The strategic behavior of firms with debt*

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Abstract

We empirically study the strategic behavior of levered firms in a non-competitive (regulated) and in a competitive (deregulated) environment. We find that regulation induces firms to increase their leverage; and that this has a double negative effect: first it reduces firms' ability to invest during the regulated period, and second, it reduces the competitivity of firms when deregulation takes place. Upon deregulation large and small levered firms adopt remarkably different strategies. Whereas small firms charge higher prices to increase margins at the expense of future market shares, large firms prey on their (small) rivals by acquiring exiting firms and reducing prices to increase their market shares. Leverage also affects the likelihood of exit and entry of new firms.

Keywords: leverage, predation, competition, endogeneity, regulation

1 Introduction

The ability of a firm to compete in the product market is affected both by its own leverage and the leverage of its rivals. A more levered firm is more likely to underinvest (Myers 1997) or to loose customers (Titman, 1984); and a firm facing low levered.competitors is more likely to suffer from predatory behavior. For example, low levered rivals can increase their spending by undertaking aggressive marketing campaigns, or they can cut prices to gain market share at the expense of their highly levered competitors (Bolton and Scharfstein, 1990).

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Whereas the relationship between financial strength and product market behavior is well studied in the empirical literature,[1] the separate identification of the effect of a firm's own debt and the debt of its rivals is often overlooked. For example, the negative effect of leverage on prices found in the literature (e.g. Zingales, 1998) can be interpreted as firms reducing prices to mitigate losses in the customer base, or them being forced to reduce prices due to the predatory behavior of their competitor firms. It is difficult to disentangle the two mechanisms when the financing and business decisions of rivals are not taken into account because the negative effect of a firm's own leverage on competition may be capturing the competitive behavior of rival firms. Thus, when studying the relationship between leverage and competition, failing to include the behavior of competitor firms may lead to overestimating the true effect of firm leverage and induce the wrong interpretation regarding the mechanism behind this relationship.[2]

The purpose of this paper is to test how financing decisions affect companies' strategies in the product market and to uncover the mechanisms behind this relationship by separating the effect of a firm's own debt and the effect of rivals' debt. The problem when studying the effect of financing decisions on competition is that this relationship is plagued with endogeneity. In her seminal paper, Chevalier (1995) finds that LBOs lead to a significant increase in prices and increased exit. Still, as Zingales (1998) points out, the interpretation of these results is made controversial because the decision to undertake an LBO is not necessarily exogenous to the competitive environment in which the firm operates. In fact, as argued by the trade-off theory of debt, firms will respond to shocks in the product market by adjusting their capital structures in order to balance the benefits of borrowing against its costs. To the extent that firms can anticipate LBO outcomes, it is impossible to distinguish whether these outcomes are the result of increased leverage (strategic debt theory) or the reason why the LBO was undertaken in the first place (trade-off theory of debt). Therefore an empirical test of the strategic debt theory may actually be a test of the trade-off theory of debt.

[1] See review in Parsons and Titman (2008).

[2] In fact, Zingales (1998) finds an indirect way to overcome this problem and uncover the reason behind the reduction in prices. He argues that since the price decline is almost exclusively due to a segment of the trucking industry in which a great proportion of value is due to customer service, this is evidence that leveraged carriers in this segment discount their services to compensate consumers for the risk associated with the probability of default. In addition to that, he concludes that since entry into this trucking segment is relatively easy, and since predation is most effective in situations in which some capital is destroyed, it is difficult to imagine that predatory pricing would be particularly effective in this segment.

We address endogeneity problems using two sources of variation that allow separate identification of the effect of the competitive environment on capital structure decisions, and of the effect of capital structure decisions on the competitive environment. We use the deregulation of the European electricity industry that took place after the European Union Directive 96/92 (formalized in 1999). We argue that, given that deregulation had to occur during a determined period of time in all European countries (between 1999 and 2004), deregulation is an exogenous event. We find that after deregulation firms decreased their debt levels, which provides evidence to the trade-off theory of debt.

