BBVA | RESEARCH

Working Paper, Nº 14/13
Madrid, June 2014

Does anti-competitive service sector regulation harm exporters? Evidence from manufacturing firms in Spain

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June 2014

Abstract

In a panel study of firm-level data from Spanish manufacturers, we show that reducing anti-competitive regulation in the provision of upstream services has a positive and sizeable effect on the volume of exports of downstream firms. Our estimates indicate that deregulation is very beneficial for the export performance of large corporations, especially if they are foreign-owned multinationals, while the evidence for SMEs is much weaker. Hence, firm characteristics matter for the connection between regulation and exports. Simulation exercises suggest that large firms increased their volume of exports by an average of 49% as a result of deregulation, such that the industries that benefited the most were typically more dependent on service inputs. The improvements in the regulatory framework of transportation services and energy provision that took place over the 1990s and 2000s in Spain had particularly strong effects on the volume of foreign sales.

Keywords: Exports; Service regulation; Firm size; Margins of trade.

JEL Classification: F14; L43; F23; D24.

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1. Introduction

The study of the effects of anti-competitive service sector regulation on economic performance has gained recent attention in the literature. Among OECD countries, regulation in services remained high for much of the second-half of the past century, until the 1990s when a decisive move to deregulate gathered momentum. Deregulation involved the progressive removal of the rules preventing competition in those service markets that could operate in more competitive environments.[1] Within this framework, the new studies have focused on the impact of service regulation on downstream activities, especially on manufacturing (e.g. Barone and Cingano (2011), Arnold *et al.* (2011), Bourlès *et al.* (2013)). Given their increased dependence on key service inputs, it seems reasonable to hypothesize that the performance of manufacturing firms might be particularly affected by an anti-competitive regulatory set-up in services. Indeed, Barone and Cingano (2011) find that countries with lower service regulation experience faster value added, productivity and export growth in those manufacturing industries that use services more intensively. That is, service sector regulation influences the pattern of specialization and trade.

Narrowing our interest to the effect on exports, the above evidence suggests that the relevance of service sector regulation may manifest itself in either or both of the firm's trade margins, i.e. on the firm's decision to enter foreign markets (extensive margin) and/or on the volume of exports once the firm is an exporter (intensive margin). In this study, we explore the connection between anti-competitive service sector regulation and firm-level manufacturing exports in an empirical framework that focuses on the volume of exports. Using a measure of real exports is important to correctly estimate the economic impact of service regulation, as the combined effect of lower regulation on prices and quantities will tend to understate its impact on nominal values (Barone and Cingano, 2011).[2] By examining the experience of Spanish manufacturers over the 1990s and 2000s, the aim is to assess whether removing anti-competitive barriers to the provision of key services has a non-negligible, beneficial impact on the volume of foreign sales at the firm level. In this respect, Spain is an interesting case to study since it recorded a remarkably stable share of exports in GDP at the back of an unprecendented expansion of construction and real estate activities that drew on a large quantity of domestic resources and underpinned competitiveness losses. Service sector deregulation may have held the key to support export performance during the boom years. In a wider macroeconomic context, this is a very timely topic as the recommendations to improve market functioning in advanced economies have consistently ranked high in the

[1] Hence, the term deregulation captures the set of improvements in the regulatory framework in which market services operate.

[2] Our database is very rich in firm-level price data which makes it possible to compute real exports by deflating nominal export values with a price index of output.

policy portfolio of international institutions during the crisis (OECD, 2014).

In line with the empirical literature on firm heterogeneity and trade, the model explains the volume of foreign sales in terms of a rich set of firm attributes, including TFP, size, capital intensity and financial health (see, e.g., Greenaway *et al.* (2007), Berman and Héricourt (2010), Minetti and Zhu (2011)). Since the estimation period spans from 1992 till 2008, we also control for export persistence at the firm level by introducing a term on the lagged dependent variable. A model that includes firm level characteristics and the lagged dependent variable raises important concerns regarding endogeneity, which are addressed by systematic System GMM testing as recommended in Roodman (2009).[3] The annual indicator of service sector regulation proxies the impact on manufacturing industries of anti-competitive restrictions in the markets for energy, transport, communications and professional services. It is constructed by combining information on service regulation, from the OECD Non-Manufacturing Regulation (NMR) databases, and on service dependence by manufacturing industry, from the input-output account matrices.[4] Once we control for firm-level attributes and other country-specific features, our main empirical findings indicate that there is a negative, sizeable effect of anti-competitive service sector regulation on the volume of exports of manufacturing firms. The relationship between service sector regulation and firm exports is very strong when firms are large, especially if they are foreign-owned multinational corporations, while is much weaker when firms are small to medium-sized (SMEs). Hence, we find that firm characteristics matter for the impact of regulation on export activity. For large firms, a lower-bound estimate of the average elasticity of firm exports to regulation reaches -0.4% while, when significant, the average elasticity of SMEs exports to regulation nears -0.2%. Simulation exercises of our baseline specification suggest that large firms increased their volume of exports by an average of 49% as a result of deregulation, such that the industries that benefited the most were typically more dependent on service inputs. Likewise, if Spain had adopted a 'best practice' service regulation level throughout the sample period, the volume of exports of large corporations would have been raised by 18%, on average. Finally, upon examining the role of each service input separately, we conclude that the deregulation of transportation services and energy provision that took place over the 1990s and 2000s in Spain had particularly strong effects on foreign sales.

To account for the potential role of other industry-level explanatory factors considered in the literature, we carry out estimations that include a measure of financial depth, defined as

[3]Recently, Bas (2013) explores the connection between service regulation and exports for a developing economy (India) using firm-level export sales deflated by industry-wide price indexes in an OLS framework that does not include the lagged dependent variable. As it shall become clear later, persistence mechanisms are very important to explain firm-level exports.

[4]The methodological approach to construct the service sector indicator is consistent with Barone and Cingano (2011) and Bourlès *et al.* (2013).

the product of Spain's level of financial development and of external financial dependence by manufacturing industry (Manova, 2013). During the 1990s and 2000s, the development of financial markets increased the capacity of the system to provide external sources of finance to firms. A well-developed financial system may thus have been critical to support export performance in Spain, especially in those manufacturing sectors more reliant on external financing. Overall, our results indicate that financial depth does not necessarily increase the volume of sales abroad of large corporations, however, we find some evidence suggesting otherwise for the export performance of SMEs, with an average elasticity of SMEs exports to financial depth approaching 0.8%. That is, the capacity of the environment to provide external financing may have mattered for SMEs exports, more so in financially vulnerable sectors, while large manufacturing firms may have relied on retained earnings or internal cash flows to fund the variable costs of exporting.

The theoretical connection of service regulation and firm performance may operate via input prices or, more generally, via the negotiated terms and conditions of exchange between service suppliers and manufacturing producers. If deregulation brings more competition to upstream markets and/or shifts the distribution of bargaining power in favor of downstream firms, the associated fall in equilibrium input prices would produce a pro-competitive cost effect that otherwise would be absent (e.g. Horn and Wolinsky (1988), Blanchard and Giavazzi (2003), Correa-López (2007), Barone and Cingano (2011), Bourlès *et al.* (2013)). This beneficial cost effect may show more evidently where the competitiveness strength of firms is most tried, namely, in foreign markets. Furthermore, in the face of deregulation, dowstream firm characteristics, such as size and foreign ownership status, would matter for the link between service regulation and firm exports. That is, service providers may compete more intensively to secure larger contracts or avert the credible threat of manufacturing relocation. An economic policy lesson of Spain's service sector deregulation is that SMEs may be at a relative disadvantage to fully exploit the benefits. This finding should underpin the importance of, and set out the incentives for, firm growth.

Finally, this study contributes to the growing literature that explores the relevance of the institutional environment for the pattern of comparative advantage and trade (Nunn (2007), Levchenko (2007), Helpman and Itskhoki (2010), Barone and Cingano (2011), Cuñat and Melitz (2012), Manova (2013)). According to the literature, well-functioning institutions endow countries with a comparative advantage in those industries that depend more intensively on those institutions. By adopting a firm level approach, our findings suggest that service deregulation shapes the pattern of trade through, at least, the intensive margin of exports, that is, through the response of existing exporters to institutional change.

The rest of the paper is organized as follows. Section 2 discusses the theoretical channels

that relate service sector regulation and export perfomance at the level of the firm. This section also presents evidence on the level of regulation observed in OECD countries over the 1990s and 2000s. Section 3 describes the data and the empirical strategy, while Section 4 discusses the empirical results. Section 5 provides a number of illustrative simulations carried out on the basis of the baseline specification. Section 6 presents robustness analysis and the last section concludes.

2. Theoretical mechanisms and OECD experience

2.1. *Anti-competitive service sector regulation and downstream firms' foreign sales*

Starting with the early work of Horn and Wolinsky (1988), the industrial organization literature has explored the effects on industry equilibrium of the lack of competition in the market for inputs. Market imperfections in the form of entry barriers lead to non-competitive solutions in upstream markets, where input prices are often determined in bargaining between suppliers and producers. Furthermore, as a result of irreversible investments, downstream firms may be locked into bilateral monopoly relations with providers, which may make pro-competitive reforms more challenging to deliver. In this context, the literature has shown that the equilibrium input price varies with the structure of the upstream industry. Horn and Wolinsky (1988), for example, find that more competition in the market for inputs, captured by a duopoly input market instead of a single input supplier, yields lower bargained input prices when downstream firms compete in imperfect substitutes. Recently, Barone and Cingano (2011) develop a simple framework where deregulation increases the share of service inputs whose price is determined under perfect competition while it reduces the share of service inputs whose price is set unilaterally by a monopolist. In a model with two production technologies, the relative cost advantage of lower service regulation shifts the equilibrium allocation of production and trade in favor of those industries that use services more intensively.

