and exchange restrictions on trade for a sample of 40 countries in 1996 and concludes that capital account liberalization is beneficial for trade. Wei and Zhang (2007) extend this work to a larger sample of 142 countries and a wider time span and find that FX controls and stricter controls on trade payments reduce trade. We contribute to this literature by providing micro evidence that capital controls act as a barrier to international trade and we pin down two specific channels – real and finance – as these are discussed in Tamirisa (1999). In other words, we shed light on two channels at work and discuss their implications for the different margins of trade.

Our paper also contributes to the wider literature on capital controls. We add to a new literature that studies the real effects of capital controls. Alfaro, Chari and Kanczuk (2017) evaluate the impact of inflow controls on firms' investment decisions in Brazil. Employing an event study methodology, they document a drop in cumulative abnormal returns of firms following the announcement of prudential capital controls. Keller (2018) studies the impact of controls on carry trade inflows in Peru and shows that banks switch lending to domestic firms from local currency to dollars in order to hedge dollar deposits. Following a depreciation shock, the dollarization of firms' debt has a negative effect on employment as firms become more financially constrained. In contrast to these studies, our focus is on international trade and on an episode of *outflow* controls as a crisis management tool (Demirguc-Kunt and Serven, 2010) rather than *inflow* controls as a crisis prevention tool. A more recent paper by Andreasen, Bauducco and Dardati (2018), which is the closest to our work, studies the effects of the Chilean encaje controls on firms' production, investment and exporting decisions using plant-level panel data. They show that controls on capital inflows depress domestic demand and investment due to the credit restriction, but increase exports in sectors with low capital intensity as firms try to compensate for the decline in domestic demand. However, given the limitations of the data, the authors cannot identify whether the effect on exports is related to credit constraints caused by the capital controls or to loopholes of the capital control policy itself. Our findings have also direct implications on the distributional consequences of capital controls policies across industries (Rajan and Zingales, 2003), as well as on their unintended consequences as crisis management tools (Demirguc-Kunt and Serven, 2010). More broadly, our paper belongs to the literature that provides microeconomic evidence on the effects of capital controls on different outcome variables. For example, Forbes (2003) studies the impact of Chilean encaje controls and documents increased financing costs for small traded firms. A more recent paper by Forbes, Fratzscher, Kostka and Straub (2016) shows how investors re-allocate their portfolios away from Brazilian assets following a tax on foreign investments in bonds, as well as away from countries that seem more likely to impose similar restrictions[5].

[5] Forbes (2005a) provides an overview of this literature.

3. Institutional background

Following the failure of the Greek parliament to elect a President of the Republic in December 2014, general elections in January 2015 brought into power a coalition government of the radical left party of SYRIZA with the smaller right-wing party of "Independent Greeks". Both parties had fiercely opposed the economic adjustment program, which had been agreed by previous governments with the troika of international lenders (European Central Bank, International Monetary Fund and EU member states) following the bailout of the Greek sovereign in May 2010. Lengthy negotiations and increased uncertainty over a new bailout plan and Greece's future within the Eurozone drove depositors to withdraw 48.6bn euros during the first six months of 2015, accounting for more than one quarter of deposits of the Greek banking system. At the same time, Emergency Liquidity Assistance (ELA) provided by the Bank of Greece to Greek banks increased drastically from 45bn to 127bn euros (including Eurosystem funding) to fill the funding gap from the flight of deposits and the drying of the interbank market for Greek banks. At the time of imposition of capital controls in June 2015, deposits accounted for less than 50%, while central bank funding (Eurosystem and ELA) accounted for more than 50% of total bank liabilities.

The new bailout agreement between the Greek government and the troika was brought into a referendum, which was unexpectedly announced on June 27, 2015[6]. As a response, the ECB refused to increase its loan limit for the provision of ELA to Greek banks on the same day, triggering the shutdown of banks (bank holiday) and the imposition of capital controls on June 28 2015[7]. Capital controls can be broadly characterized as restrictions on capital transactions and comprised of three pillars: (a) measures to prevent outflows of funds abroad, (b) measures limiting cash withdrawals from banks and (c) measures to prevent the rapid decline of bank assets and liabilities (e.g. repayment of the remaining capital on bank loans). Despite these measures, there was no explicit restriction on the provision of credit by financial institutions. In addition, during the first phase of restrictions, all credit institutions operating in Greece, including

[6] Although the new bailout plan was rejected in the referendum of July 5, the Greek government came to an agreement with lenders for a new bailout program which envisaged financing of up to 86bn euros over a three year period in exchange of a programme of fiscal austerity measures and structural reforms.

[7] Although Bank of Greece is responsible for ELA funding, it is ECB's decision to extend or restrict the ELA ceiling, i.e. the maximum amount of ELA available to Greek banks

branches of foreign banks, were forced to close until July 20, 2015, the Athens Stock Exchange remained closed and daily cash withdrawals were limited to a maximum of 60 euros per depositor per bank. No capital restrictions were applied to credit cards issued by foreign banks. During this phase, a special Banking Transactions Approval Committee (BTAC) was established to examine requests for transfers of funds abroad.

The committee was responsible to gather, approve, reject or revise requests for transfer of funds abroad. Especially for importers, this was a particularly resource-intensive process, as firms were required to provide detailed documentation of past imports-related transfers as well as invoices and other trade-related documents. These documents were not easily accessible to firms, which further impaired their ability to import as compared to the period before capital controls. To reduce the burden of documentation requirements submitted to the centralized committee, special subcommittees were established in each financial institution to approve or reject submitted applications. The special subcommittees were responsible for the approval of transfers under a certain threshold, regardless of the purpose of transfer (e.g. imports or payment of tuition fees). Transfers larger than this threshold had to be approved by BTAC[8]. The purpose of these thresholds was to control the flow of funds abroad, but exogenously restricted the ability of importers to meet their contractual obligations with suppliers abroad. Following the agreement over the new bailout plan between the Greek government and the troika in August 2015 and a new round of parliamentary elections in September 2015, capital controls were significantly relaxed in January 2016[9].

4. Data

Our exports (FOB) data are obtained from the Hellenic Statistical Authority (ELSTAT) and report export values (in euros) and volumes (in kgr) at the firm-product (5-digit SITC Rev.4)-destination level. The data report the universe of both intra-EU (Intrastat) and extra-EU (Extrastat) transactions from all Greek firms at a monthly

[8] The threshold of the total amount of transfers abroad by any individual firm was set initially at 100,000 euro per working day. This limit has been gradually increased to 150,000 euros by August 2015 and to 250,000 by January 2016.

[9] Nevertheless, capital controls are still effective at the time of writing of this paper (September 2018), although significantly relaxed as compared to the first six months of their imposition.

frequency[10]. Intrastat refers to the trading of goods between EU Member States, while Extrastat refers to the trading of goods with third countries. Firms that perform intra-EU transactions are liable for providing statistical information to ELSTAT, while firms that perform extra-EU transactions fill the Single Administrative Document (SAD) and submit it to the Customs Authorities. Documents are then transmitted to ELSTAT, which is responsible for compiling the total trade data within and outside the EU[11]. Although Extrastat system records virtually all flows, EU National Authorities impose statistical thresholds for intra-EU trade, below which Intrastat declarations are not submitted by firms[12]. ELSTAT has set exports' exemption reporting thresholds at 90,000 euros in 2014 and 2015. Data below the statistical threshold are still included in the Intrastat database and are estimates based on the Recapitulative Statements of intra-EU Deliveries and Acquisitions that all firms submit for fiscal purposes to the Ministry of Finance. Essentially, these are administrative documents that *all* firms are obliged to submit and thus can be considered of high quality. We clean the data in a number of ways. First, we drop a handful of destinations that are not named for confidentiality reasons. Second, we aggregate 5-digit SITC (Rev.4) products in 2-digit ISIC (Rev.3) sectors to exploit variation of import dependence and credit needs at the sector level. Since there is no concordance table to map directly, we first map 5-digit SITC Rev.4 to 6-digit HS 2007 products[13] and then 6-digit HS 2007 products to 4-digit ISIC Rev.3 industries[14]. The matching is clean as we match from *m* to *1* and from *1* to *m* respectively. We then aggregate at the 2-digit level and restrict our attention to the manufacturing sector (codes 15-37). A downside of our data is that firms are marked with a unique numerical identifier[15]. We identify firms by merging with a second dataset that reports export values (in euros) and volumes (in kgr) at the firm-product (5-digit SITC)-destination level, and