However, if the strategic theory of debt is true, firms should not only change their capital structures in response to deregulation merely to bring leverage back to its optimal level (see Ovtchinnikov 2010), but they should also consider refinancing as a way to affect their competitive position and survival in the newly deregulated market. When we study the effect of leverage changes on competition we use instrumental variables as a source of exogenous variation in debt. We also exploit the fact that our dataset covers several years prior to deregulation and several years after. Since in a non-competitive environment there is no room for strategic behavior, comparing the differential effect of leverage on competition in both environments allows us to provide further support for the strategic theory of debt.

We find that before deregulation firms are incentivized to take on debt because of the way in which prices are set by the regulators, which are higher the higher the costs, and such costs take into account the cost of debt. This allows these firms to increase their pre-deregulation margins. Interestingly though, leverage does not have a positive effect on market shares before deregulation, if anything, the effect is negative. This suggests that the reason why firms increase debt before deregulation is not to be more competitive, since this does not allow them to invest more, nor to gain market share, but only to take advantage of the price increase.

Once deregulation takes place, the average leverage of firms decreases in all markets and prices also decrease as fiercer competition starts. We find significant differences in the behavior of small and large firms that survive deregulation. Small firms with higher leverage charge higher prices, and this drives their margins up. However, this is at the expense of their future market shares, which decrease with leverage. Thus, for small firms leverage makes competition softer, as argued by the theory of Chevalier and Scharfstein (1996) and Dasgupta and Titman (1998). Large firms

leverage induces them to compete more aggressively as argued by the model of Brander and Lewis (1986). These firms invest more, increase their output, and acquire rival firms. This strategic behavior, even though it reduces their margins because it puts downward pressure on prices, is part of their strategy to gain market share.

Since we include both individual firm leverage and average market leverage in the same regression, we are able to see the effect of rivals on firms' competitive outcome. The average leverage in the market affects the competitivity of small firms, firms that exit, and entrant firms. When market leverage is higher, there is more predation by large rivals. This drives prices down and reduces the margins of small (and large) firms. At the same time, the higher presence of deep pockets rivals in the market encourages exit and discourages the entry of new firms. In this sense, lower market leverage makes predation more likely and competition is tougher for small, entrant and exitor firms, as predicted by the models of Bolton and Scharstein (1990) and Fudenberg and Tirole (1986).

Overall, our results provide support for the strategic theory of debt. However, whereas small and large firms seem to behave strategically, the effect of leverage is remarkably different for these two types of firms. In particular, while leverage seems to be a burden for small firms because they are more likely to suffer from predation, it can be a competition trigger for larger firms. We also shed light on the negative effects of regulatory practices showing that firms are encouraged to take on debt during the regulated period because regulators set higher prices when debt is higher. The problem is that this curtails their investment and increases the likelihood of exit of firms when deregulation takes place.

This paper is part of the literature that relates capital structure and product market competition. The pioneer empirical papers in this area are the works by Phillips (1995), Chevalier (1995), and Kovenock and Phillips (1997) that analyze the effect of leverage on competition and exit in several industries that experienced leveraged buyouts (LBOs). As explained above, a potential problem with these papers is that the decision to undertake an LBO is not exogenous. Chevalier and Scharfstein (1996) try to address this problem in a way similar to ours, by using time variation in the competitive environment: they show that price-cost margins of supermarket chains that are more financially constrained increase more during recessions relative to the price-cost margins of chains that are less financially constrained. To the extent that some major recessions are unexpected and modify competition, the authors rely on a possibly exogenous source of variation in the

competitive environment. In a related paper, Zingales (1998) studies the effect of leverage on the survival of firms in the trucking industry after deregulation. He finds that highly levered carriers are less likely to survive deregulation. Since his major concern is that capital structure could reflect unobserved heterogeneity in efficiency, he controls for this particular endogeneity problem, but he does not try to draw conclusions on the effect of capital structure on market outcomes nor to see the effect of rival firms. Finally, a related paper by Campello (2003) studies the effect of leverage on sales growth. This paper focuses on the changes in this relationship during the business cycle but does not study the effect on prices and investment of firms. The papers by Schargrodsky (2002) and Ovtchinnikov (2009) study whether the trade-off theory of debt is supported by data; however, these papers do not provide a test of the strategic theory of debt. Our contribution is twofold: first, by including both firm and market leverage in our regressions allows for a separate identification of the effect of a firm's leverage on its competitivity and the effect of the leverage of rival firms; and second, we shed light on the differences in the strategic behaviors of large and small firms, and the negative effects of regulation.