In addition to the direct impact on the upstream market structure and thus the equilibrium input price, deregulation may influence the distribution of bargaining power in input price negotiations. Blanchard and Giavazzi (2003) incorporate this transmission channel in an imperfectly competitive macroeconomic model to study the effect of labor market deregulation on the equilibrium bargained real wage and employment. Bourlès *et al.* (2013) present a 'neo-Schumpeterian' growth model where regulations that curb market competition upstream alter the incentive structure for efficiency improvements downstream, as the expected rents from innovation would have to be shared with intermediate input suppliers. In their framework, the bargaining power of suppliers decreases in the intensity of competition in upstream sectors. Thus, the higher the bargaining power of upstream firms, the larger the share of the downstream rents appropriated by suppliers via higher negotiated input prices.

Analytically, it appears that removing upstream barriers to competition lowers equilibrium input prices and provides downstream producers with a pro-competitive cost effect that otherwise would be absent. This beneficial cost effect may prove relevant for firm performance in foreign markets, where competition pressures are often at their highest. Thus, from an empirical perspective, the first hypothesis to test is whether a more competitive input market environment increases the volume of downstream firm exports.

Further, for a given level of regulation, the distribution of bargaining power in input price negotiations may be influenced by downstream firm characteristics. Large firms, for example, may be able to secure better terms and conditions in their negotiations with input suppliers while SMEs may encounter more restrictions on bargaining conditions or may even have to act as price-takers. In this context, deregulation would shift the distribution of bargaining power in favor of large manufacturers, as upstream suppliers compete more intensively to secure sizeable contracts. Hence, the beneficial cost effect of lower service regulation would be bigger when downstream firms are large. By splitting the sample in two separate size categories, we effectively test whether the impact of deregulation on the volume of exports varies with firm size. Finally, to further strengthen the evidence suggesting that firm characteristics matter, we test the hypothesis that multinational corporation status affects the relationship between deregulation and firm exports. Multinational corporations may have more leverage on input price negotiations with providers since gaining access to a larger pool of suppliers through the parent company is a real alternative, especially after the removal of domestic regulatory barriers. As a result, the pro-competitive cost effect of deregulation might be particularly beneficial for foreign corporations, which would be evidenced by an increased sensitivity of exports to service sector deregulation.

2.2. *Service sector deregulation in OECD countries*

In the late 1980s, the service sectors of advanced economies remained highly sheltered from competition, with some notable exceptions such as the U.S. case. Competitive pressures were halted by a set of regulations preventing entry into key non-manufacturing input markets which could have otherwise operated in more competition-prone environments. In the 1990s and 2000s, service sector deregulation gathered momentum and countries engaged on a deregulatory path at a varying pace. To facilitate the study of the economic consequences of an anti-competitive regulatory framework in services, the OECD has recently produced a quantitative measure of its knock-on effects.[5] In particular, the OECD Regulation Impact Indicator (RII) measures "the potential costs of anti-competitive regulation in selected non-manufacturing sectors on sectors of the economy that use the output of non-manufacturing sectors as intermediate inputs in the production process". The RII combines country-specific

[5] See Conway and Nicoletti (2006).

information on both the level of regulation in various service activities and the extent and composition of service dependence across manufacturing, to produce an indicator that is specific to each manufacturing industry.[6]

Figure 1 illustrates the variation of the *RII* of four manufacturing sectors for a sample of 20 OECD countries. Note that a higher value of the indicator captures higher potential costs of anti-competitive service regulation. Albeit the extent and composition of service dependence may vary somewhat across advanced economies, the figure shows that Spain is one of the countries that deregulated the most since 1991.[7]

[INSERT FIGURE 1 HERE]

3. Data and econometric strategy

3.1. *Firm-level dataset and sample*

The source of firm-level data is the *Encuesta sobre Estatregias Empresariales* (ESEE), an annual survey conducted by the *Fundación SEPI*. This provides detailed information on companies that have operated in the Spanish manufacturing sector since the launch of the survey in 1990. In the base year, all firms that employed more than 200 employees (large firms) were asked to participate while firms with 10 to 200 employees (SMEs) were surveyed according to a random sampling scheme. Participation rates reached approximately 70% of the population of large firms and close to 5% of the population of SMEs. The same selective sampling scheme was applied to each industry in the base year. In subsequent years, entry of newly created firms and recorded exits have maintained the initial sample properties.[8]

The manufacturing firms in our dataset are classified in 10 industries during the period 1991-2010. For each manufacturing industry, we obtain a firm-level TFP estimate using the Levinsohn and Petrin's (2003) control function approach. Before TFP estimation, we follow a number of steps to clean the sample. We exclude firms with only one year of data available. We drop firm-year observations that do not have a complete record of the variables needed to estimate TFP. Also, we remove observations where the ratios of labor cost to sales or material cost to sales are larger than unity and, finally, we exclude firms at the top and bottom 1% of the capital-output and the capital-labor distributions.[9] The total sample comprises 29,137

[6] The *RII* is available at an annual frequency for the period 1975-2007. Service dependence is obtained from country-specific input-output tables for the year 2000. The database, together with a methodological note on its construction, can be found at: http://www.oecd.org.

[7] A similar pattern is observed for the remaining manufacturing industries not shown in the figure. Next section presents a variant of the OECD *RII* that is more suitable for our estimation purposes and provides further details on the construction of the indicators.

[8] See Delgado *et al.* (2002) and González *et al.* (2005) for further details on the survey.

[9] Typically, these cleaning rules are used to eliminate outliers from the data due to, e.g., very large mergers, extraordinary firm shocks or coding errors. Note that, after applying these exclusion rules, the representativeness of the sample by industry remains virtually unchanged.

observations covering information on 3,540 firms arranged in an unbalanced panel observed annually for the period 1991-2010, with an average of 8 observations per firm. Appendix A.1 summarizes the results of the TFP estimation.

Exporters are defined as those firms that exported in all the years in which they are present in the sample.[10] Of the total 29,137 observations, 11,339 correspond to 1,752 exporters, out of which 647 are large firms, 848 are SMEs and 257 are size-switchers.[11] Table 1 provides descriptive statistics of the firm-level variables of interest identified in the literature as candidate determinants of the intensive margin of exports. The period of analysis is 1991-2008 since the availability of the regulation indicator will restrict the information we draw from our sample to that period. The variable exports is measured by the ratio of foreign sales over a firm-specific price index of output. Capital intensity refers to the capital-labor ratio and size is proxied by the number of employees. A self-reported measure of market power in the main market (to a large extent, the domestic market) is given by the market share variable. Financial health is captured by the leverage ratio, computed as the value of long-term debt with financial institutions divided by own funds, and foreign ownership is measured as foreign participation in a firm's equity. Table 1 shows that, on average, large exporting firms export more, are more efficient, more capital intesive, financially healthier and older than exporting SMEs. They also have more market power and foreign presence in their ownership structure.

[INSERT TABLE 1 HERE]

3.2. *Industry-level regulation indicators*

The indicator that measures the impact of the regulatory environment in the upstream market for service inputs on downstream manufacturing (REG_{jt}) is constructed from two data sources, combined as follows:

$$REG_{jt} = \sum_{s=1}^{4} \omega_{js} Z_{st}, \tag{1}$$

where j refers to the manufacturing industry, t denotes the year and s refers to the upstream service input.

[10] This definition is in line with the "continuous exporters" definition used in Greenaway *et al.* (2007). Therefore, it excludes those firms that switch from non-exporting to exporting, and vice versa, over the sample period.

[11] Appendix A.2 contains detailed information on sample distribution by firm size and export status. Note that firms that change size category in the years in which they are present in the sample are not part of the subsamples used for estimation.

In Eq. (1), Z_{st} encompasses the regulatory indexes of four upstream service activities -energy (electricity and gas), transport (air, road, rail), communication (telecom and post) and professional services (accountancy, architecture, engineering and legal)- drawn from the OECD NMR databases.[12] The index on the regulatory environment of each service activity quantifies information on *ex-ante* anti-competitive restrictions in the market for that particular service, measured by the extent of entry barriers, the degree of vertical integration and market conduct.[13] A lower value of the regulatory index Z_{st} indicates a service market environment more exposed to competitive pressures.

The weight ω_{js} in Eq. (1) captures industry j dependence on each regulated service s. Based on information obtained from the OECD Input-Output database, we produce two measures of ω_{js} that differ in the extent of the direct and indirect linkages of service s to industry j accounted for in each measure. In particular, 'direct dependence' is given by the technical coefficients of the input-output table, which are computed as the ratio of the cost of each service input s to the value of output produced in industry j. 'Direct and indirect dependence' is retrieved from the inverse Leontieff matrix and the industry shares of value added in production, and accounts for both the direct and indirect contributions of service s to the value of output produced in industry j.[14] Since the measure of service dependence should reflect the true technological requirements of each manufacturing industry (Rajan and Zingales, 1998), we choose as a benchmark the input-output table of the U.S. economy

[12]The regulatory indexes of energy, transport and communication are available, at an annual frequency, for the period 1975-2007. The indicator of professional services is only available for three years: 1996, 2003, 2008. In this case, we have assumed constancy of the index at its 1996 value for the 1991-1995 period and we have linearly intrapolated the missing observations for the rest of the sample. Note that, unlike the OECD RII, REG_{jt} does not include retail trade as a relevant service input provider to downstream manufacturing and banking.

[13]Barriers to entry hinder competition in a market that otherwise could operate in a competitive environment. There are barriers to entry when: (i) restrictions apply on the number of firms that may operate in a market (e.g. the telecom sector, the post service, the freight transport rail market, or the domestic airline service); (ii) licensing policies may limit industry capacity (e.g. road freight transport, professional services); (iii) third party access to the electricity and gas transmission grids is limited; (iv) there is no liberalised wholesale market for electricity; (v) consumer choice of electricity and gas suppliers is hampered by consumption thresholds; (vi) etc. Vertical integration is mainly concerned with the degree of market separation between the generation/import and the supply/distribution segments of the electricity and gas industries, as competitive pressures can be higher if each segment constitutes a separate market. Market conduct applies to professional services and refers to restrictions on prices and fees, advertising, the form of business and inter-professional cooperation. Finally, notice that, unlike the OECD RII, REG_{jt} excludes measures concerned with the *ex-post* enforcement of regulation and privatization policies, such as the extent of public ownership and the prevailing market structure. For a detailed description of the OECD NMR indicators, see Conway and Nicoletti (2006).