[10] We obtain these data for years 2007-2015 in order to retrieve tax identifiers from a second administrative database that reports the *same* information at the *same* level of disaggregation and overlaps with the anonymized version of our database.
[11] Since 2005, it is mandatory for member states to check the quality of the declared information.
[12] On an annual basis, ELSTAT sets and releases imports and exports exemption thresholds in order to reduce the reporting burden on firms.
[13] Table is from UN (https://unstats.un.org/unsd/cr/registry/regdnld.asp?Lg=1).
[14] Table is from WITS (http://wits.worldbank.org/product_concordance.html).
[15] We will need the tax IDs of firms only when we study heterogeneous effects at the firm level and compare multinationals with domestic companies. We look at the universe of firms when we exploit within firm variation in our baseline regressions.

overlaps with our anonymized database in years 2007-2009[16]. Crucially, export flows in both datasets (anonymized and identified) are administrative and include the *same* information at the *same* level of disaggregation (i.e. firm-product (5-digit SITC)-destination level), however, data have been extracted from ELSTAT's intra-EU and extra-EU databases at different points in time. Thus, the first and more recent (anonymized) dataset is richer than the second (identified) dataset, because of subsequent revisions by the Statistical Authority. In order to identify firms, we carefully match based on unique value-volume-product-destination entries reported in both databases and we perform an extensive set of sanity checks to test the quality of our matching procedure[17].

5. The intensive margin of exports

5.1 Definitions of variables

We exploit the imposition of capital controls on outflows in Greece in June 2015 as a quasi-natural experiment to evaluate the contribution of the two channels – real and finance – and we employ a difference-in-differences approach around the policy shock. Because exports data are highly seasonal, we compare the period June 2015 – November 2015, which serves as our *post* period, with the period June 2014 – November 2014, which serves as our *pre* period. An important advantage of our *pre* period is the economic and political stability, which significantly eliminates concerns regarding anticipation effects of capital controls and, thus, adjustment before the shock. This is the reason that we also exclude December 2014 (and as a result December 2015) from our regressions in order to avoid any estimation bias associated with the uncertainty surrounding the presidential election in December 2014. As discussed above, we proxy for the real channel by exploiting a sectoral measure of dependence on imported inputs, which we call *Import Content of Exports*, and we proxy for the finance channel by exploiting a sectoral measure of dependence on short-term credit, which we call *Inventories Ratio*. The *Import Content of Exports* measure is from the OECD STAN Input-Output Database (at the 2-digit ISIC Revision 2 classification) and is measured as of 2005, which is the

[16] We access these data through the Bank of Greece.
[17] The step-by-step matching procedure, along with the set of all sanity checkst he we perform, can be made available upon request.

last year of data availability for Greece[18]. Building on the vertical specialization concept of Hummels, Ishii and Yi (2001), it is a unique and reliable measure of a sector's backward linkages since it takes into account the direct and indirect participation of imported intermediate inputs in the final good to be exported. In other words, the measure is constructed following all imported inputs that are used in one sector, whose outputs are inputs in a second sector, and then in a third sector and are finally embodied to the exported product.

The *Inventories Ratio* measure is defined as inventories over sales and captures a sector's dependence on short-term bank credit in order to meet demand. In other words, it is a proxy for the duration of the production process. The higher this measure is, the higher the dependence of a sector on short-term credit. The measure reflects the dependence of the median U.S. firm in period 1980-1999 and we obtain it directly from Kroszner, Laeven and Klingebiel (2007). The fact that it is based on U.S. companies, rather than Greek firms as our *Import content of Exports* measure, should be seen as a concern, since it is a standard practice in the literature. The behaviour of U.S. companies plausibly approximates the use of external capital in the absence of financial frictions (Rajan and Zingales, 1998). What matters is that industries have similar ranking regarding financing needs around the world, rather than the exact same dependence on bank credit as in the U.S. This is plausible, since it is meant to capture an innate to each sector technological component, which makes them a good proxy of sectoral financing needs across all countries (e.g. Rajan and Zingales, 1998; Claessens and Laeven, 2003; Manova, Wei and Zhang, 2015). The measure follows the 3-digit ISIC Revision 2 classification, which we in turn concord as weighted averages at the 2-digit ISIC Revision 3 classification. Table 1 presents these sector-level measures for 18 manufacturing sectors at the 2-digit ISIC Revision 3 level. In the last column, the table also reports the *External Finance Dependence* measure, which is later used at the extensive margin of exports.

[18] This alleviates concerns that sectors have adjusted import dependence during the Greek crisis since 2008. Thus, it can be treated as exogenous to the policy shock in 2015. However, for robustness, we also consider an alternative, more recent, measure as of 2011, which has been constructed only for 16 instead of 18 manufacturing industries as our baseline measure.

[Insert Table 1, around here]

5.2 Econometric specification

We look at within-firm changes in sectoral exports before and after the imposition of capital controls. As compared to changes across-firms, exploiting variation within the same firm across sectors has the advantage of establishing the causal effect of the policy shock[19]. However, we do study exports adjustment across firms and document that the statistical significance and economic relevance of our results remain the same. Formally, we estimate the following model:

$$\Delta \log(Exports)\, fpd = \beta_1 * IC\ of\ Exports_s + \beta_2 * Liquidity\ Needs_s + \alpha_f + \alpha_d + \varepsilon_{fpd} \quad (1)$$

In the above specification, *f* denotes a firm exporting products *p* that belong to sector *s* and serve export markets/destinations *d*. Although the variables of interest vary at the sector-level, our dependent variable, which denotes the log growth of exports of firm *f* to destination *d*, varies at the product-level. In other words, we study the adjustment of exports of products that belong to different sectors with differential exposure to the import and credit constraints. Since firms do not necessarily export each product every month, the sample contains a number of intermittent export flows. We thus collapse the data into two time periods, t={*pre* , *post*}, and consider an export flow to be active at *t* if positive exports were registered at any month during this period. That way, we avoid potential estimation bias due to serial correlation concerns. The cross-section specification in first-differences has the advantage to eliminate all time-invariant heterogeneity at the firm, product and destination level (or a combination of those) as well as macroeconomic factors common to all firms and industries (e.g. political uncertainty). We winsorize our dependent variable at the 1st and 99th percentiles to minimize the probability that outliers drive our findings. The terms α_f and α_d are firm and destination fixed effects respectively and ε_{fpd} is the error term. Since exports are an

[19] Especially for the extensive margin, studying changes within the same firm, facilitates its measurement in a more precise way. For instance, if all but one large firm drops a product variety, this product would not contribute to the extensive margin at the aggregate level. However, a within-firm analysis would still pick up the effect regardless of what the rest of firms do.

equilibrium outcome, *changes* in demand are captured by the destination fixed effects. In case demand effects are time-invariant, these are already wiped out in the first-differences model[20]. Finally, we correct standard errors to take into account that both the *Import Content of Exports* and *Inventories Ratio* vary at the sector level, which is the most aggregate variable of interest. Failure to do so would result in a downward bias in the estimated errors (Moulton, 1990)[21].

5.3 Core results

Our results are presented in Table 2. The negative coefficient for the *Import Content of Exports* implies that sectoral exports with higher import content before capital controls drop more during capital controls. Controlling for firm fixed effects implies that the adjustment takes place within the same firm. Regardless of whether we account for other sector-level observable characteristics that directly affect export performance (column 2) or we account for changes in demand and relevant observed or unobserved heterogeneity at the destination-level (column 3), the coefficient remains statistically significant and economically relevant. This implies that the real channel is operational and has high explanatory power in explaining the adjustment in sectoral exports. Economically, our strictest specification suggests that a one standard deviation increase on a sector's dependence on imported intermediate inputs is associated with approximately 4pp lower export growth within the same firm during capital controls. The coefficient for the *Inventories Ratio* is negative suggesting that credit constraints become more, not less, binding during capital controls, however it is never statistically significant. Taken together, these findings are in line with the trade literature that documents the importance of high-quality imported intermediate inputs for productivity (e.g. Kasahara and Rodrigue, 2007; Halpern, Koren and Szeidl, 2015), higher product

[20] We assume that changes in demand are destination-specific. This may not be a good assumption, because demand might adjust more for specific sectors as compared to others. Wherever our empirical strategy allows us to do so, we control for a set of destination-sector-specific dummies to address this concern.