This paper is organized as follows. In section 2 we describe the deregulation process of the electricity industry in Europe. Section 3 presents the theories of debt and their predictions as well as the empirical strategy. Section 4 describes our data. In section 5 we study how deregulation changed the competitive environment and firms' leverage decisions. In section 6 we study the effect of capital structure changes on competition. Section 7 concludes.

2 Electricity deregulation in Europe

In Europe the deregulation of electricity markets started with the establishment of the England and Wales market pool in 1990. The first European Union Directive for the deregulation of electricity in continental Europe was established in 1996 with Directive 96/92EC and further amendments were made in 2003 with Directive 2003/54/EC. This process officially started the liberalization of the electricity industry in Europe.

This industry was traditionally organized with the vertical integration of all sections in the electricity chain: generation, transmission, distribution, and supply. Generation consists in the production of electricity. Transmission is done through the electricity highways from the producer

to its designated region. Distribution is done by the regional and local electricity networks. Supply is the delivery of electricity to the end customers. In the electricity chain, the network units, transmission and distribution, are non-competitive and constitute natural monopolies. The objective of the EU Directives is to introduce competition at the commercial units level, i.e. generation and supply. According to these Directives, the key element of the deregulation is to guarantee that market participants compete with each other for market shares in both the wholesale and retail markets by enjoying non-discriminatory access to the still monopolized transmission and distribution units.[3].

All member states are obliged to comply with deregulation by the specified deadlines, however, heterogeneity exists among European countries regarding the dates in which the electricity directives were transposed into domestic law. Table 1 in the appendix displays the transposition dates for the 13 countries in our sample. These dates coincide with the European Commission's statement of deregulation in its 2005 benchmark report[4].

3 Hypotheses

3.1 Theory and Predictions

This paper addresses the follwoing question: how does the leverage of firms affect their strategic interactions in the product market and their competitivity when an unexpected shock to competition accrues? to answer this question we study first the effect of leverage on market shares and margins, then on market structure. We also try to uncover the mechanisms behing this relationship by studying the effect of leverage on prices and investment.

The following theories help us derive empirical predictions. The models by Bolton and Scharfstein (1990), henceforth BS90, and Fudenberg and Tirole (1986), henceforth FT86, show that cash-rich firms ("deep-pockets") drive their high-debt competitors out of business by interfering in the uncertainty of future profits of these rivals (FT86), or by ensuring their poor performance so that they cannot obtain further financing in the capital markets (BS90). The strategic behavior by

[3]The texts of the Directives can be found at http://europa.eu.int/comm/energy/electricity/legislation/index_en .htm

[4]Report on progress in creating the internal gas and electricity market (COM/2005/0568). Technical Annex. European Commission 2005.

deep-pockets firms may include predatory pricing, agressive marketing strategies targeted against rivals, the acquisition of new power plants, the construction of more efficient sites, or even the employment of more productive workers (Campello, 2003). These effects could be present in less competitive industries, like the electricity industry, because the predator firm is able to recover the short-run costs of preying in the long-run only in the presence of entry barriers.

According to these models we should observe that in a market with more financially constrained firms there is more predation by deep pockets and therefore lower prices, lower margins, and a higher likelihood of exit of financially constrained firms. We should also observe higher market shares of the surviving firms that prey and lower market shares of shallow-pockets firms. In addition, if entry is possible, low market debt (i.e. the presence of more deep-pockets) should discourage the entry of new (financially constrained) firms because margins are low.