[14]Due to intersectoral dependence, a unit of final demand in industry j will have direct and indirect repercussions on the production of other sectors, which in turn make use of service inputs. Anti-competitive service regulation thus has direct and indirect channels through which to affect industry j production. For further details on how to obtain the direct and indirect weights from the input-output tables, see Barone and Cingano (2011).

for the year 2000. Adopting the input-output structure of a second country with a low level of anti-competitive service regulation is often done in the literature to address an important source of endogeneity that emerges from domestic regulatory policy (Bourlès *et al.*, 2010; Barone and Cingano, 2011).[15] Likewise, in an attempt to capture shifts in service dependence that may be the result of technical change, we construct separate measures of dependence for two additional years, namely 1995 and 2005, which are available in the OECD Input-Output database. For comparative purposes, we also retrieve the corresponding weights of the U.K. economy since its regulatory set-up has been considered best practice over the sample period (Bourlès *et al.*, 2010).[16]

Figure 2 depicts the evolution of the benchmark REG_{jt} for each manufacturing sector. The variability shown across sectors and over time reflects differences in the extent of service sector dependence of each industry, in the composition of the input services used, and in the initial level and pace of deregulation of each service.

[INSERT FIGURE 2 HERE]

3.3. *Econometric strategy*

To establish a link between service sector regulation and manufacturing firm's foreign sales, we estimate baseline specifications of the form:

$$\ln x_{it} = \alpha + \beta \ln x_{it-1} + \gamma \Pi_{it} + \delta REG_{jt-1} + \phi dev_t + \eta_j + \lambda_t + \mu_i + \varepsilon_{it}, \tag{2}$$

where x denotes exports, subscript i refers to the firm and subscripts $\{j, t\}$ are defined as in Eq. (1). In Eq. (2), the lagged dependent variable accounts for export persistence at the firm level. Π_{it} is a vector of controls for firm characteristics that includes TFP, capital intensity, size, market share, leverage, age of the firm, a dummy that takes the value of 1 if the firm is fully owned by a foreign multinational corporation in year t -and 0 otherwise-, and a dummy that takes the value of 1 if the firm reports a recessionary main market in

[15] In this case, the measuremente error could be non-classical and the endogeneity bias could be of either sign (Ciccone and Papaioannou, 2006). Note that even adopting the input-output table of a country with no anti-competitive regulation would not preclude the possibility of other relevant sources of bias. Bias may result from service dependence being determined by other factors in addition to technological ones, e.g. country-specific shocks, that are unrelated to firm exports ("attenuation" bias). For the period 1975-2007, the U.S. economy exhibited, on average, the lowest level of regulation among OECD countries, which potentially minimizes measurement error. Finally, notice that, unlike REG_{jt}, the weights of the OECD RII are constructed from the domestic country input-ouput table and that, in so doing, the direct and indirect measure is used.

[16] For the period under study, the U.K. economy exhibited, on average, the lowest level of regulation among OECD countries. Note that the robustness section includes estimates using the weights extracted from Spain's input-output tables.

year t -and 0 otherwise. As the effect of service deregulation may take time to show on firm's outcomes, the REG indicator enters the specification lagged once, where regulation is treated as exogenous brought forward from E.U.-wide directives and initiatives. Eq. (2) also includes a currency devaluation dummy (dev_t), industry dummies (η_j) and time dummies (λ_t). Finally, the composite disturbance has two orthogonal components: fixed effects (μ_i), that control for unobserved firm-level heterogeneity, and an idiosyncratic error (ε_{it}).

We employ the system generalized method of moments (GMM) estimator due to Arellano and Bover (1995) and Blundell and Bond (1998). The system GMM estimator controls for endogeneity of the lagged dependent variable and various firm-level characteristics.[17] A common problem of applying system GMM is that of instrument proliferation. 'Too many instruments' can overfit endogenous variables and fail to remove their endogeneous components. To limit the risk of instrument proliferation, we carefully restrict the number of lags to use as instruments for each endogenous variable and we collapse the instrument matrices, as proposed by Roodman (2009).[18] Note that because Eq. (1) includes the dependent variable lagged once, the estimation sample covers the years 1992-2008. We run separate regressions for our samples of large exporting firms and exporting SMEs.

4. Empirical results

4.1. *Anti-competitive service regulation and large firms' foreign sales*

Table 2 presents the results obtained from the estimation of Eq. (2) under alternative measures of REG_{jt} based on the U.S. input-output tables. We find a negative and significant effect of anti-competitive regulation in the provision of services on the volume of exports of large manufacturing firms. The magnitude of the effect is sizeable: a point estimate of -1.189 implies an elasticity of exports to service regulation of -0.43%, likewise, a point estimate of -2.253 implies an elasticity of -1.2%.[19] Since we have accounted for endogeneity and we have controlled for a broad set of factors relevant to the firm, the results provide strong support to the hypothesis that service sector deregulation increases the intensive margin of trade in downstream manufacturing. With regard to other determinants of firm exports, we find that size, capital intensity and, especially, TFP have a positive and significant effect on foreign sales. In addition, being owned by a foreign multinational corporation increases exports by 15%.[20] Similarly, the results show that large exporters benefited from the currency

[17] The firm-level characteristics that are considered potentially endogenous in the exports equation are TFP, capital intensity, size, market share and leverage.

[18] We use the xtabond2 command in Stata 12 to carry out estimations.

[19] To extract the elasticity, we multiply the estimated coefficient by the corresponding average level of REG over the sample period. It is worth pointing out that the sample average level of REG that results from each input-output table increases progressively from 1995 until 2005. This is driven, to a good extent, by an increased dependence on business services.

[20] Notice that we assume exogeneity of multinational corporation status to the level of regulation. The

devaluations of the early 1990s, which increased foreing sales by more than 70%. Also, we find a negative association between age of the firm and exports. Finally, the results suggest that, once we control for all other firm attributes, the market share in the firm's main market and its long-term leverage with financial institutions are not significantly associated with the intensive margin of exports. Regarding the latter, it may be the case that long-term leverage with financial institutions is the channel through which firms finance the large, fixed-costs associated to long-term investment projects or entry into export markets, while it is unrelated to the variable costs of selling abroad.[21] Overall, these findings are confirmed irrespective of which measure of REG_{jt} is used, albeit point estimates may differ slightly across specifications.

[INSERT TABLE 2 HERE]

Table 3 confirms the significance of the negative relationship between service sector regulation and exports when the weights of the U.K. input-output tables are used to compute REG_{jt}. Columns (1) and (2) show that the effects of regulation on exports are of a slightly higher order of magnitude than the corresponding ones reported in Table 2. In particular, a point estimate of -1.582 implies an elasticity of exports to service regulation of -0.52% and a point estimate of -3.159 implies an elasticity of -1.74%. The rest of the coefficient estimates are very stable.

The results that figure in columns (3) and (4) of Table 3 account for the role of financial depth. Financial depth addresses the impact on firm exports of the scope and quality of Spain's financial system, while allowing for different levels of financial dependence by industry. Financial depth is thus defined as the product of financial development and external financial dependence, where the former is proxied by the ratio of private domestic credit to GDP and the latter is measured by an industry-level index of short-term liquidity needs (Raddatz (2006), Kroszner *et al.* (2007)). Since Spain's private credit over GDP expanded substantially from the late 1990s till the eruption of the 2008 financial crisis, we try with alternative definitions of private credit that may or may not include credit to the construction

motives that lead a company to shift production abroad are varied and have been extensively addressed in the literature: models of vertical FDI emphasize the factor prices advantage (e.g. Helpman (1984) and Yeaple (2003)), while models of horizontal FDI consider the proximity-concentration trade-off (e.g. Markusen and Venables (2000) and Helpman *et al.* (2004)) or the relevance of labor market institutions (Mukherjee, 2008).

[21] These include shipping, duties and cross-border insurance, in addition, exporters have higher working capital needs due to longer time lags between production and delivery. The results reported in Table 2 might be in line with the sunk costs hypothesis that ascribes a more relevant effect of firm's financial health on trade at the time of firm's entry into exporting, i.e. on the extensive margin of exports (Berman and Héricourt, 2010).

and real estate sectors.[22] We use Raddatz (2006) and Kroszner *et al.* (2007) measure of liquidity needs by industry, which is defined as the ratio of total inventories over annual sales for U.S. firms over the period 1980-1999.[23] Once again, adopting the U.S. economy as a benchmark assumes that the financial structure displayed by U.S. firms captures more closely the firm's choice of outside funds that only obeys to technological and economic reasons.[24] Notice that external dependence is beyond the control of individual firms and inherent to the nature of the industry, that is, firms operating in certain industries may face higher short-run working capital needs mostly related to the variable costs of their activity. Overall, the estimations reported in Table 3 do not find a significant relationship between financial depth and the volume of sales abroad by large corporations. Without precluding the possibility that its effect is partly picked up by the dummies, our results indicate that the economy's increased ability to support financial relationships did not necessarily raise the intensive margin of exports of large exporters. In practice, the evidence may suggest that large manufacturing firms rely on retained earnings, internal cash flows or some other form of trade credit to fund the variable costs of exporting. Finally, notice that, after controlling for financial depth, the point estimates of service regulation reported in columns (3) and (4) are still highly significant and of a slightly greater order of magnitude. The rest of the coefficient estimates are also very stable.[25]

[INSERT TABLE 3 HERE]

Columns (5) and (6) of Table 3 presents evidence supporting the hypothesis that the multinational corporation status matters for the impact of regulation on firm exports. The sign and significance of the interaction term introduced in columns (5) and (6) shows that being a multinational corporation reinforces the positive effect of service sector deregulation on export volumes, when the extra benefit of deregulation reaches 0.26% in elasticity terms.[26]

[22] Kaminsky and Reinhart (1999) suggest that private credit over GDP may bias the financial depth proxy upwards during periods of rapid credit growth, which was the case of Spain in the 2000s.

[23] As noted in Manova *et al.* (2013), the ratio serves as a proxy for the duration of the production cycle and the liquidity needs to keep inventories stable and face demand.