[21] The covariance matrix of our error term is very complex. Apart from errors being correlated across firms within a sector, they may be correlated across firms within a destination. But they may also be correlated across sectors or across destinations within the same firm. Our results remain robust when we account for these potential identification threats and double cluster at the sector and destination level and triple cluster at the firm, sector and destination level. These results are available upon request.

scope (e.g. Goldberg, Khandelwal, Pavcnik and Topalova, 2010) and export performance (e.g. Chevassus-Lozza, Gaigne and Mener, 2013; Feng, Li and Swenson, 2016).

[Insert Table 2, around here]

5.4 Robustness checks

In Table 3, we perform a number of tests to check the robustness of these results. First, we drop the month of the bank holiday (i.e. July 2015) and re-run our main specification. In our baseline specification, the role of credit constraints may be overestimated, because firms could not rollover old or get new credit during the bank holiday month. Column 1 confirms that when we compare the period August – November 2014 with the respective period in 2015, both coefficients have very similar magnitude as in Table 2. The fact that the coefficient of the *Import Content of Exports* is somewhat lower is in line with the normalization in the process the centralized committee was handling firm requests to transfer funds abroad for import-related purposes. As a result, excluding the bank holiday month does not change the magnitude of our baseline estimates.

In column 2, although our baseline measure of *Import Content of Exports* refers to year 2005, which is the last year data are available for Greece in the OECD-STAN Input-Output Database, we consider an alternative measure as of 2011 obtained from the Trade in Value Added Database. The alternative measure has two limitations. One, it is constructed for 16, instead of 18 industries as in the OECD-STAN Input-Output Database, which implies less cross-sectoral variation in import dependence and, two, it might reflect sectoral adjustments because of the ongoing Greek crisis which started in 2008. However, with these caveats in mind, we confirm that our conclusions hold regardless of the measure we employ as proxy for the real channel.

In column 3, although our focus so far has been on the log growth of export *values*, we also consider the adjustment of export *volumes*. The advantage of volumes over values is that volumes strip out price changes, which might be sector-specific. Our conclusions with the alternative measure of trade adjustment do not change suggesting that changes in prices internationally do not drive our baseline estimates.

In column 4, we include additional controls at the sector-level that may affect the adjustment of exports during capital controls. In particular, we add a measure of durability intensity (Kroszner, Laeven and Klingebiel, 2007) and a measure of trade credit intensity (Fisman and Love, 2003). The rationale behind these controls is that exports adjustment might be more pronounced for durable as compared to non-durable goods and, as such, we want to rule out the possibility *Import Content of Exports* is confounded with durability characteristics. Further, it is likely that trade credit provision adjusted following the imposition of capital controls, which in turn might have affected a firm's export performance. However, the magnitude of our estimate in column 4 suggests that none of these characteristics materially affect the real channel and, as such, our conclusions remain unchanged.

In column 5, we check whether our results remain robust when we experiment with an alternative level of aggregation of our data at the firm-sector-destination level. In the new model, sector level follows the 2-digit ISIC Rev. 3 classification, in other words we aggregate at the same level as the main explanatory variables. Our results remain robust to the alternative level of aggregation.

Finally, as is the case with any difference-in-differences strategy, we need to ensure that any post-shock differential adjustment in sectoral exports is because of the capital controls policy rather than any pre-existing sectoral trends within the same firm. We formally test for this assumption and consider an episode of *placebo* capital controls a year before the imposition of the actual capital controls. Assuming that controls were imposed in June 2014, and treating the period June 2013–November 2013 as our *placebo pre* period and June 2014–November 2014 as our *placebo post* period, column 6 confirms that exports adjust because of the policy shock rather than any pre-existing trend in a sectoral exports.

[Insert Table 3, around here]

6. Teasing out the channels

A concern regarding the selection of our proxy for the real channel – *Imports Content of Exports* – is whether identifying the contribution of each channel – real and

finance – is really feasible. In particular, it could be the case that exports of import-intensive sectors decline because there is lack of credit to finance imports rather than because administrative controls put constraints on imports. Ideally, a clean identification of the two channels would require detailed data on the actual amount of credit devoted to imports, production and exports. To this end, and in the absence of such detailed data, we proceed in two steps to check for the robustness of our identification strategy.

6.1 Sectors with low versus high credit needs

As a first step, we check the magnitude of the coefficient of the real channel for sectors that are low and high credit dependent at the 2-digit ISIC Revision 3 level. If the finance channel contaminates our real channel, in other words if exports adjustment is driven by lack of credit to finance imports, then the coefficient of the *Import Content of Exports* would be higher for relatively more credit dependent sectors. Because of the low cross-section variation, we split industries in two categories (*Low* and *High*) and re-run our baseline regression for each subsample. Table 4 confirms that the economic effect of the real channel is very similar when we consider separately exports of sectors with *Low* versus *High* credit needs. This suggests that the credit constraints do not mix with the imports channel and, as such, our baseline estimates provide a relatively clean identification of the two channels[22].

[Insert Table 4, around here]

6.2 Exempted versus restricted products

As a second step, we exploit a unique feature of the capital controls policy, namely the exemption of a set of imported goods from any administrative restriction on capital outflows for reasons of public safety and health. Non-restricted imports include medicinal

[22] Del Prete and Federico (2014) discuss the importance of import versus ordinary loans in international trade. They show that import loans are less sensitive than ordinary loans during a large credit crunch episode exploiting a uniquely detailed dataset on the various forms of bank credit in Italy. In fact, they find no evidence of an effect of bank liquidity shocks on import loans and they attribute this to the standardized and low risk nature of these products. A notable difference related to the riskiness of these products is that the goods to be shipped serve as collateral for an import loan as compared to an ordinary loan. More generally, Niepmann and Schmidt-Eisenlohr (2017) discuss the crucial role of banks in the financing terms supporting international trade.

products, petroleum products, electrical machinery for health and production purposes and food. Products belonging to these sectors were exempted from submitting documentation that justifies the transfer of funds abroad for import-related purposes and, as such, were prioritized as compared to imports of other sectors. This unique feature allows us to conduct a counterfactual exercise and formally tease out the real from the finance channel.

6.2.1 Across sectors

Table 5 presents the results of this exercise, where we consider separately exempted and restricted product categories. Following the 5-digit SITC Revision 4 classification[23], medicinal products correspond to code 54, petroleum products correspond to code 33 and electric machinery products correspond to codes 771 (electric power machinery), 772 (electrical apparatus for switching or protecting electrical circuits), 773 (equipment for distributing electricity) and 774 (electrodiagnostic apparatus for medical, surgical, dental or veterinary purposes and radiological apparatus)[24]. Because guidelines on the food products to be exempted from restrictions were not clearly determined by the transactions approval committee, we experiment with various definitions in the columns of Table 5. In column 1, we exclude meat (01), diary (02) and fish (03) products as well as the rest of exempted products. The coefficient of *Import Content of Exports* turns positive, which suggests that the real channel becomes neutral when we consider separately the set of exempted products. This might well be driven by the low credit dependence of this set of products, which however does not seem to be the case, as the coefficient of the *Inventories Ratio* is negative and increases in magnitude as compared to the baseline specifications (column 3 in Table 2). As for the restricted products (column 2), *Import Content of Exports* has somewhat larger explanatory power as in the baseline regression (0.412***) and *Inventories Ratio* remains statistically insignificant but lower in

[23] https://unstats.un.org/unsd/publication/SeriesM/SeriesM_34rev4E.pdf

[24] The electric machinery products to be exempted were related to health and production purposes, but no specification on the exact product categories was provided. However, anecdotal evidence and discussions point to the importance of health and production equipment (e.g. electrodiagnostic apparatus for medical and surgical purposes) to be of high priority for payments abroad as compared to household-type electrical equipment (e.g. refrigerators or dishwashing machines – code 775 in 5-digit SITC Revision 4) during capital controls.

magnitude. Taken together, the exempted products seem to offer a solid counterfactual setup that allows us to tease out the real channel and formally test whether it mixes with the finance channel, which does not seem to be the case. In columns 3 and 4, we re-run our regressions excluding food product categories meat (01), diary (02) and fish (03), cereal (04) and vegetables (05) and our conclusion remains unchanged. Finally, in columns 5 and 6, we add coffee (06) and sugar (07) to the exempted categories. Across all models, the real channel neutralizes suggesting that *Import Content of Exports* is a solid proxy of the real channel, well distinguished from the finance channel.