A second group of models by Chevalier and Scharfstein (1996), henceforth CS96, and Dasgupta and Titman (1998), henceforth DT98, argue that leverage makes competition softer in the product market. These models show that high debt firms directly increase prices as a means to secure short-term profits at the expense of future market-share. The reason why they do that is because debt increases the rate at which future profits are discounted (DT98). According to these models we should see a positive effect of firm leverage on prices and margins and a negative effect on (future) market share. Note that the effect of firm leverage on margins in these models is the opposite to the previous models that predict that higher firm debt has a negative effect on margins because shallow-pocket firms are more prone to predatory conduct by deep-pockets competitiors.

A third group of models predict that firms' own debt level has a negative effect on their competitivity. As Myers (1977) points out, highly indebted firms may be unable to finance large new investments having to pass up profitable growth opportunities and eventually be forced out of the market. Similarly, high leverage may affect a firm's competitive position because customers are unwilling to deal with a company that is likely to go bankrupt (Titman, 1984).

And finally, the model by Brander and Lewis (1986) argues that high leverage can have a positive effect on firms' competitivity because highly-levered firms are more prone to compete aggressively in the market due to the option-like payoff of levered equity. In this model firms produce larger quantities causing a reduction in prices. If this is true, we should find that more highly levered firms are more competitive and more likely to survive in the deregulated market.

The above theories and predictions assume competitive, or in our terms deregulated, markets. But we are also able to study the effect of leverage changes on competition in a non-competitive environment since our sample period covers several years of industry regulation. The common wisdom is that firms in regulated industries choose high debt levels to induce price increases because regulators set high prices that take into account the firm's costs, including the cost of debt. The idea is to protect firms from financial distress.[5] Regulators also control industry competition by preventing the entry of rival firms. In this context there is little room for the strategic theory of debt. As a result, we expect pre-deregulation leverage to have a positive effect on pre-deregulation prices and margins, and no effect on market shares; and we expect leverage to have no effect on market structure (i.e. entry and exit) during regulation.

3.2 Empirical strategy

When studying the relationship between capital structure and competition we face two endogeneity problems. The first problem is reverse causality because competition affects firms' financing decisions, as explained by the trade-off theory of debt, and levereage affects firms' competitivity, as explained by the strategic theory of debt. The second endogeneity problem is due to unobserved firm characteristics that affect both firms' competitiveness and their capital structure. For example, lower quality firms are less competitive and have higher debt, as predicted by the pecking order theory. We solve these endogeneity problems in various ways.

First, we use the deregulation in the electricity industry as a natural experiment. Deregulation is an exogenous event for each individual country since it stems from legislation at the European level and every country has to transpose the deregulatory measures into its national law by the specified deadlines.[6] Since this is an exogenous shock to firms' competitive environment, we argue that firms

[5] See Taggart (1985).

[6] Given that EU members enjoyed some discretion in the timing of the transposition of deregulatory measures, we may question whether deregulation was in fact an unexpected event. We are confident that deregulation in our sample is exogenous for the following reasons. First, the deregulation of electricity markets is part of the European integration process which aims to guarantee the free movement of goods, freedom to provide services, and freedom of establishment in Europe, and thus all member countries have to comply with the measures by the specified deadlines. Second, a number of studies show that delays longer than six months in implementing the EU directives are due to cross-national factors like the political priority assigned to the process, the timing of national elections, the political power in the European Council of Ministers, the length of membership in the EU, or the economic power of the

did not modify their capital structures beforehand to deal with that. On the contrary, and as we will see in the empirical analysis, firms signficantly modified their leverage after deregulation in order to adapt to the new market conditions and also to affect their competitiveness in the market.

Second, we use an instrumental variables approach using a source of exogenous variation in leverage to isolate the effect of leverage on competition by taking care of both reverse causality and omitted variable biases.

Third, we use the individual firms' leverage as well as the average leverage in the market to account for a differential effect of a firm's own debt and its rivals' debt.