[24] For example, U.S. data is less likely to be distorted by factors such as industry subsidies. Kroszner *et al.* (2007) report the median level of various measures of external financing across U.S. ISIC industries for the period 1980-1999. To match our industry classification, we compute the median of the relevant indicators of the ISIC classification.

[25] These results carry over when a measure of private credit that includes construction and real estate activities is used in the estimation.

[26] About 38% of large exporters' observations correspond to multinational corporations. These are present in all sectors and no distinct pattern of correlation between the level of service sector regulation and the multinational status is observed. Thus, there are sectors with a relatively higher incidence of multinationals and either higher (e.g. chemicals) or lower (e.g. electrical and optical equipment) service sector regulation. Likewise, there are sectors with a relatively lower incidence of multinationals and either higher (e.g. non-

Large multinational corporations may have more leverage on input price negotiations with domestic service providers as shifting production abroad may be a more credible threat. Likewise, multinational corporations may also have a bigger pool of potential providers which may help reduce the bargained price of service inputs. Both mechanisms would provide multinationals with a cost advantage that may result in higher foreign sales. Notice that coefficient estimates are very robust and that the impact of the multinational corporation dummy increases to around 45%.

Table 4 explores the hypothesis according to which the advantage of multinational corporations over domestic firms in terms of export sales is systematically greater in financially more vulnerable sectors, as shown in Manova *et al.*'s (2013). Multinational corporations may find it easier to access a larger pool of funds by tapping resources from the parent company or borrowing from foreign capital markets. In this context, a measure of sectoral financial vulnerability that might be particularly relevant is $ExtFin$ (Rajan and Zingales, 1998), which is constructed as the share of capital expenditures not financed with cash flows from operations. $ExtFin$ proxies the sectors' dependence on outside capital to fund long-term investment projects.[27] In order to test Manova *et al.*'s (2013) hypothesis, the specifications in columns (1) to (4) of Table 4 extend further Eq. (2) with an interaction term between multinational corporation status and sectoral financial vulnerability.[28] Overall, once we control for firm level attributes and service sector regulation, we do not find a significant effect of sectoral financial vulnerability on the impact of multinational corporations on exports. Hence, the evidence from our sample suggests that, in financially more vulnerable industries, the wider access to finance of multinationals does not necessarily provide them with an export advantage over large domestic firms. In the absence of pronounced liquidity constraints, this result might capture that selling more abroad is less intensive on outside finance than other type of investments.

[INSERT TABLE 4 HERE]

Our last set of results is presented in Table 5 where we separately consider the role of each regulated service input in the baseline specification. The coefficient estimates of energy and transport are correctly signed and significant, with an average elasticity of exports to regulation of -0.1% and -0.23%, respectively. Notice that the point estimates of communications

metallic mineral products) or lower (e.g. pulp, paper, paper products, printing and publishing) service sector regulation.

[27] As in the case of liquidity needs, $ExtFin$ is taken from Kroszner *et al.* (2007) and refers to the period 1980-1999. Note that $ExtFin$ may take negative (financially less vulnerable sectors) as well as positive (financially more vulnerable sectors) values.

[28] Notice that the industry dummies absorb the level effect of sectoral financial vulnerability.

and professional services, albeit correctly signed, are statistically insignicant. Alternatively, when the U.K. 2000 input-output table is used to construct REG_{jt}, we find that communications is also correctly signed and significant.[29] Barone and Cingano (2011) found strong effects on value added growth of regulation in the provision of energy and professional services. In our sample, professional services display reduced time variation in comparison with other service components, which may explain its lack of significance when it enters Eq. (2) separately.

[INSERT TABLE 5 HERE]

4.2. *Anti-competitive service regulation and SMEs' foreign sales*

This section investigates whether the link between regulation and foreign sales is present when firms are small to medium-sized. Theory mechanisms suggest that, if present, this relationship might be weaker than the one identified in the case of large firms. Indeed, when we control for the aggregate measure of REG_{jt}, we do not find systematic evidence supporting the hypothesis that service sector deregulation increases the volume of exports of downstream SMEs. However, if we consider each regulated service input separately, we find a negative and significant effect of anti-competitive regulation in the provision of energy on SMEs' exports. Table 6 illustrates this result in a set of preferred estimations arrived at after a battery of specification tests. When it is significant, the magnitude of the effect of energy regulation on foreign sales is sizeable, varying from -0.14% to -0.21% in elasticity terms depending on the input-output table used to extract energy services dependence. Table 6 also reveals the relevance of both TFP and size for the export volume of SMEs, with point elasticities of 1.9% and 1%, respectively. Likewise, the results show that the currency devaluations of the first half of the 1990s may have increased SMEs' foreign sales substantially and that the SMEs reporting a recessionary main market witnessed a significant rise of their sales abroad compared to those that did not report it. In addition, the estimates presented in Table 6 suggest that the number of industrial establishments is negatively associated to the volume of exports. This result might capture, among other factors, the presence of an expansion strategy that favours reaching the domestic market over gaining scale or location for the foreign market. On the other hand, capital intensity, the level of long-term leverage with financial institutions and being owned by a foreign multinational corporation are not significantly associated to the export volume of SMEs.[30] Note that only 9% of SMEs observations in our sample correspond to multinational corporations, a figure much lower

[29] The estimates are available from the authors upon request.

[30] The specifications in Table 6 do not include the market share in the main market, as an overwhelming majority of SMEs declare it to be atomistic.

than the 38% exhibited by large firms. Finally, Table 6 gathers some evidence suggesting that SMEs rely on the availability of outside capital from a deeper financial system to fund the variable costs of exporting. A point estimate of 0.064 implies an average elasticity of 0.79%, hence financial depth might raise the intensive margin of small to medium-sized exporters, more so in financially more vulnerable sectors.

[INSERT TABLE 6 HERE]

5. The estimated impact of service sector deregulation on the intensive margin of exports

This section presents a number of simulations that intend to further illustrate the impact on firm-level manufacturing exports of adopting a more efficient regulatory framework in upstream industries. Using the estimated coefficients of the baseline model reported in column 3 of Table 2, the first exercise compares the total volume of exports at the industry level simulated by the model with the corresponding counterpart once we assume that all components of REG_{jt} stayed constant over the sample period at their respective 1990 value. The aim of the exercise is to gauge the magnitude of the difference in export performance between a scenario in which Spain did not improve its regulatory framework at all and the scenario of observed service sector deregulation. Figure 3 presents the results of the first simulation.[31] The figure shows that the effects of lower service regulation on downstream manufacturing exports were sizeable: from the smallest gains recorded in electrical and optical equipment (13.4%) and transport equipment (27.7%) to the largest gains recorded in chemicals (64.2%), food products (69.4%) and other non-metallic mineral products (82.9%). Consistent with Figure 2, the industries that benefited the most of lower service regulation were typically more dependent on service inputs.

The second exercise calculates the potential firm-level export gains from Spain's adoption of the 'best practice' regulatory framework. We extract two measures of 'best practice' regulation that let us carry out two alternative simulations. The first 'best practice' measure computes the average of the three lowest levels of regulation by service category observed across the OECD in 2007, and holds it constant throughout the sample period. This 'best practice' regulation indicator is used to construct REG_{jt} and extract the simulated total volume of exports by industry, which is then compared with the baseline simulation of observed deregulation. Figure 3 depicts the results of the simulation exercise. The adoption of the 'best practice' regulation would have increased exports by an average of 18%, with

[31] Note that to extract the simulated level of firm's exports at year t, we use the fitted lagged dependent value at year $t-1$. For this reason, the simulation period is 1993-2008. In the figure, the numbering of manufacturing industries follows the order displayed in Table A.1.

a range of variation that spans from 14.8% (electrical and optical equipment) to 23.7% (other non-metallic mineral products). The second 'best practice' measure calculates the path of deregulation as the annual average of the paths of the three 'best practice' countries, where 'best practice' regulation countries are those that recorded the lowest average level of regulation over the period 1990-2007 (namely, Australia, Sweden and the U.K.). Once again, the indicator is used to compute REG_{jt} and extract the simulated total volume of exports by industry, which is then compared with the baseline one. The results are summarized in Figure 3. Adopting the 'best practice' scenario would have raised exports by 4% on average, that is, even if the deregulatory path had been much less pronounced, the impact of low regulation on exports would have been non-negligible.

6. Robustness

Once our baseline findings are established, we carry out a number of robustness checks. Columns (1) and (2) of Table 7 present the results of the baseline estimation for large firms when the weights of Spain's input-output matrix for the year 2000 are used to compute the extent of service dependence in the measure of REG_{jt}. Once again, we find a negative and significant impact of anti-competitive service regulation on the volume of exports of large manufacturing firms. In elasticity terms, the magnitude of the effect is sizeable: -0.4% when the direct weights are used and -1.3% when the direct and indirect dependence are both taken into account. Notice that from a simple visual inspection of the point estimates reported in Tables 1, 2 and 7, we cannot reach a conclusion regarding the sign of the bias that may be present when the definition of REG_{jt} draws information from the domestic country input-output table.[32] The coefficient estimates of the other explanatory variables remain robust across specifications. For the case of SMEs, columns (4) and (5) present the results of the baseline estimation when the regulation impact indicator in the provision of energy is computed incorporating the weights of Spain's 2000 input-output table. Once direct and indirect dependence is considered, the elasticity of exports to deregulation in energy provision reaches -0.4%, while the rest of coefficients are robust to the change of benchmark input-output matrix.