[Insert Table 5, around here]

6.2.2 Within sectors

A concern when we consider exempted and restricted products separately is whether comparison is plausible. Although our models control for important observables at the sector-level, such as factor intensities and relationship-specificity/contract intensity, and exempted products are relatively more credit dependent as coefficients suggest in Table 5, we cannot fully rule out the possibility that sector-level unobservable characteristics (e.g. durability) drive the exports adjustment of the set of exempted products through the real channel. In Table 6, we compare the *differential* adjustment of exports of exempted as compared to restricted products within the *same* sector. That way, we mitigate any remaining concerns that the sectors of exempted products are very different from the sectors of restricted products to begin with. In Table 6, we exploit the variation across product type (exempted versus restricted) within firm-sector and within destination-sector pairs. In other words, we consider a firm *f* exporting an exempted and a restricted product *p* of the same sector *s* that both serve the same destination *d*. This (very restrictive) specification has the advantage to suggest the *level* adjustment of exports of the exempted products along with the *differential* effect. Table 6 confirms our results. The level of exports of the exempted products during capital controls increases and the *differential* adjustment within a sector with a given level of import dependence is positive and statistically significant as compared to the restricted products. This exercise suggests that even within the same firm-sector and destination-sector pair, exempted products are

immune to the rules on import payments and, as such, offer a valid counterfactual to tease out the real channel. In line with Table 5, exempted products are more credit intensive as compared to restricted products, which is why the coefficient of the interaction with the finance channel is negative and statistically significant. Overall, these findings suggest that the identification of the two channels – real and finance – is relatively clean in our baseline regressions and our empirical strategy provides a credible evaluation of the contribution of each channel to firms' exports adjustment.

[Insert Table 6, around here]

7. Exports adjustment across firms within product-destination markets

So far, for identification purposes, we have focused on within-firm changes in sectoral exports following the capital controls policy in June 2015. However, from an economics point of view, it is interesting to repeat the analysis across firms and check the robustness of our findings (both statistically and economically). Formally, we estimate the following model:

$$\Delta \log(Exports)_{fpd} = \beta_1 * \ Imported\ Intermediate\ Inputs_f + \beta_2 * \ STDebt_f + \alpha_{pd} + \\ + \varepsilon_{fpd} \quad (2)$$

Imported Intermediate Inputs is normalized by a firm's total imports and denotes dependence on imported intermediate inputs as of 2013. Intermediate inputs follow the BEC Revision 4 classification and correspond to codes 111, 121, 21, 22, 42 and 53, as in Hummels, Ishii and Yi (2001). *Short-Term Debt (STDebt)* is normalized by a firm's total liabilities and denotes dependence on short-term bank credit as of 2013. The model includes an extensive set of product-destination dummies to control for product-destination-specific changes in demand for exports. Additional firm-level control variables include the liquidity position of the firm, stock of inventories and dependence on trade payables. To allow for a rather conservative inference, we double cluster standard errors at the product-destination and a firm's province level. As Table 7 reports,

our conclusions remain robust when we study the adjustment across firms that export the same product to the same destination. Economically, the estimated effect is essentially the same as the one obtained from the analysis within-firm (4pp), in other words a one standard deviation increase in imported intermediate inputs (i.e. 0.07) is associated with 3.7pp lower export growth across firms during capital controls. Overall, our regressions suggest that imported intermediate inputs, rather than short-term working capital needs, are of primary importance in the exports adjustment at the intensive margin of trade. Of course, our results do not suggest that credit constraints do not matter for exports adjustment. Rather, they suggest that, when both channels are operational, lack of imported intermediate inputs seems to be of relatively higher importance for the adjustment at the intensive margin.

[Insert Table 7, around here]

8. The extensive margin of exports

In this section, we turn our attention to the extensive margin of exports. To this end, we consider three models to study the change in the number of products exported (product scope of exports), the number of destinations served (destination scope of exports) and the number of product-destination pairs (product-destination scope of exports). We construct three new dependent variables, one for each alternative model: the percent change in the number of products aggregated by firm-sector-destination (i.e. *%Δ(# Products)*), the percent change in the number of destinations by firm-sector (i.e. *%Δ(# Destinations)*) and the percent change in the number of product-destinations by firm-sector (i.e. *%Δ(# Product-Destinations)*)[25]. We proxy for the finance channel with a sector's *External Finance Dependence* (Rajan and Zingales, 1998; Kroszner, Laeven and Klingebiel, 2007; Manova, Wei and Zhang, 2015), which is associated with the production capacity of firms and the exit/entry decisions to export. As compared to the *Inventories Ratio*, *EFD* reflects the long-run investment needs of a sector and, as such, is

[25] We opt in constructing these variables as percent changes, that is $(\#products_{post} - \#products_{pre}) / \#products_{pre}$, as compared to log-differences, that is $log(\#products_{post}) - log(\#products_{pre})$, in order to account for terminated export flows (i.e. the cases where the number of products equals 0) and as a result for a more precise evaluation of the extensive margin.

mainly associated with the extensive margin of trade. We obtain this measure from Kroszner, Laeven and Klingebiel (2007) at the 3-digit ISIC Revision 2 level and concord it as a weighted average at the 2-digit ISIC Revision 3 level. To remain consistent with the *Inventories Ratio* used at the intensive margin, *External Finance Dependence* is also calculated with U.S. data over the period 1980-1999.

Table 8 presents the results for the analysis of the extensive margin. In all models, higher dependence on high-quality imported intermediate inputs is associated with a decline in the product (column 1), destination (column 2) and product-destination (column 3) scope of exports, but never enters as statistically significant. In contrast, higher dependence on external capital is associated with 3.7pp lower number of products exported, 5.5pp lower number of destinations and 5.7pp lower number of product-destination pairs during capital controls. These results suggest that lack of access to bank credit for long-run investment purposes (e.g. product customization) leads to a decline in the number of products exported and export markets served. As a result, dependence on external capital for long-run investments seems to drive the adjustment at the extensive margin, above and beyond the lack of imported intermediate inputs.

[Insert Table 8, around here]

In Table 9, we consider an alternative proxy for the dependence on long-term bank credit to check the robustness of our conclusions. The new measure reflects a sector's R&D intensity over the period 1980-1999 and is also obtained from Kroszner, Laeven and Klingebiel (2007). Table 9 confirms the findings of Table 8. Economically, the effect is somewhat larger: a one standard deviation increase in a sector's R&D intensity (i.e. 0.02) is associated with 5.5pp lower number of products exported, 8.2pp lower number of destinations served and 8.4pp lower number of product-destination pairs during capital controls.

[Insert Table 9, around here]

9. Multinational activity, imported inputs and credit constraints

In the final section, we explore whether and how multinationals overcome the distortions associated with the controls on capital outflows. Controls on capital outflows are associated with both real and financial frictions and theory suggests that multinational firms may adjust differently. On the one hand, Rodrigeuz-Clare (1996) puts forward three explanations for the linkages which a multinational firm develops domestically in order to acquire intermediate inputs. First, activities that use more intensively intermediate goods are more likely to develop domestic linkages. This is likely to be sector-specific and, as a result, subsumed by sector-specific dummies in an econometric specification. Second, the higher the communication costs between the headquarters and the production plant are, the stronger the incentive of an affiliate to purchase intermediate inputs domestically. This channel is firm-specific, and as a result, subsumed by firm-specific dummies in an econometric specification. Third, all else equal, the less developed the host country is (in terms of the number of product varieties), the more likely for the foreign affiliate to buy specialized inputs abroad. Given the prolonged recession in Greece since 2008, this channel is more likely to explain multinational activity and dependence on imported intermediate inputs.

On the other hand, firms offshore part of their production process because of lower manufacturing costs (e.g. Helpman, 1984; Markusen, 1984; Helpman, Melitz and Yeaple, 2004). Conditional on multinational presence, multinationals enjoy access to an internal capital market which is a crucial comparative advantage as compared to domestic firms. Multinational companies reap the benefits of accessing the internal market especially in periods when credit constraints bind or during other episodes of macroeconomic adjustment (e.g. Desai, Foley and Forbes, 2008). For example, in a recent paper, Manova, Wei and Zhang (2015) document that foreign affiliates in China have better export performance in financially more vulnerable sectors, because of access to parent's internal funds.