Fourth, we use the fact that we observe firm capital structure decisions and product market outcomes several years before and several years after deregulation. Because the strategic debt theory by definition suggests that debt has different impacts depending on whether markets are competitive or not, we can use this splitting of the effect of debt before and after deregulation as an instrumental variable. In this way, the difference in our estimates of the effect of debt on competition before and after deregulation are consistent even if there are unobservable firm characteristics correlated with leverage[7]. Moreover, the differential effect of leverage on competition in the two environments helps us provide further support for the strategic theory of debt.

Fifth, we try to uncover the mechanism through debt affects competition by studying the effect of leverage on investment, on pricing, and on market structure.

Finally, we take care of possible biases introduced by firm heterogeneity by including a wide variety of variables that should capture firms' characteristics, we use firm and time fixed effects, and we conduct a series of robustness tests. Simultaneity problems are also taken care of by lagging

member state; rather than idiosyncratic characteristics related to a particular law (See Mbaye (2001), Falkner et al (2005), Konig and Luetgert (2008).). A second argument for the exogeneity of deregulation is suggested by data on delays in the transposition of several other EU Directives by member countries. We obtained information for the 13 countries in our sample for the period 1986 to 2002 from Celex (Sector 7), a database on the legal issues of the European Union. Transposition delays vary widely across countries, ranging from 8% of directives delayed in Sweden to 51% of the directives delayed in Portugal. If we rank member states according to the percentage of delays from low to high and we compare it to the year of transposition of the EU electricity directives by each member state, we find that the transposition of the electricity directive is no exception: countries that have traditionally had the highest (lowest) percentage of delays in implementing EU directives are also the latest (earliest) ones to implement the electricity directives.

[7] See Zingales (1998) for a similar argument.

our explanatory variables one or several periods.

4 Sample

We built our main dataset from Datastream. We selected all listed firms whose main activity was electricity generation in the European Union countries for the period between 1990 and 2006. Our dataset includes firms in thirteen countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Italy, Luxembourg, Spain, Sweden, Portugal, and the United Kingdom. We classify each country as a market, and we assume that each firm has the majority of its business activity in the country/market where it is listed. Firms from new member countries are not included in our sample because they were not subject to the deregulation directives before entering the EU. Firms in The Netherlands and Ireland were not listed during our sample period. Our sample counts with a total of 97 companies. In terms of our main variable, which is leverage, our sample has 40 to 56 observations per year. The number of total usable firm-year observations is 947. The unbalanced nature of the panel is due to acquisitions or liquidation of existing firms, as well as entry. We know when a firm exits because it disappears from the Datastream database and is recorded as dead. Most of the dead firms in our sample are acquired by other firms, and only a minority of them are liquidated.

We consider that a firm enters the industry when it appears for the first time in Datastream during our sample period. There are 65 surviving firms in our sample, that is, 65 of the 97 (67%) firms are present in our dataset during the whole period. There are 13 firms that exit the sample, and 19 firms that are entrants. Most exits occur around the deregulation year, and all entries occur after deregulation. We study these movements in our analysis.

Information at the firm level includes most of the firms' balance sheet variables and their key accounts reports. Information at the European level comes from Eurostat.

5 Changes in leverage after deregulation

5.1 Descriptive statistics

We begin our analysis with simple summary statistics of the main variables used in this paper. The definitions of these variables can be found in table 2 in the appendix. Table 3 in the appendix reports a comparison of the pre- and post-deregulation averages of our main variables.

After deregulation, the size of firms, their profitability, their investment, and their collateral significantly decreased at the 10% level with respect to their values before deregulation. On the contrary, growth opportunities and intangible assets significantly increased. A decline in size, profitability, investment, and the collateral of firms after deregulation translates into an increase in these firms' expected costs of financial distress and in a reduction of their agency costs of free cash flow (Jensen, 1986). This is further supported by the fact that costs significantly increased, and the return on sales decreased, although not significantly, after deregulation. That growth opportunities and intangible assets increased implies, according to the trade-off theory of debt, that the risk of underinvestment (Myers 1977) and risk shifting problems (Jensen and Meckling, 1976) are more severe with the presence of risky debt[8]. Despite that, average investment seems to increase.