Column (3) of Table 7 replaces our measure of REG_{jt} by the OECD *RII* in the sample of large firms. Given the range of variation of *RII,* a point estimate of -15.841 implies an elasticity of -1.86%, which is higher than the elasticity extracted from the estimation in column (2). Yet, the estimates are sufficiently close in magnitude as to be able to ascribe

[32] In an attempt to solve the measurement problem associated to service dependence, Barone and Cingano (2011) adopt the approach of Ciccone and Papaioannou (2006). The objective is to recover a measure of industry-level service dependence that is not specific to a benchmark country or to a level of regulation. Under this approach, a two-step estimation procedure produces an instrument for average service-dependence. Once the instrument is incorporated in the *REG* measure, Barone and Cingano (2011) confirm the robustness of their estimated baseline model.

the difference to the heterogeneous composition of each indicator. The rest of the estimated coefficients reported in column (3) are robust to the inclusion of the OECD *RII*. Likewise, the results presented in column (6) of Table 7 confirm both, the lack of statistical significance of the aggreagte OECD *RII* for the sample of small-to-medium sized corporations and the stability of the remaining coefficient estimates. In a final robustness exercise, we added the real volume of world exports by manufacturing industry to the baseline specifications in order to account for the upward world trade trend of the period. The world exports variable appears correctly signed but insignificant while the estimate on the REG_{jt} variable was robust to this change.[33]

7. Conclusion

Growing evidence suggests that regulatory barriers to competition in the markets for inputs matter for the performance of downstream firms. Indeed, the literature has shown that anti-competitive service sector regulation shapes the pattern of comparative advantage and trade. However, evidence regarding the firm level mechanisms that drive the results is still lacking. In a panel study of firm-level data from Spanish manufacturers, we find that reducing anti-competitive regulation in the provision of upstream services has a positive and sizeable effect on the volume of exports of downstream firms. Our estimates indicate that deregulation is very beneficial for the export performance of large corporations, especially if they are foreign-owned multinationals, while the evidence for SMEs is much weaker. Hence, firm characteristics are relevant for the impact of regulation on export volumes. Intuitively, large exporters may be able to negotiate better input prices in the face of a more competitive input market environment, raising large firms' ability to compete internationally. An economic policy lesson is that SMEs may be at a relative disadvantage to fully exploit the benefits of service deregulation, highlighting the importance of firm growth. Simulation exercises of our baseline specification suggest that large firms increased substantially their volume of exports as a result of deregulation, such that the industries that benefited the most were typically more dependent on service inputs, in line with the aggregate results in Barone and Cingano (2011). Without excluding the possibility of other relevant mechanisms, our results indicate that service deregulation shapes the pattern of trade through the intensive margin of exports, that is, through the response of existing exporters to lower service regulation.

Acknowledgements

We would like to thank Noelia Cámara, George Chouliarakis, Juan Ramón García and seminar participants at BBVA Research and the XXXVIII Simposio de Análisis Económico, December 2013, for their comments and suggestions.

[33] Estimates are available from the authors upon request.

Appendix

A.1. Firm-level TFP estimation using Levisohn and Petrin's (2003) control function approach

The point of departure to obtain firm-level TFP estimates is the log-linearized representation of a standard Hicks-neutral Cobb-Douglas production function where firm's gross output depends upon a number of observed determinants (namely capital stock, labor and intermediate inputs) and of unobserved determinants that are gathered in the productivity term, commonly referred to as TFP. In this context, we use the Levinsohn and Petrin (2003) estimation technique that adopts an explicit structural model of firm behavior to address the well-known 'transmission bias' problem and that accounts for serial correlation of productivity shocks. In order to derive their production function estimator, Levinsohn and Petrin (2003) rely on the firm's demand for intermediate inputs to back out a proxy for unobserved productivity. The identification of production function elasticities is done in a two-stage estimation procedure that critically hinges on a number of assumptions, e.g., a monotonically increasing relation between intermediate input use and productivity, the 'quasi-fixed' nature of capital stock whereby the level of capital stock is determined *prior to* firm's experience of the random productivity shock, or that the first lag of intermediate input use can serve as an instrument to identify the intermediate input elasticity in the second-stage of the estimation. Albeit the choice of this estimator is not absent of criticism, from Table A.1 we note that the magnitudes of the estimated input elasticities are consistent with the ones obtained in the literature using alternative techniques applied to the ESEE database (González and Miles-Touya, 2012).[34] The estimator was implemented on firm-level data from 10 manufacturing industries using the *levpet* command in Stata (Petrin *et al.*, 2004).

[INSERT TABLE A.1 HERE]

A.2. Sample distributions by sector of activity.

[INSERT TABLE A.2 HERE]

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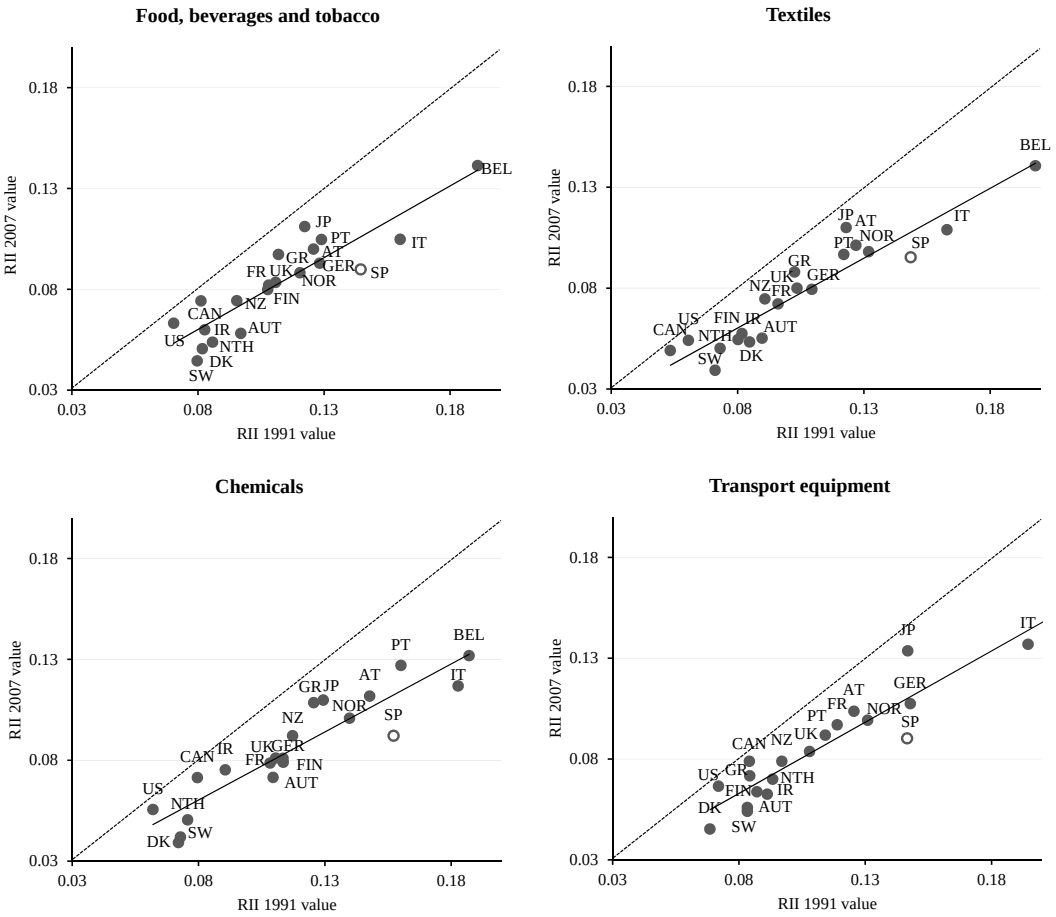

Fig. 1. The OECD Regulation Impact Indicator, selected manufacturing sectors, 1991-2007

Table 1. Summary statistics, 1991-2008

	Total sample		Large exporting firms		Exporting SMEs	
Variables	Mean	S.D.	Mean	S.D.	Mean	S.D.
Exports (in logs)	14.44	2.68	16.57	1.73	13.43	1.89
TFP (in logs)	2.53	1.31	2.75	1.50	2.53	1.22
Capital intensity (in logs)	9.93	1.05	10.67	0.82	9.89	0.94
Size (in logs)	4.33	1.51	6.31	0.75	3.77	0.81
Market share in main market (%)	12.16	20.24	19.99	22.39	10.94	19.67
Leverage ratio	2.59	289.92	0.35	5.54	0.51	2.57
Age (in logs)	2.85	0.93	3.32	0.83	2.83	0.91
Foreign ownership (%)	18.16	37.05	46.45	47.59	13.15	32.08

Note: See the text and the notes to Table A.1 for a detailed description of the variables and the definition of each sample.
Source: Authors' calculations based on ESEE, Fundación SEPI.

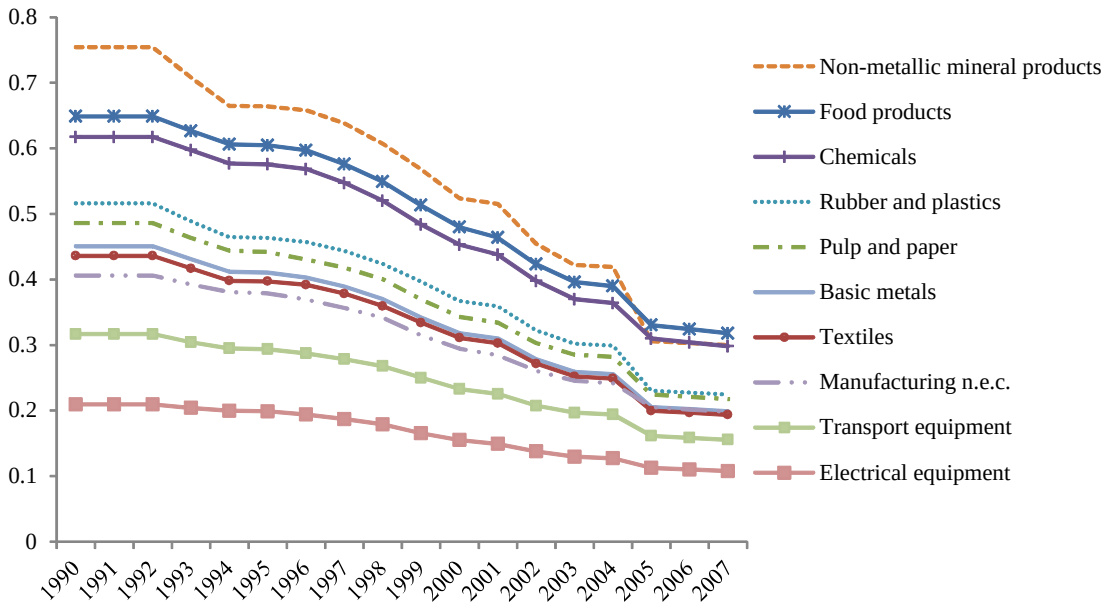

Fig. 2. Spain: REG_{jt} by manufacturing sector (based on U.S. I/O Table for year 2000, direct dependence)