To test for the exports adjustment of multinational firms in the presence of both import and credit constraints, we modify our baseline specification and estimate the following model:

$$Y_{fpd} = \beta_1 * MNC_f * IC\ of\ Exports_s + \beta_2 * MNC_f * Credit\ Needs_s + \alpha_f + \alpha_{ds} + \\ + \varepsilon_{fpd} \quad (3)$$

We estimate the model for both intensive and extensive margin of exports. As such, the dependent variable is defined accordingly as earlier. Our sector-level variables of interest now interact with a dummy variable of multinational activity at the firm-level, MNC_f, which allows us to introduce firm (α_f) and destination-sector (α_{ds}) fixed effects. The latter set of dummies capture changes in demand that are destination-sector rather than only destination-specific. These dummies help isolate the third channel of multinational activity and dependence on imported inputs, as discussed in Rodrigeuz-Clare (1996). The first two channels, which are the intensive use of intermediate inputs and the communication costs channel, are subsumed by the extensive set of fixed effects. MNC_f is a dummy variable which takes the value 1 if the firm is affiliate of a foreign multinational (defined as a firm with more than 50% of its stakes owned by foreign investors as of end 2013) and 0 else. We obtain information on a firm's ownership structure accessing confidential reports from ICAP, which is the largest business registry and the primary source of information for ORBIS in Greece. Although the ORBIS database is considered to provide high-quality ownership information and, as a result, has been extensively used in the literature (e.g. Franks et al, 2012; Fons-Rosen et al, 2013), there are data gaps, missing information and double entries for many companies[26]. We overcome these shortcomings by collecting ownership structure information directly from the reports. A report provides a detailed overview of a firm's operations, such as financial data, bankers and branches, suppliers, shareholders and board of directors, as well as their management histories as of today. Crucially for our purposes, as of today corporate control information is complemented by detailed changes in the ownership structure, their timing and the precise share of stakes owned by each individual shareholder[27]. This allows us to track acquisitions that took place after the end of 2013 and, most importantly, after the

[26] An important step to clean and update ORBIS's corporate control data is made by Aminandav and Papaioannou (2017).

[27] For example, we see the ownership structure (i.e. names of sharehoders and precise stake ownership of each shareholder) of firm X, until it was fully acquired by a foreign company in December 2016. As of today, firm X is part of a multinational company but back at the time of the imposition of capital controls in June 2015, it was a domestic company. Thus, we classify X as a domestic firm.

imposition of capital controls and minimize any endogeneity concerns regarding ownership structure changes during a liquidity crisis (Aguiar and Gopinath, 2005).

Table 10 presents our results. At the intensive margin (column 1), multinationals seem able to overcome the credit constraints associated with the controls on capital outflows policy as compared to domestic firms. In contrast, multinationals do not overcome the import constraints, because they are relatively more dependent on imported intermediate inputs as compared to domestic firms as theory discusses (Rodrigeuz-Clare, 1996). To further isolate the effect of multinational activity, we follow Manova, Wei and Zhang (2015) and control for the interaction of a firm's size with the respective sector-level measure to account for the possibility large firms having established relationships with international suppliers and, as such, be more dependent on imported inputs and for the possibility large firms being less financially constrained in relatively more credit dependent sectors. Accounting for the size effect, our estimates provide a relatively clean effect of multinational activity.

At the extensive margin, multinationals are also able to overcome credit constraints associated with access to long-term bank credit that affects their production capacity, as columns 2, 3 and 4 suggest (fixed effects are adjusted accordingly). In all models, our results are both statistically strong and economically relevant, which suggests that multinationals do access parents' funds in times of lower available liquidity. Taken together, our results suggest that multinational firms overcome credit constraints because of access to an internal capital market, but do not overcome import constraints because of stronger linkages for specialized inputs abroad. To the best of our knowledge, this paper is the first to jointly consider multinational activity and export adjustment when both channels – real and finance – are operational.

[Insert Table 10, around here]

10. Conclusion

In this paper, we take a first step to *jointly* study the role of imported intermediate inputs and credit constraints on exports. The literature has studied the two channels – real and finance – in isolation, but recent experience shows that they can operate

simultaneously during large trade adjustment periods (e.g. during the 2008-2009 Global Financial Crisis). For identification, we study an episode of capital controls on outflows and the large-scale credit crunch that followed the imposition of controls in Greece in June 2015. Importantly, at the time of imposition, there was no expectation regarding the time of relaxation of capital controls. Employing sector-level proxies for the real and finance channels and exploiting within-firm variation across sectors, we find that it is imported intermediate inputs, rather than working capital needs, that explain the drop in exports at the intensive margin. In contrast, a sector's long-run investment needs are the sole determinant of adjustment at the extensive margin and lack of access to long-term bank credit is associated with a lower product, destination and product-destination scope of exports. These results survive a large number of robustness tests, counterfactual exercises and remain relevant to alternative specifications and econometric assumptions. We also explore, for the first time, whether and how multinational activity adjusts on export performance when both frictions – real and financial – are at work. We find that multinational firms are able to overcome credit constraints because of access to a deep internal credit market, but not the import constraints because of stronger linkages for specialized inputs abroad.

Our results have implications for both theory and policy. Since the Global Financial Crisis, capital controls have been used both as a crisis prevention tool (inflow controls) and a crisis management tool (outflow controls). Our paper is the first to focus on the latter employing rich micro data and a unique policy experiment to study the channels at work, as discussed theoretically in Tamirisa (1999). We show that although outflow controls are a form of financial regulation designed to contain a crisis, in our case a bank run, they are *no free lunch*. Imposing controls on capital outflows has a negative effect on firms' international trade activities and this effect manifests itself through different channels with different implications for the margins of trade. These results have direct implications on the distributional consequences of capital controls as a financial stability tool (Rajan and Zingales, 2003), as well as their unintended consequences as a crisis management tool (Demirguc-Kunt and Serven, 2010). Restricting international capital flows either to prevent or to contain a financial crisis is an old tool that currently receives

fresh attention. The availability of rich micro data calls for more research to address a lot of open and important questions. We look at these questions deeper in future research.

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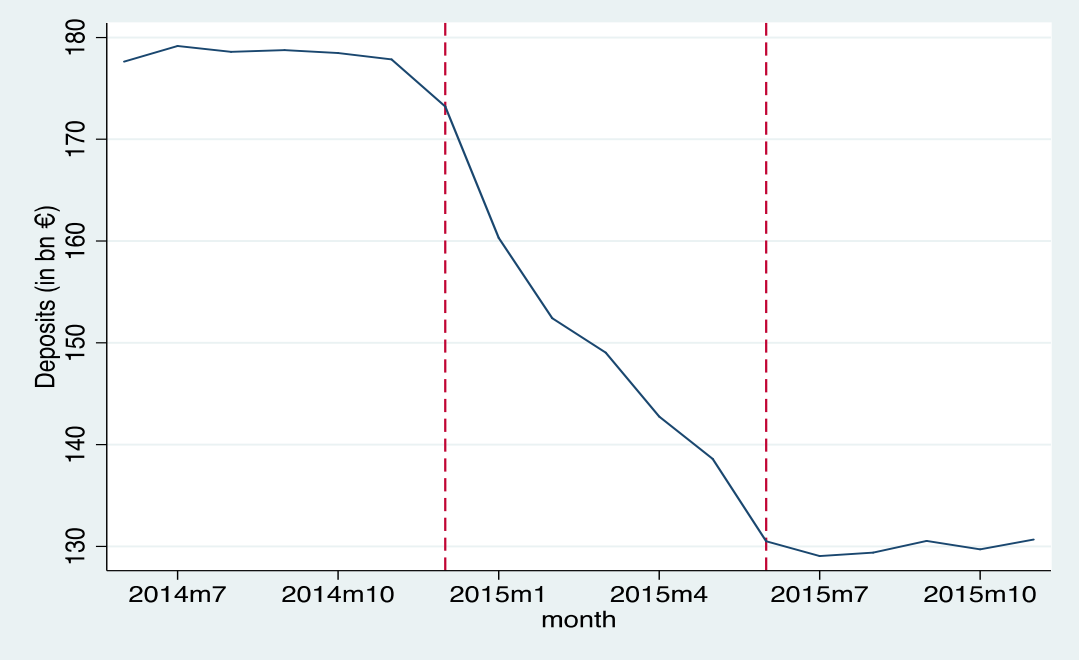
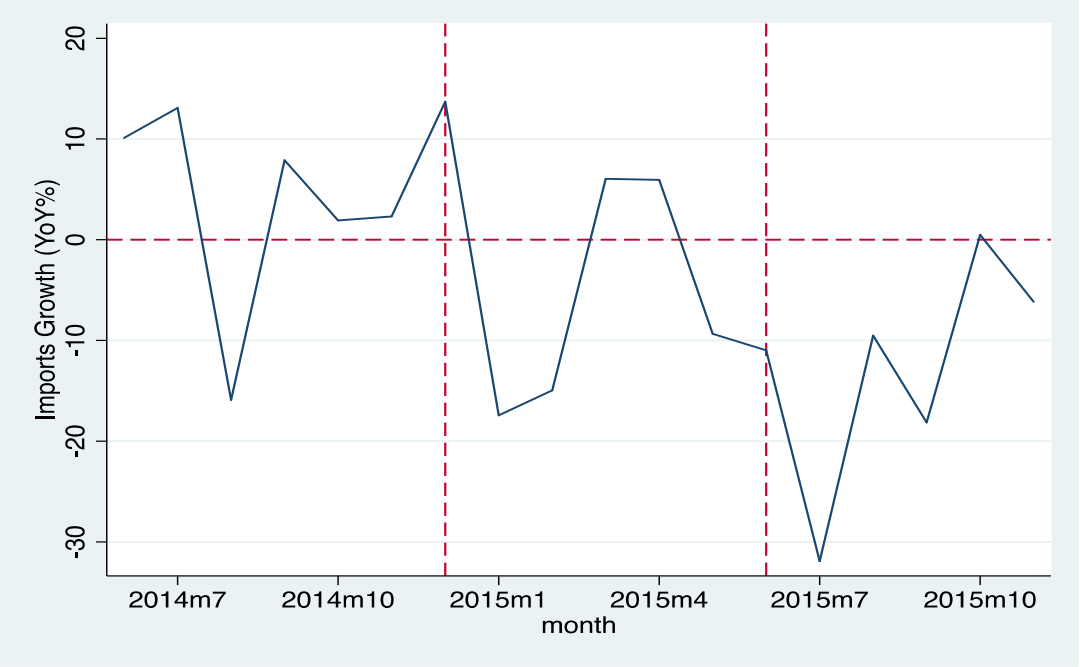
Figure 1: Evolution of Deposits in the Greek Banking System