Although revenues from sales significantly increased after deregulation, profit margins, industrial prices and market shares decreased significantly suggesting that deregulation introduced a higher degree of competition among firms. In addition, total debt decreased significantly (at the 16% level) after deregulation and cash significantly increased. Total assets also decreased, but not significantly. The change in firm leverage does not appear to decrease significantly using this simple analysis, and market leverage significantly increases.[9]

It is clear from this preliminary analysis that the increased competition brought by deregulation changed in a significant way the operating environment of firms increasing their costs of holding debt. As a result, firms were presumably lefts with a leverage level above the desired target. We analyze whether this is true in the next section.

[8] These results are consistent with previous empirical findings like Frank and Goyal (2003) and Ovtchinnikov (2010).

[9] As we will see, firm and market leverage significantly decrease as soon as we add firm and year fixed effects.

5.2 Regression analysis

In this section we explore, with a more rigorous econometric analysis, whether firms modified their leverage following deregulation using the year of deregulation as an exogenous shock to competition. Our dataset includes firm level observations in different countries that are all subject to the deregulation directive but are affected in different ways by its adoption. The year/country cells may belong to three different groups:

- Those countries which are not subject to deregulation, because they are deregulated at the start of the period (UK), or not subject to the European Directive during the period (Portugal);
- Those countries which are subject to deregulation but have not yet put it in practice (all the rest of the sample before the year, specific to each country, in which the directive was assimilated in the nation's law);
- The same countries after deregulation was put into force.

The structure of our sample makes it possible to use a difference-in-difference strategy. The fact that deregulation is not simultaneous in each country forces a slight modification in the usual difference-in-difference method[10]. We run the following regression:

$$y_{it}^{j} = 1_{treat(j)}\beta_1 + (1_{treat(j)} * 1_{dereg(j,t)})\beta_2 + X_{i,t-1}\gamma + \delta_t + \delta_i + u_{it}$$

For firm i in country j at time t, the dependent variable y_{it}^{j} corresponds to a measure of leverage which is explained by the treatment variables ($1_{treat(j)}$ and $(1_{treat(j)} * 1_{dereg(j,t)})$), firm-specific characteristics $X_{i,t-1}$, common time effects across Europe δ_t, and firm-level heterogeneity δ_i. The first treatment variable ($1_{treat(j)}$) is a dummy for the potentially treated group, i.e. it takes the value of 1 for firms that operate in a market that deregulated during the sample period and 0 for firms that operate in a market that did not. The variable ($1_{dereg(j,t)}$) is a dummy that takes the

[10] Table 2 in the appendix shows the year in which deregulation took place in every country. When there was some ambiguity about the exact timing of deregulation, usually because of a gradual opening process, we chose the last year in which the minimal requirements of the directive were implemented as the year of deregulation. This choice is, of course, somewhat arbitrary, but since our methodology gives weight to long differences, we are confident that the results are not sensitive to it.

value of 1 if a firm operates in a deregulated industry for the years after deregulation took place and it equals 0 for the years preceding deregulation. The coefficient β_1 captures the permanent differences in the financing decisions of unregulated countries and countries that will deregulate before deregulation takes place. The coefficient β_2 is the difference-in-difference estimator and it captures the differences in the financing decisions of firms operating in unregulated countries and firms in countries that end up deregulating after deregulation takes place. Thus, the coefficient β_2 captures the deregulation effect.

The vector $X_{i,t-1}$ includes firm characteristics like growth opportunities, size, collateral, and profitability. These control variables are standard in the literature (see Rajan and Zingales, 1995, Frank and Goyal, 2003, and Ovtchinnikov, 2010) and are meant to capture additional determinants of firms' capital structure choices such as agency costs, information asymmetries, and the possibility of financial distress. Following the common practice in the field, we lag these variables once to mitigate potential simultaneity problems.