Table 2. Service regulation and large firms' foreign sales: U.S. weights, 1992-2008

Dep. variable: Log exports						
Regressors	(1) U.S. 1995 *direct*	(2) U.S. 1995 *direct and indirect*	(3) U.S. 2000 *direct*	(4) U.S. 2000 *direct and indirect*	(5) U.S. 2005 *direct*	(6) U.S. 2005 *direct and indirect*
Log exports (t-1)	0.358***	0.360***	0.360***	0.361***	0.357***	0.360***
	[0.081]	[0.081]	[0.081]	[0.081]	[0.081]	[0.081]
TFP (in logs)	1.332***	1.343***	1.332***	1.335***	1.346***	1.357***
	[0.416]	[0.415]	[0.415]	[0.414]	[0.417]	[0.416]
Capital intensity (in logs)	0.359*	0.354*	0.369*	0.362*	0.376*	0.371*
	[0.200]	[0.201]	[0.200]	[0.202]	[0.196]	[0.197]
Size (in logs)	0.679**	0.668**	0.682**	0.672**	0.687**	0.683**
	[0.292]	[0.297]	[0.291]	[0.294]	[0.285]	[0.288]
Market share	0.000	-0.001	0.000	0.000	0.000	0.000
	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]
Leverage	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	[0.009]	[0.008]	[0.008]	[0.008]	[0.009]	[0.008]
Age (in logs)	-0.096***	-0.095***	-0.094***	-0.093***	-0.095***	-0.094***
	[0.035]	[0.035]	[0.035]	[0.035]	[0.035]	[0.035]
REG (t-1)	-1.525***	-2.292***	-1.189**	-0.932*	-1.287*	-2.253*
	[0.570]	[0.796]	[0.583]	[0.559]	[0.678]	[1.318]
Devaluation	0.580***	0.949***	0.533**	0.565**	0.597**	1.029**
	[0.213]	[0.304]	[0.220]	[0.244]	[0.252]	[0.474]
MNC	0.142**	0.142**	0.142**	0.143**	0.144**	0.145**
	[0.059]	[0.060]	[0.060]	[0.060]	[0.060]	[0.060]
Recession	0.420	0.422	0.419	0.429	0.426	0.425
	[0.293]	[0.291]	[0.29]	[0.298]	[0.295]	[0.294]
Number of:						
Observations	3944	3944	3944	3944	3944	3944
Groups	587	587	587	587	587	587
Instruments	61	61	61	61	61	61
Arellano-Bond AR(2) test	0.62 (0.54)	0.62 (0.53)	0.62 (0.54)	0.62 (0.53)	0.62 (0.53)	0.63 (0.53)
Arellano-Bond AR(3) test	-0.48 (0.63)	-0.47 (0.64)	-0.49 (0.62)	-0.50 (0.61)	-0.54 (0.59)	-0.56 (0.58)
Hansen test of overid.	13.79 (0.97)	13.66 (0.97)	13.65 (0.97)	13.52 (0.97)	13.40 (0.97)	13.32 (0.97)
Difference-in-Hansen tests:						
GMM instruments for levels	3.03 (0.88)	3.10 (0.88)	2.96 (0.89)	3.03 (0.88)	2.89 (0.90)	2.88 (0.90)
Lagged exports	0.43 (0.93)	0.43 (0.93)	0.46 (0.93)	0.46 (0.93)	0.48 (0.92)	0.47 (0.93)
TFP	1.32 (0.52)	1.15 (0.56)	1.08 (0.58)	1.09 (0.58)	1.05 (0.59)	0.94 (0.62)
Capital intensity	0.26 (0.88)	0.24 (0.88)	0.32 (0.85)	0.30 (0.86)	0.32 (0.85)	0.29 (0.86)
Size	0.61 (0.96)	0.60 (0.96)	0.60 (0.96)	0.53 (0.97)	0.59 (0.97)	0.58 (0.97)
Market share	0.73 (0.87)	0.70 (0.87)	0.66 (0.88)	0.65 (0.88)	0.68 (0.88)	0.76 (0.86)
Leverage	11.2 (0.85)	11.3 (0.84)	11.2 (0.85)	11.2 (0.85)	11.0 (0.86)	11.0 (0.86)

Notes: All specifications include a constant term, time and industry dummies; *** denotes statistical significance at 1%, ** at 5% and * at 10% level; two-step efficient system GMM estimation; in brackets, Windmeijer-corrected robust standard errors; test statistics are reported with p-values in parentheses. MNC refers to the multinational corporation dummy; devaluation takes the value of 1 in 1992, 1993 and 1995. The dummy recession is instrumented with its own lag.

Source: Authors' calculations based on ESEE, Fundación SEPI.

Table 3. Service regulation and large firms' foreign sales: U.K. 2000 weights, financial depth and the role of MNCs, 1992-2008

Dep. variable: Log exports			*Direct dependence*			
Regressors	(1) U.K. 2000 *direct*	(2) U.K. 2000 *direct and indirect*	(3) U.S. 2000 *Financial depth*	(4) U.K. 2000 *Financial depth*	(5) U.S. 2000 *Regulation and MNCs*	(6) U.K. 2000 *Regulation and MNCs*
Log exports (t-1)	0.357***	0.359***	0.359***	0.357***	0.355***	0.352***
	[0.081]	[0.081]	[0.082]	[0.082]	[0.081]	[0.081]
TFP (in logs)	1.355***	1.356***	1.331***	1.351***	1.349***	1.384***
	[0.421]	[0.418]	[0.414]	[0.420]	[0.413]	[0.430]
Capital intensity (in logs)	0.369*	0.370*	0.365*	0.366*	0.369*	0.375**
	[0.199]	[0.200]	[0.202]	[0.200]	[0.198]	[0.193]
Size (in logs)	0.687**	0.689**	0.669**	0.676**	0.688**	0.691**
	[0.290]	[0.292]	[0.294]	[0.293]	[0.295]	[0.285]
Market share	0.000	-0.001	0.000	0.000	0.000	0.000
	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]
Leverage	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	[0.008]	[0.008]	[0.008]	[0.008]	[0.008]	[0.008]
Age (in logs)	-0.096***	-0.096***	-0.094***	-0.096***	-0.095***	-0.097***
	[0.035]	[0.035]	[0.035]	[0.035]	[0.035]	[0.035]
REG (t-1)	-1.582***	-3.159***	-1.469**	-1.705***	-1.021*	-1.430***
	[0.565]	[1.060]	[0.613]	[0.598]	[0.598]	[0.559]
REG (t-1) x MNC					-0.702*	-0.780**
					[0.370]	[0.393]
Devaluation	0.650***	1.448***	0.965*	0.930*	0.542***	0.667***
	[0.228]	[0.449]	[0.520]	[0.504]	[0.218]	[0.228]
MNC	0.142**	0.140**	0.143**	0.143**	0.378***	0.388***
	[0.060]	[0.060]	[0.060]	[0.060]	[0.133]	[0.135]
FINDEV x LiqNeeds			0.035	0.024		
			[0.038]	[0.037]		
Recession	0.418	0.413	0.418	0.414	0.408	0.395
	[0.293]	[0.294]	[0.292]	[0.292]	[0.292]	[0.293]
Number of:						
Observations	3944	3944	3944	3944	3944	3944
Groups	587	587	587	587	587	587
Instruments	61	61	62	62	62	62
Arellano-Bond AR(2) test	0.62 (0.54)	0.62 (0.53)	0.62 (0.54)	0.62 (0.54)	0.66 (0.51)	0.64 (0.52)
Arellano-Bond AR(3) test	-0.49 (0.63)	-0.51 (0.61)	-0.47 (0.64)	-0.47 (0.64)	-0.54 (0.59)	-0.50 (0.62)
Hansen test of overid.	13.58 (0.97)	13.65 (0.97)	13.56 (0.97)	13.54 (0.97)	13.13 (0.98)	13.34 (0.97)
Difference-in-Hansen tests:						
GMM instruments for levels	2.94 (0.89)	3.01 (0.88)	3.04 (0.88)	3.01 (0.88)	2.49 (0.93)	2.48 (0.93)
Lagged exports	0.40 (0.94)	0.37 (0.95)	0.47 (0.93)	0.40 (0.94)	0.63 (0.89)	0.29 (0.96)
TFP	1.09 (0.58)	1.07 (0.59)	0.94 (0.62)	0.99 (0.61)	1.01 (0.60)	1.11 (0.57)
Capital intensity	0.26 (0.88)	0.21 (0.90)	0.33 (0.85)	0.26 (0.88)	0.14 (0.93)	0.11 (0.95)
Size	0.58 (0.97)	0.55 (0.97)	0.62 (0.96)	0.58 (0.97)	0.44 (0.98)	0.44 (0.98)
Market share	0.76 (0.86)	0.87 (0.83)	0.68 (0.88)	0.79 (0.85)	0.60 (0.90)	0.57 (0.90)
Leverage	11.1 (0.85)	11.2 (0.85)	11.24 (0.84)	11.2 (0.85)	10.9 (0.86)	11.13 (0.85)

Notes: See the notes to Table 2. Financial depth is defined as the product of FINDEV (domestic credit to the private sector, excluding construction and real estate activities, over GDP) and LiqNeeds (industry-level index of short-term liquidity needs).

Source: Authors' calculations based on ESEE, Fundación SEPI.