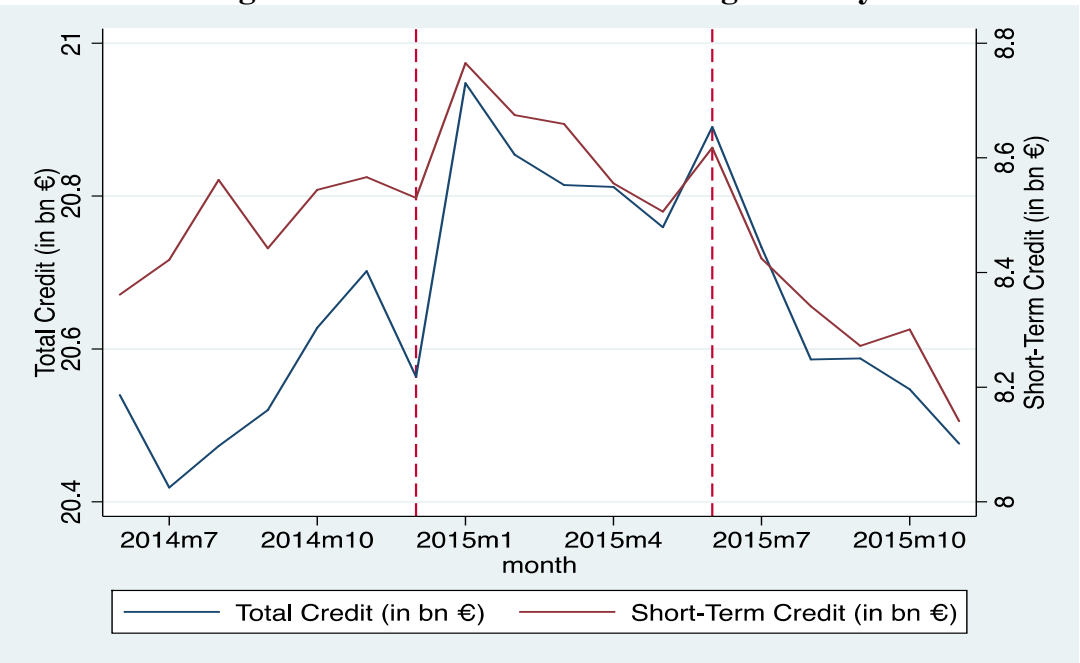
Note: The figure presents the evolution of deposits in the Greek banking system. The red vertical dashed lines signal the Pre={June 2014 - November 2014} and Post={June 2015 - November 2015} periods of our difference-in-differences estimation strategy.

Figure 2a: Imports Growth (YoY%)



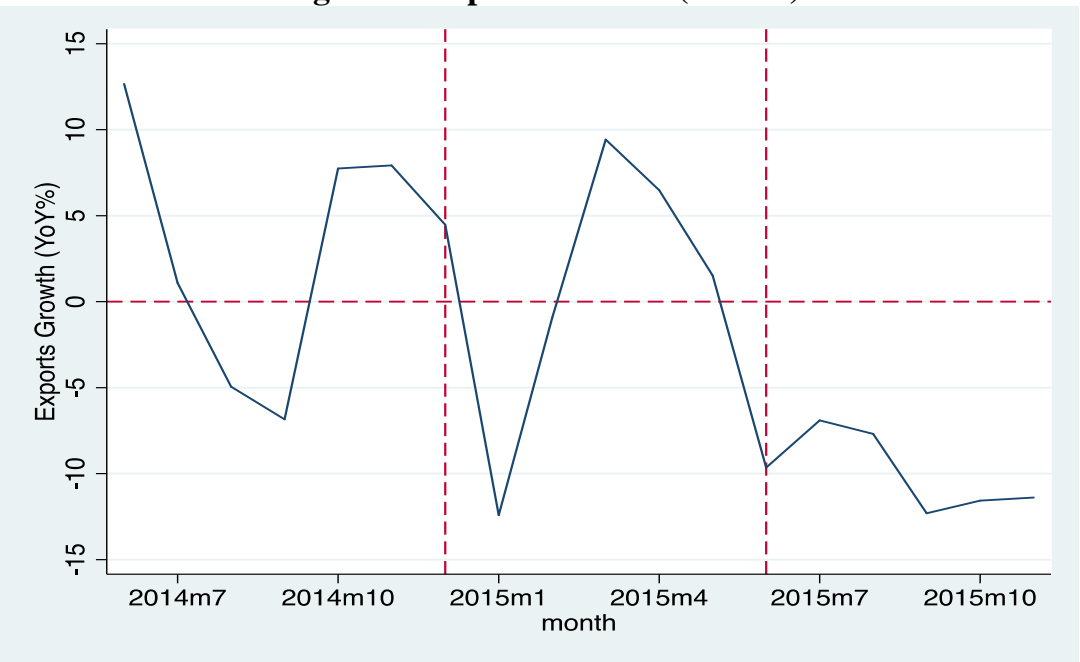
Note: The figure presents the year-on-year imports growth. The red vertical dashed lines signal the Pre={June 2014 - November 2014} and Post={June 2015 - November 2015} periods of our difference-in-differences estimation strategy.

Figure 2b: Credit to Manufacturing Industry



Note: The figure presents the evolution of total and short-term credit to the manufacturing industry. The red vertical dashed lines signal the Pre={June 2014 - November 2014} and Post={June 2015 - November 2015} periods of our difference-in-differences estimation strategy.

Figure 3: Exports Growth (YoY%)



Note: The figure presents the year-on-year exports growth. The red vertical dashed lines signal the Pre={June 2014 - November 2014} and Post={June 2015 - November 2015} periods of our difference-in-differences estimation strategy.