A firm's leverage ratio is expected to vary inversely with its growth opportunities. This prediction is due to two well-known theories. Myers (1977) argues that firms with risky debt tend to underinvest in value-enhancing projects. Since the cost of underinvestment increases for firms with higher growth opportunities, such firms will tend to finance their projects with equity instead of debt in order to avoid underinvestment. Jensen's (1986) argument is that debt can reduce the agency costs of free cash flow. These agency costs are less severe for firms with higher growth opportunities; hence this theory also predicts a negative relationship between leverage and growth opportunities. Size should be positively related to leverage since larger firms have lower costs of debt and thus higher debt capacity. Collateral should be positively correlated with leverage because firms with a larger portion of physical assets are able to obtain more debt. Finally, profitability should enter the regressions with a negative sign consistently with the pecking order theory (Myers and Majluf, 1984) according to which firms tend to prioritize internal sources of financing over external ones.

Since identification comes from the change in y before and after deregulation in the countries that deregulated and the ones that did not, we include time dummies (δ_t) to control for common time effects across Europe (such as the introduction of the Euro). Heterogeneity in debt is widespread and it is likely to be correlated with X_{it} through the private information of managers regarding

their firms' prospects, as well as through a number of omitted variables such as age. We control for firm-level heterogeneity using firm fixed effects (δ_i). Our sample includes government-owned electricity firms that became privatized and listed during our sample period (e.g. EDP in Portugal or EDF in France). These firms may benefit from particular conditions in the credit market. The use of firm fixed effects in our regressions also serve to control in a non-parametric way for all permanent differences these firms could display relative to other firms. In addition to generation, many of the firms in our sample also owned the transmission or distribution grids before starting to deregulate. Use of firm fixed effects should also take care of differences between these and generation-only firms. Also, following the suggestion by Bertrand et al. (2004), standard errors are robust estimates. u_{it} is clustered at the country level.

We use two alternative measures of leverage, one is the ratio of the book value of a firm's debt to the book value of its total assets, the other one is the ratio of the book value of a firm's debt to the market value of its assets. The results from our baseline specification are shown in Table 4 in the appendix. Regressions (1) and (4) omit the covariates and include only firm and year fixed effects, and country-level clustered errors. In regressions (2) and (5) we add the controls, and in regressions (3) and (6) we include only the permanent firms in the sample for robustness.[11]

The estimated effect of deregulation is negative and significant in all specifications. After deregulation, the ratio of debt to assets decreases by 8 percentage points and the ratio of debt to enterprise value decreases by 14 percentage points. These results suggest that the opening of the European electricity markets to competition prompted firms to significantly decrease leverage. The negative effect of deregulation on leverage is consistent with the strategic theory of debt, that is, firms may be reducing debt levels in order to affect competition in the product market. However, this result can also be explained with the trade-off theory of debt because greater competition brought by deregulation increases firms' expected costs of financial distress. In order to find out whether the strategic theory of debt is in play, we explore the effect of leverage decreases on the competitive outcome of firms in the next section.

[11] The number of observations decreases in columns (2) and (5) with respect to columns (1) and (4) for two reasons: i) by construction, lagged variables demand two lags of the data; ii) Datastream does not report the entreprise value, needed to construct the growth opportunities variable, for some firm-year observations.

The additional controls show that firm-level heterogeneity is pervasive. Growth opportunities and profitability negatively affect leverage in both specifications, as expected. A one standard deviation increase in growth opportunities decreases the debt-to-market value of assets by 12%; and a one standard deviation increase in profitability causes a 35% and a 31% decrease in the debt-to-book and debt-to-market value of assets respectively. Size positively affects leverage, also as expected. Collateral is negative and significant only in the last regression, which is surprising given the theoretical predictions.

Various robustness checks support the validity of the previous result. Using short differences by taking only the first difference in our model gives the same qualitative results, but we lose too much variance and the estimated effect is not significant. Using country-specific time trends and their square rather than our set of dummies does not change our results, but the estimated time dummies do not display a linear relationship, so we retain our choice. We also estimate the above model without imposing the restriction that deregulation should have the same effect across all European countries (not reported for brevity). We find that leverage decreases after deregulation for the majority of countries. In another regression model (not reported) we find that the deregulation effect on leverage becomes stronger when we exclude Portugal, Greece, France and Italy, the countries that the EC identified as the slowest in adopting deregulation.