Table 4. Service regulation and large firms' foreign sales: financial vulnerability and MNCs, 1992-2008

Dep. variable: Log exports	*Direct dependence*			
	(1) U.S. 2000	(2) U.K. 2000	(3) U.S. 2000	(4) U.K. 2000
Regressors				
Log exports (t-1)	0.355***	0.353***	0.350***	0.348***
	[0.082]	[0.082]	[0.082]	[0.082]
TFP (in logs)	1.299***	1.321***	1.348***	1.352***
	[0.399]	[0.405]	[0.416]	[0.421]
Capital intensity (in logs)	0.392**	0.391**	0.413**	0.416**
	[0.198]	[0.196]	[0.194]	[0.188]
Size (in logs)	0.737***	0.740***	0.750**	0.755***
	[0.296]	[0.293]	[0.293]	[0.281]
Market share	0.000	0.000	0.000	0.000
	[0.003]	[0.004]	[0.004]	[0.004]
Leverage	-0.001	-0.001	-0.002	-0.001
	[0.008]	[0.008]	[0.008]	[0.008]
Age (in logs)	-0.099***	-0.101***	-0.104***	-0.104***
	[0.036]	[0.036]	[0.036]	[0.036]
REG (t-1)	-1.168**	-1.589***	-1.029*	-1.445***
	[0.600]	[0.571]	[0.602]	[0.560]
REG (t-1) x MNC			-0.880**	-0.778*
			[0.445]	[0.422]
Devaluation	0.514**	0.637***	0.546**	0.656***
	[0.227]	[0.230]	[0.231]	[0.235]
MNC	0.125**	0.125**	0.433***	0.374***
	[0.060]	[0.060]	[0.166]	[0.148]
ExtFin x MNC	0.086	0.081	-0.227	-0.067
	[0.266]	[0.266]	[0.324]	[0.286]
Recession	0.395	0.393	0.374	0.361
	[0.287]	[0.287]	[0.284]	[0.285]
Number of:				
Observations	3944	3944	3944	3944
Groups	587	587	587	587
Instruments	62	62	63	63
Arellano-Bond AR(2) test	0.62 (0.54)	0.61 (0.54)	0.62 (0.53)	0.62 (0.54)
Arellano-Bond AR(3) test	-0.50 (0.62)	-0.49 (0.62)	-0.50 (0.62)	-0.48 (0.63)
Hansen test of overid.	12.26 (0.98)	12.2 (0.99)	11.89 (0.99)	11.80 (0.99)
Difference-in-Hansen tests:				
GMM instruments for levels	2.55 (0.92)	2.49 (0.93)	1.94 (0.96)	1.90 (0.97)
Lagged exports	1.18 (0.76)	1.09 (0.78)	0.68 (0.88)	0.63 (0.89)
TFP	0.87 (0.65)	0.87 (0.65)	0.90 (0.64)	0.91 (0.64)
Capital intensity	0.15 (0.93)	0.10 (0.95)	0.05 (0.97)	0.05 (0.97)
Size	0.60 (0.96)	0.57 (0.97)	0.42 (0.98)	0.39 (0.98)
Market share	0.80 (0.85)	0.93 (0.82)	0.51 (0.92)	0.62 (0.89)
Leverage	9.77 (0.91)	9.70 (0.92)	9.61 (0.92)	9.50 (0.92)

Notes: See the text and the notes to Table 2.

Source: Authors' calculations based on ESEE, Fundación SEPI.

Table 5. Service regulation and large firms' foreign sales: disaggregated regulation impact indicators, 1992-2008

Dep. variable: Log exports	*Direct dependence*			
	(1) U.S. 2000	(2) U.S. 2000	(3) U.S. 2000	(4) U.S. 2000
Regressors	*Energy*	*Transport*	*Communication*	*Professional services*
Log exports (t-1)	0.360***	0.357***	0.360***	0.361***
	[0.082]	[0.081]	[0.082]	[0.082]
TFP (in logs)	1.345***	1.344***	1.317***	1.303***
	[0.420]	[0.415]	[0.412]	[0.409]
Capital intensity (in logs)	0.368*	0.361*	0.366*	0.376*
	[0.201]	[0.200]	[0.201]	[0.204]
Size (in logs)	0.681**	0.669**	0.677**	0.678**
	[0.290]	[0.297]	[0.294]	[0.294]
Market share	0.000	0.000	0.000	0.000
	[0.003]	[0.003]	[0.003]	[0.003]
Leverage	-0.001	-0.001	0.000	-0.001
	[0.009]	[0.009]	[0.009]	[0.008]
Age (in logs)	-0.095***	-0.094***	-0.094***	-0.093***
	[0.035]	[0.035]	[0.035]	[0.035]
REG (t-1)	-2.831*	-1.621*	-9.230	-1.739
	[1.715]	[0.891]	[12.34]	[1.528]
Devaluation	0.408**	0.402**	0.432	0.415**
	[0.188]	[0.177]	[0.273]	[0.214]
MNC	0.143**	0.144**	0.143**	0.140**
	[0.059]	[0.060]	[0.060]	[0.059]
Recession	0.426	0.438	0.434	0.410
	[0.298]	[0.296]	[0.298]	[0.295]
Number of:				
Observations	3944	3944	3944	3944
Groups	587	587	587	587
Instruments	61	61	61	61
Arellano-Bond AR(2) test	0.62 (0.54)	0.62 (0.54)	0.63 (0.53)	0.63 (0.53)
Arellano-Bond AR(3) test	-0.49 (0.63)	-0.52 (0.61)	-0.52 (0.61)	-0.52 (0.61)
Hansen test of overid.	13.54 (0.97)	13.32 (0.97)	13.52 (0.97)	14.04 (0.96)
Difference-in-Hansen tests:				
GMM instruments for levels	2.94 (0.89)	3.05 (0.88)	3.12 (0.87)	3.17 (0.87)
Lagged exports	0.38 (0.94)	0.56 (0.91)	0.49 (0.92)	0.45 (0.93)
TFP	1.08 (0.58)	1.06 (0.59)	1.28 (0.53)	1.32 (0.52)
Capital intensity	0.28 (0.87)	0.34 (0.84)	0.34 (0.84)	0.32 (0.85)
Size	0.58 (0.97)	0.49 (0.97)	0.50 (0.97)	0.58 (0.97)
Market share	0.67 (0.88)	0.61 (0.89)	0.61 (0.89)	0.72 (0.87)
Leverage	11.23 (0.84)	11.05 (0.85)	11.21 (0.85)	11.44 (0.83)

Notes: See the text and the notes to Table 2.

Source: Authors' calculations based on ESEE, Fundación SEPI.

Table 6. Service regulation and the volume of exports of SMEs: the role of energy, 1992-2008

Dep. variable: Log exports	*Direct dependence*					
	(1) U.S. 1995	(2) U.K. 1995	(3) U.S. 2000	(4) U.K. 2000	(5) U.S. 2005	(6) U.K. 2005
Regressors						
Log exports (t-1)	0.364***	0.364***	0.363***	0.364***	0.363***	0.364***
	[0.065]	[0.066]	[0.065]	[0.066]	[0.065]	[0.066]
TFP (in logs)	1.906***	1.911***	1.904***	1.908***	1.904***	1.911***
	[0.512]	[0.517]	[0.513]	[0.515]	[0.513]	[0.518]
Capital intensity (in logs)	0.245	0.242	0.246	0.244	0.245	0.236
	[0.234]	[0.236]	[0.233]	[0.236]	[0.233]	[0.237]
Size (in logs)	1.001***	1.008***	0.999***	1.004***	0.999***	1.008***
	[0.252]	[0.254]	[0.251]	[0.253]	[0.251]	[0.254]
Leverage	0.006	0.006	0.007	0.006	0.007	0.006
	[0.016]	[0.016]	[0.016]	[0.016]	[0.016]	[0.016]
Age (in logs)	-0.109*	-0.110*	-0.111**	-0.110*	-0.111**	-0.110*
	[0.058]	[0.058]	[0.058]	[0.058]	[0.057]	[0.058]
ENERGY REG (t-1)	-2.735**	-3.798**	-2.414	-2.596**	-2.277	-1.728*
	[1.304]	[1.669]	[2.152]	[1.349]	[2.301]	[0.942]
Devaluation	1.618***	1.780***	1.567***	1.656***	1.568***	1.674***
	[0.508]	[0.535]	[0.521]	[0.519]	[0.530]	[0.523]
MNC	-0.181	-0.185	-0.180	-0.183	-0.179	-0.182
	[0.161]	[0.162]	[0.160]	[0.161]	[0.161]	[0.162]
Recession	0.900***	0.910***	0.901***	0.910***	0.901***	0.913***
	[0.317]	[0.320]	[0.318]	[0.320]	[0.318]	[0.322]
Number of establishments	-0.462***	-0.463***	-0.460***	-0.461***	-0.460***	-0.461***
	[0.117]	[0.117]	[0.116]	[0.117]	[0.116]	[0.117]
FINDEV x LiqNeeds	0.059	0.064*	0.063	0.060	0.064	0.064*
	[0.038]	[0.039]	[0.039]	[0.039]	[0.040]	[0.039]
Number of:						
Observations	3983	3983	3983	3983	3983	3983
Groups	687	687	687	687	687	687
Instruments	59	59	59	59	59	59
Arellano-Bond AR(2) test	1.11 (0.27)	1.11 (0.27)	1.1 (0.27)	1.10 (0.27)	1.10 (0.27)	1.10 (0.27)
Arellano-Bond AR(3) test	-1.47 (0.14)	-1.48 (0.14)	-1.46 (0.14)	-1.47 (0.14)	-1.46 (0.14)	-1.47 (0.14)
Arellano-Bond AR(4) test	0.86 (0.39)	0.86 (0.39)	0.86 (0.39)	0.86 (0.39)	0.86 (0.39)	0.85 (0.39)
Hansen test of overid.	11.31 (0.97)	11.30 (0.97)	11.53 (0.97)	11.39 (0.97)	11.54 (0.97)	11.34 (0.97)
Difference-in-Hansen tests:						
GMM instruments for levels	3.27 (0.78)	3.14 (0.79)	3.38 (0.76)	3.25(0.78)	3.40 (0.76)	3.13 (0.79)
Lagged exports	1.29 (0.52)	1.19 (0.55)	1.27 (0.53)	1.21 (0.55)	1.30 (0.52)	1.18 (0.56)
TFP	0.57 (0.75)	0.7 (0.70)	0.59 (0.75)	0.68 (0.71)	0.57 (0.75)	0.72 (0.70)
Capital intensity	1.61 (0.45)	1.61 (0.45)	1.69 (0.43)	1.63 (0.44)	1.68 (0.43)	1.64 (0.44)
Size	1.58 (0.81)	1.59 (0.81)	1.67 (0.80)	1.63 (0.80)	1.67 (0.80)	1.58 (0.81)
Leverage	7.70 (0.97)	7.62 (0.97)	7.83 (0.97)	7.69 (0.97)	7.85 (0.97)	7.63 (0.97)

Notes: See the text and the notes to Tables 2 and 3.