Table 1: Sector Characteristics

ISIC Rev. 3	Sector	Import Content of Exports	Inventories Ratio	External Finance Dependence
C15T16	Food products, beverages and tobacco	15.6%	10.8%	-16.1%
C17T19	Textiles, textile products, leather and footwear	20.5%	18.0%	-9.9%
C20	Wood and products of wood and cork	26.4%	12.1%	-3.0%
C21T22	Pulp, paper, paper products, printing and publishing	22.3%	13.0%	-17.7%
C23	Coke, refined petroleum products and nuclear fuel	67.9%	11.2%	1.3%
C24	Chemicals and chemical products	32.3%	15.3%	-11.4%
C25	Rubber and plastics products	27.0%	15.5%	4.2%
C26	Other non-metallic mineral products	16.6%	14.7%	-21.1%
C27	Basic metals	44.7%	16.4%	-13.4%
C28	Fabricated metal products except machinery and equipment	32.6%	17.9%	-13.3%
C29	Machinery and equipment n.e.c	28.5%	19.1%	-1.7%
C30	Office, accounting and computing machinery	17.8%	20.5%	34.1%
C31	Electrical machinery and apparatus n.e.c	32.3%	17.7%	10.8%
C32	Radio, television and communication equipment	17.7%	18.0%	24.0%
C33	Medical, precision and optical instruments	27.5%	19.5%	35.3%
C34	Motor vehicles, trailers and semi-trailers	32.7%	17.5%	-9.1%
C35	Other transport equipment	28.8%	18.0%	-2.0%
C36T37	Manufacturing n.e.c; recycling	19.8%	17.1%	-3.4%

Note: The table presents *Import Content of Exports*, *Inventories Ratio* and *External Finance Dependence* measures at the 2-digit ISIC Revision 3 sector level. *Import Content of Exports* is defined as the share of total imported intermediated inputs (foreign value-added) used in the production of a sector's gross exports in Greece in 2005 and is obtained by the OECD STAN Input-Output Database. *Inventories Ratio* is defined as the inventories to sales ratio and corresponds to the median level of liquidity needs for ISIC sectors in the U.S. in period 1980-1999. *External Finance Dependence* is defined as the share of capital expenditures not financed with cash flow from operations and corresponds to the median level of investment needs for ISIC sectors in the U.S. in period 1980-1999. *Inventories Ratio* and *External Finance Dependence* measures are obtained from Kroszner, Laeven and Klingebiel (2007) at the 3-digit ISIC Revision 2 level and are concorded by the authors as weighted averages at the 2-digit ISIC Revision 3 level. The correlation bewteen the *Import Content of Exports* and *Inventories Ratio* is 24% (not statistically significant) and the correlation between the *Import Content of Exports* and External Finance Dependence is 7% (not statistically significant).

Table 2: Imported Inputs, Credit and Exports Adjustment

	Δlog(Exports)		
	1	*2*	*3*
Import Content of Exports	-0.341**	-0.337*	-0.331*
	0.129	0.173	0.176
Inventories Ratio	-0.7	-0.723	-0.716
	0.473	0.52	0.53
K, H, Contract Intensity	no	yes	yes
Destination FE	no	no	yes
Firm FE	yes	yes	yes
Adj. R^2	0.067	0.067	0.068
N	50,033	50,033	50,033

Note: The table presents results from difference-in-differences regression models at the firm-product-destination level. The time-window is Pre={June 2014-November 2014} and Post={June 2015-November 2015}. Dependent variable is *Δlog(Exports)*, which denotes the log growth of exports following the imposition of controls on capital outflows in June 2015. Additional sector-level control variables include capital and skills intensity and contract intensity. Capital intensity is obtained from Kroszner, Laeven and Klingebiel (2007), skills intensity from Manova (2013) and contract intensity from Nunn (2007) at the 3-digit ISIC Revision 2 level and are concorded by the authors as weighted averages at the 2-digit ISIC Revision 3 level. Standard errors are clustered at the sector level. Statistical significance is denoted as .01***; .05**; .1*.

Table 3: Robustness Checks

	Δlog(Exports)					
	Exclude Bank Holiday	IC of Exports as of 2011	Export Volumes	Additional Controls	Firm-Sector-Destination	Placebo Capital Controls
	1	*2*	*3*	*4*	*5*	*6*
Import Content of Exports	-0.309*	-0.409*	-0.437*	-0.385*	-0.501**	0.171
	0.147	0.193	0.22	0.203	0.222	0.166
Inventories Ratio	-0.778	-0.587	-0.466	-0.611	0.523	-0.575
	0.516	0.543	0.482	0.515	0.738	0.571
K, H, Contract Intensity	yes	yes	yes	yes	yes	yes
Durability, Trade Credit	no	no	no	yes	no	no
Intensity Destination FE	yes	yes	yes	yes	yes	yes
Firm FE	yes	yes	yes	yes	yes	yes
Adj. R^2	0.07	0.067	0.075	0.068	0.066	0.057
N	39,995	49,881	50,033	50,033	31,050	45,604

Note: The table presents results from difference-in-differences regression models. Definitions of variables are as earlier with the following amendements. In column 1, the time-window is Pre={August 2014-November 2014} and Post={August 2015-November 2015}. In column 2, *Import Content of Exports* is measured as of 2011 for 16 manufacturing industries at the 2-digit ISIC Revision 3 level and is obtained from the Trade in Value Added Database. In column 3, the dependent variable denotes the log growth of export volumes. In column 4, we control for a sector's durability (Kroszner, Laeven and Klingebiel, 2007) and trade credit intensity (Fisman and Love, 2003). In column 5, the dependent variable varies at the firm-sector-destination level. In column 6, placebo capital controls are assumed in June 2014, where Pre={June 2013-November 2013} and Post={June 2014-November 2014}. Additional sector-level control variables include capital and skills intensity and contract intensity. Capital intensity is obtained from Kroszner, Laeven and Klingebiel (2007), skills intensity from Manova (2013) and contract intensity from Nunn (2007) at the 3-digit ISIC Revision 2 level and are concorded by the authors as weighted averages at the 2-digit ISIC Revision 3 level. Standard errors are clustered at the sector level. Statistical significance is denoted as .01***; .05**; .1*.

Table 4: Low versus High Credit Needs

	Δlog(Exports)	
	Low Credit Needs	High Credit Needs
	1	*2*
Import Content of Exports	-0.395*	-0.463*
	0.183	0.26
Inventories Ratio	-0.482	3.64
	1.581	2.624
K, H, Contract Intensity	yes	yes
Destination FE	yes	yes
Firm FE	yes	yes
Adj. R^2	0.076	0.072
N	23,227	26,253

Note: The table presents results from difference-in-differences regression models at the firm-product-destination level. The time-window is Pre={June 2014-November 2014} and Post={June 2015-November 2015}. Dependent variable is *Δlog(Exports)*, which denotes the log growth of exports following the imposition of controls on capital outflows in June 2015. In column 1, sectors with below average credit needs *(Low Credit Needs)* are considered. In column 2, sectors with above average credit needs *(High Credit Needs)* are considered. Additional sector-level control variables include capital and skills intensity and contract intensity. Capital intensity is obtained from Kroszner, Laeven and Klingebiel (2007), skills intensity from Manova (2013) and contract intensity from Nunn (2007) at the 3-digit ISIC Revision 2 level and are concorded by the authors as weighted averages at the 2-digit ISIC Revision 3 level. Standard errors are clustered at the sector level. Statistical significance is denoted as .01***; .05**; .1*.

Table 5: Exempted versus Restricted Products

	Δlog(Exports)					
	Exempted	Restricted	Exempted	Restricted	Exempted	Restricted
	1	*2*	*3*	*4*	*5*	*6*
Import Content of Exports	1.454	-0.412**	1.037	-0.451**	1.199	-0.436**
	0.86	0.185	0.91	0.192	0.863	0.195
Inventories Ratio	-3.517	-0.828	-7.11	-0.742	-13.102*	-0.648
	9.871	0.486	7.232	0.473	5.824	0.455
K, H, Contract Intensity	yes	yes	yes	yes	yes	yes
Destination FE	yes	yes	yes	yes	yes	yes
Firm FE	yes	yes	yes	yes	yes	yes
Adj. R^2	0.106	0.069	0.099	0.068	0.095	0.067
N	3,865	45,874	7,318	42,307	8,187	41,437

Note: The table presents results from difference-in-differences regression models at the firm-product-destination level. The time-window is Pre={June 2014-November 2014} and Post={June 2015-November 2015}. The dependent variable is *Δlog(Exports)*, which denotes the log growth of exports. Exempted imports are medicinal products (code 54), petroleum products (code 33), electrical machinery (codes 771, 772, 773 and 774) and food. In column 1, exempted food corresponds to meat (01), diary products (02) and fish (03). In column 3, exempted food corresponds to meat (01), diary products (02), fish (03), cereals (04) and vegetables (05). In column 5, exempted food corresponds to meat (01), diary products (02), fish (03), cereals (04), vegetables (05), sugar (06) and coffee (07). Additional sector-level control variables include capital and skills intensity and contract intensity. Capital intensity is obtained from Kroszner, Laeven and Klingebiel (2007), skills intensity from Manova (2013) and contract intensity from Nunn (2007) at the 3-digit ISIC Revision 2 level and are concorded by the authors as weighted averages at the 2-digit ISIC Revision 3 level. Standard errors are clustered at the sector level. Statistical significance is denoted as .01***; .05**; .1*.

Table 6: Exempted versus Restricted Products Within-Sector

	Δlog(Exports)		
	1	*2*	*3*
Exempted	0.576***	0.556***	0.585***
	0.12	0.115	0.116
Exempted * Import Content of Exports	1.520**	1.537**	1.512**
	0.664	0.662	0.667
Exempted * Inventories Ratio	-7.563***	-7.481***	-7.604***
	1.953	1.937	1.947
Firm-Sector FE	yes	yes	yes
Destination-Sector FE	yes	yes	yes
Adj. R^2	0.088	0.088	0.088
N	47,224	47,224	47,224

Note: The table presents results from difference-in-differences regression models at the firm-product-destination level. The time-window is Pre={June 2014-November 2014} and Post={June 2015-November 2015}. Dependent variable is *Δlog(Exports)*, which denotes the log growth of exports following the imposition of controls on capital outflows in June 2015. Exempted imports are medicinal products (code 54), petroleum products (code 33), electrical machinery (codes 771, 772, 773 and 774) and food. In column 1, exempted food corresponds to meat (01), diary products (02) and fish (03). In column 2, exempted food corresponds to meat (01), diary products (02), fish (03), cereals (04) and vegetables (05). In column 3, exempted food corresponds to meat (01), diary products (02), fish (03), cereals (04), vegetables (05), sugar (06) and coffee (07). Standard errors are clustered at the sector level. Statistical significance is denoted as .01***; .05**; .1*.

Table 7: Exports Adjustment Across Firms Within Product-Destination Markets

	Δlog(Exports)	
	1	*2*
Imported Intermediate Inputs / Total Imports	-0.335**	-0.530***
	0.139	0.111
Short-Term Debt / Total Liabilities	-0.06	-0.006
	0.058	0.069
Cash/Assets, Inv/Assets, Pay/(Pay+Receiv)	no	yes
Product-Destination FE	yes	yes
Adj. R^2	0.017	0.018
N	11,344	10,710

Note: The table presents results from difference-in-differences regression models at the firm-product-destination level. The time-window is Pre={June 2014-November 2014} and Post={June 2015-November 2015}. The dependent variable is *Δlog(Exports)* , which denotes the log growth of exports following the imposition of controls on deposit outflows in June 2015. *Imported Intermediate Inputs / Total Imports* denotes a firm's dependence on imported intermediate inputs as of 2013. Intermediate inputs follow the BEC Revision 4 classification and correspond to codes 111, 121, 21, 22, 42 and 53. *Short-Term Debt / Total Liabilities* denotes a firm's dependence on short-term bank credit as of 2013. Additional firm-level control variables include the ratios cash over assets, inventories over assets and trade payables over the sum of trade payables and trade receivables, all measured as of 2013 and obtained from firms' balance sheets. Standard errors are double clustered at the product-destination and firm's province level. Statistical significance is denoted as .01***; .05**; .1*.

Table 8: Extensive Margin

	By Firm-Sector-Destination	By Firm-Sector	
	%Δ (#Products)	%Δ (#Destinations)	%Δ (#Product-Destinations)
	1	*2*	*3*
Import Content of Exports	-0.224	-0.063	-0.089
	0.265	0.321	0.329
External Finance Dependence	-0.222*	-0.323***	-0.336***
	0.113	0.106	0.095
K, H, Contract Intensity	yes	yes	yes
Destination FE	yes	-	-
Firm FE	yes	yes	yes
Adj. R^2	0.193	0.223	0.248
N	54,062	13,160	13,160

Note: The table presents results from difference-in-differences regression models. The time-window is Pre={June 2014-November 2014} and Post={June 2015-November 2015}. In column 1, the dependent variable is *%Δ (#Products)* (product scope) at the firm-sector-destination level, which denotes the percent change in the number of products exported. In column 2, the dependent variable is *%Δ (#Destinations)* (destination scope) at the firm-sector level, which denotes the percent change in the number of export markets. In column 3, the dependent variable is *%Δ (#Product-Destinations)* (product-destination scope) at the firm-sector level, which denotes the percent change in the number of products exported - export market pairs. Standard errors are clustered at the sector level. Statistical significance is denoted as .01***; .05**; .1*.

Table 9: Extensive Margin - R&D as Proxy for Long-Run Investment Needs

	By Firm-Sector-Destination	By Firm-Sector	
	%Δ (#Products)	%Δ (#Destinations)	%Δ (#Product-Destinations)
	1	*2*	*3*
Import Content of Exports	-0.311	-0.202	-0.23
	0.264	0.32	0.334
R&D Intensity	-2.748**	-4.126***	-4.222***
	0.954	1.046	1.068
K, H, Contract Intensity	yes	yes	yes
Destination FE	yes	-	-
Firm FE	yes	yes	yes
Adj. R^2	0.193	0.224	0.249
N	54,062	13,160	13,160

Note: The table presents results from difference-in-differences regression models. The time-window is Pre={June 2014-November 2014} and Post={June 2015-November 2015}. In column 1, the dependent variable is *%Δ (#Products)* (product scope) at the firm-sector-destination level, which denotes the percent change in the number of products exported. In column 2, the dependent variable is *%Δ (#Destinations)* (destination scope) at the firm-sector level, which denotes the percent change in the number of export markets. In column 3, the dependent variable is *%Δ (#Product-Destinations)* (product-destination scope) at the firm-sector level, which denotes the percent change in the number of products exported - export market pairs. Standard errors are clustered at the sector level. Statistical significance is denoted as .01***; .05**; .1*.

Table 10: Multinational Activity, Imported Inputs and Credit Constraints

	Intensive Margin	Extensive Margin		
	Δlog(Exports)	%Δ (#Products)	%Δ (#Destinations)	%Δ (#Product-Destinations)
	1	*2*	*3*	*4*
Import Content of Exports * MNC	-0.089	0.493	-0.366	-0.445
	0.633	0.373	0.303	0.426
Inventories Ratio * MNC	3.969*			
	2.212			
External Finance Dependence * MNC		0.355**	0.669***	0.689***
		0.123	0.137	0.205
Firm, Destination-Sector FE	yes	yes	-	-
Firm, Sector FE	-	-	yes	yes
Firm Size * Sector-Level Measure	yes	yes	yes	yes
Adj. R^2	0.07	0.157	0.159	0.204
N	26,402	23,314	4,953	4,953

Note: The table presents results from difference-in-differences regression models at the firm-product-destination level. The time-window is Pre={June 2014-November 2014} and Post={June 2015-November 2015}. In column 1, the dependent variable is *Δlog(Exports)* , which denotes the log growth of exports. In column 2, the dependent variable is *%Δ (#Products)* (product scope) at the firm-sector-destination level, which denotes the percent change in the number of products exported. In column 3, the dependent variable is *%Δ (#Destinations)* (destination scope) at the firm-sector level, which denotes the percent change in the number of export markets. In column 3, the dependent variable is *%Δ (#Product-Destinations)* (product-destination scope) at the firm-sector level, which denotes the percent change in the number of products exported - export market pairs. *MNC (Multinational)* is a dummy variable, which is defined as (private) firm with more than 50% of its stakes owned by foreign investors as of end 2013 and is obtained from ICAP reports. All models control for the interaction of a firm's size with the respectve sector-level measure. A firm's size is proxied by the log of total assets and is measured as of end 2013. Standard errors are clustered at the sector level. Statistical significance is denoted as .01***; .05**; .1*.

Appendix Table 1: Summary Statistics

Variable	Definition	Mean	Median	S.D.	N
Δlog(Exports)	Log growth of exports	0.02	0.02	1.33	50,033
%Δ (#Products)	Percent change in number of products at the firm-sector-destination level	-0.35	0.00	0.63	54,062
%Δ (#Destinations)	Percent change in number of destinations at the firm-sector level	-0.23	0.00	0.74	13,160
%Δ (#Product-Destinations)	Percent change in number of product-destinations at the firm-sector level	-0.18	-0.19	0.88	13,160
Import Content of Exports	Measure of backward linkages at the sector-level	0.28	0.27	0.12	18
Inventories Ratio	Measure of short-run working capital needs at the sector level	0.16	0.17	0.03	18
External Finance Dependence	Measure of long-run investments needs at the sector-level	-0.01	-0.03	0.17	18
R&D Intensity	Measure of long-run investments needs at the sector-level	0.03	0.02	0.02	18
Physical Capital Intensity	Measure of physical capital intensity (capital/labor) at the sector-level	31.68	23.53	23.32	18
Human Capital Intensity	Measure of human capital intensity at the sector-level	1.04	1.07	0.15	18
Contract Intensity	Measure of relationship specificity intensity at the sector-level	0.54	0.50	0.16	18

Note: The table presents summary statistics of the main variables used in the empirical specifications.

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