Source: Authors' calculations based on ESEE, Fundación SEPI.

Table 7. Service regulation and firms' foreign sales: Spain 2000 weights and OECD RII, 1992-2008

Dep. variable: Log exports	Large firms			SMEs		
	(1) Spain 2000	(2) Spain 2000	(3) OECD RII	(4) Spain 2000	(5) Spain 2000	(6) OECD RII
Regressors	*direct*	*direct and indirect*		*direct*	*direct and indirect*	
Log exports (t-1)	0.355***	0.355***	0.353***	0.364***	0.364***	0.364***
	[0.082]	[0.081]	[0.081]	[0.065]	[0.065]	[0.065]
TFP (in logs)	1.354***	1.358***	1.387***	1.900***	1.901***	1.895***
	[0.420]	[0.419]	[0.423]	[0.511]	[0.513]	[0.511]
Capital intensity (in logs)	0.365*	0.356*	0.359*	0.236	0.234	0.239
	[0.198]	[0.199]	[0.200]	[0.234]	[0.234]	[0.233]
Size (in logs)	0.681**	0.673**	0.677**	1.003***	1.007***	1.001***
	[0.289]	[0.295]	[0.294]	[0.251]	[0.253]	[0.251]
Market share	0.000	-0.001	-0.001			
	[0.003]	[0.003]	[0.003]			
Leverage	-0.001	-0.001	-0.001	0.007	0.006	0.007
	[0.009]	[0.010]	[0.009]	[0.016]	[0.016]	[0.016]
Age (in logs)	-0.096***	-0.097***	-0.096***	-0.111**	-0.111**	-0.112**
	[0.035]	[0.035]	[0.035]	[0.057]	[0.057]	[0.057]
REG (t-1)	-0.899**	-2.097***	-15.84***	-1.610	-4.908*	-6.755
	[0.406]	[0.819]	[5.428]	[1.279]	[2.875]	[6.020]
Devaluation	0.536***	1.161***	1.078***	1.581***	1.996***	1.785***
	[0.206]	[0.384]	[0.330]	[0.519]	[0.633]	[0.614]
MNC	0.144**	0.144**	0.142**	-0.177	-0.179	-0.178
	[0.060]	[0.060]	[0.059]	[0.161]	[0.161]	[0.161]
Recession	0.433	0.435	0.424	0.900***	0.904***	0.897***
	[0.295]	[0.296]	[0.294]	[0.316]	[0.316]	[0.317]
Number of establishments				-0.462***	-0.464***	-0.460***
				[0.116]	[0.117]	[0.116]
FINDEV x LiqNeeds				0.063*	0.066*	0.064*
				[0.039]	[0.039]	[0.039]
Number of:						
Observations	3944	3944	3944	3983	3983	3983
Groups	587	587	587	687	687	687
Instruments	61	61	61	59	59	59
Arellano-Bond AR(2) test	0.61 (0.54)	0.62 (0.54)	0.61 (0.54)	1.10 (0.27)	1.11 (0.27)	1.11 (0.27)
Arellano-Bond AR(3) test	-0.52 (0.60)	-0.54 (0.59)	-0.49 (0.62)	-1.46 (0.15)	-1.46 (0.15)	-1.47 (0.14)
Arellano-Bond AR(4) test				0.86 (0.39)	0.86 (0.39)	0.86 (0.39)
Hansen test of overid.	13.39 (0.97)	13.59 (0.97)	13.32 (0.97)	11.31 (0.97)	11.14 (0.97)	11.36 (0.97)
Difference-in-Hansen tests:						
GMM instruments for levels	2.92 (0.89)	3.01 (0.88)	2.94 (0.89)	3.27 (0.77)	3.17 (0.79)	3.26 (0.77)
Lagged exports	0.50 (0.92)	0.49 (0.92)	0.43 (0.93)	1.35 (0.51)	1.36 (0.51)	1.29 (0.52)
TFP	1.20 (0.55)	1.44 (0.49)	1.05 (0.59)	0.51 (0.78)	0.50 (0.78)	0.53 (0.77)
Capital intensity	0.30 (0.86)	0.23 (0.89)	0.22 (0.90)	1.63 (0.44)	1.58 (0.46)	1.65 (0.44)
Size	0.53 (0.97)	0.48 (0.98)	0.44 (0.98)	1.55 (0.82)	1.47 (0.83)	1.62 (0.81)
Market share	0.66 (0.88)	0.75 (0.86)	0.68 (0.88)			
Leverage	11.0 (0.86)	11.0 (0.86)	11.2 (0.85)	7.76 (0.97)	7.66 (0.97)	7.81 (0.97)

Notes: See the notes to Tables 2 and 3. Columns (3) and (6) use the OECD regulation impact indicator instead of our REG measure. In columns (4) and (5), REG is the disaggregated indicator for energy.

Source: Authors' calculations based on ESEE, Fundación SEPI.

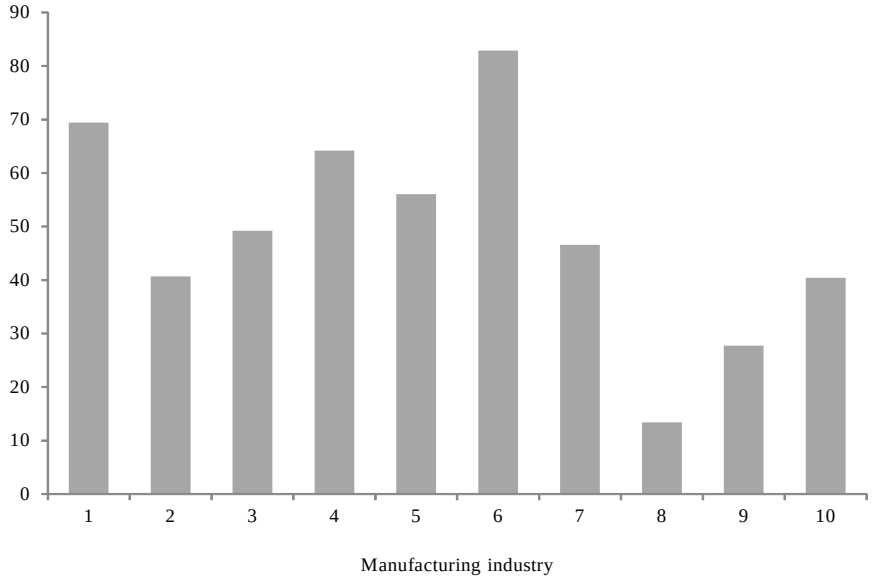

Fig. 3. Difference in total exports of large firms by sector of activity: deregulation vs. no deregulation, 1993-2008 (%)

Fig. 4. Total exports of large firms by sector of activity in two best-practice regulatory scenarios, 1993-2008

Table A.1. Input elasticities estimated using Levinsohn and Petrin's (2003) control function approach, 1991-2010

INDUSTRY	Capital	Labor	Materials	Wald test: CRS	N
Food products, beverages and tobacco	0.09 ***	0.12 ***	0.77 ***	(0.902)	4374
Textiles, textile products, leather and footwear	0.08 *	0.25 ***	0.63 ***	(0.674)	3406
Pulp, paper, paper products, printing and publishing	0.07	0.28 ***	0.43 ***	(0.095)	3236
Chemicals	0.15 **	0.18 ***	0.48 **	(0.264)	2025
Rubber and plastics products	0.22 ***	0.31 ***	0.43 ***	(0.740)	1627
Other non-metallic mineral products	0.07 ***	0.16 ***	0.73 ***	(0.373)	2130
Basic metals and fabricated metal products	0.09 **	0.24 ***	0.68 ***	(0.844)	5764
Electrical and optical equipment	0.05	0.27 ***	0.54 ***	(0.170)	2262
Transport equipment	0.10 **	0.20 ***	0.68 ***	(0.777)	2023
Manufacturing nec	0.15 **	0.24 ***	0.52 ***	(0.345)	2290

Notes: Firm's output is the value of total sales plus the variation of inventories deflated by a firm-specific price index of output. Real capital stock is the firm's stock of capital evaluated at the current replacement value deflated by the price index of investment in equipment goods, where capital stock at the current replacement value is obtained using the perpetual inventory method that requires an initial-year estimate of capital stock and data on firm's investment in the previous period (for a detailed account on how to estimate capital stock from the ESEE, see Escribano and Stucchi (2008)). Labor input is defined as total effective hours worked. Materials is the value of intermediate consumption (raw materials, components, energy and services) deflated by a firm-specific price index of materials. Real capital stock is adjusted by firm-level data on capacity utilization. Variables are expressed in logs. *** denotes significance at 1%, ** at 5% and * at 10% levels. In parentheses, p-values of Wald tests on constant returns to scale (CRS). N refers to the number of observations.

Source: Authors' calculations based on ESEE, Fundación SEPI.

Table A.2. Sample frequency by sector of activity, 1991-2010

INDUSTRY	Total sample	Large firms	Large exporting firms	SMEs	Exporting SMEs
Food products, beverages and tobacco	4374	1035	730	2720	630
Textiles, textile products, leather and footwear	3406	372	340	2508	785
Pulp, paper, paper products, printing and publishing	3236	567	374	2403	478
Chemicals	2025	834	699	933	476
Rubber and plastics products	1627	276	266	964	259
Other non-metallic mineral products	2130	487	390	1324	337
Basic metals and fabricated metal products	5764	1197	1105	3864	1316
Electrical and optical equipment	2262	892	754	1089	538
Transport equipment	2023	891	802	625	277
Manufacturing nec	2290	211	178	1894	605
Number of observations (sum)	29137	6762	5638	18324	5701
Number of firms	3540	771	647	2401	848

Note: See the text for a description of each sample.

Source: Authors' calculations based on ESEE, Fundación SEPI.

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