Finally, given our cross-country analysis, we also need to consider the extent of firms' cross-border activity. If cross-border electricity flows were substantial, our deregulation measure would measure with error the true exposure to competition of these firms. Fortunately for our study, congestion of the cross-border interconnectors occurs very frequently during our sample period. When this happens, price convergence is not possible and the neighbor electricity markets are separated[12]. In fact, the DG TREN[13] reports that cross-border electricity flows were only 8% in 2000, and increased to only 10.7% five years after that[14]. Therefore, cross-border integration in the electricity markets during our sample period is weak. Finally, in a number of cases, firms that have not deregulated their industry hold shares in foreign firms that already operate in a deregulated environment. This could pose a problem for the interpretation of our results; however, although firms hold more assets at the end than at the beginning of the period, financial assets do not

[12] Bosco et al. (2006).

[13] Directorate General of Transport and Energy

[14] DG TREN Benchmarking report (2005) - Technical Annex, page 24.

explode, which is what we would expect if cross-border participations were widespread.

6 Effect of capital structure changes on competition

In this section we test the strategic theory of debt by investigating the effect of leverage reductions on competition outcomes. We start the analysis by running a simple OLS regression that includes our competition dependent variable explained by four main variables of interest and several covariates. The four main variables of interest are: firms' leverage before and after deregulation, and average leverage in each market before and after deregulation. The controls and covariates are explained below.

To address endogeneity we use an instrumental variables approach that allows us to establish the causal effect of leverage on the competitive outcome. Post-deregulation firm leverage is clearly the potential endogenous variable in our analysis. Thus, we start our analysis instrumenting this variable. The endogeneity of pre-deregulation firm leverage is less clear due to the nature of a regulated environment which tends to protect incumbents. Moreover, as recommended by Angrist and Pischke (2009), it is better to start an instrumental variables analysis by instrumenting only one endogenous variable. Nevertheless, we will run some tests instrumenting both pre- and post-deregulation leverage at the end of the section.

Firms have different incentives to take on debt for reasons that are not directly related to competition. Any variable that captures these incentives is potentially a good instrument provided that it can reasonably be assumed exogenous with respect to the competitive outcome. We use tangible assets defined as the ratio of firms' property plant and equipment to total assets as our instrument.[15] We exploit the fact that firms in our sample operated in regulated markets during half of the sample period and that this was followed by a period of liberlization during the other half of the sample period, to construct two versions of our instrument: tangible assets before dergulation and tangible assets post-deregulation. We can do that if we assume that tangible assets before deregulation affect leverage differently than the tangible assets post-deregulation. In a liberalized market, more tangible assets should allow firms to undertake higher debt levels as

[15] Tangible assets have been used as instruments for leverage previously in the literature by Aivazian (2005) and Fresard (2010). Moreover, a recent paper by Oztekin (2013) shows that tangible assets is a reliable determinant of leverage.

tangible assets can be used as collateral, thus we expect tangible assets to be positvely correlated with leverage after deregulation. The effect of tangible assets before deregulation on leverage is less clear. On the one hand, firms that had more tangible assets before deregulation may still hold more tangible assets after deregulation allowing them to borrow more, in which case we expect a positive relationship; on the other hand, it may be the case that firms with higher tangible assets during the regulated period are firms that accumulated too much debt, and therefore, their ability to borrow in the credit market once the industry deregulates is lower due to a problem of debt overhang. In this case we expect a negative relationship.

The following equation represents our first stage regression:

$$Lev_{it}^{j} = Z_{i,t-1}\alpha_1 + (1_{dereg_{j,t}} * Z_{i,t-1})\alpha_2 + X_{i,t-1}\gamma_1 + \delta_i + \delta_t + u_{it}$$

where Lev_{it}^{j} is the endogenous variable and it corresponds to the ratio of debt-to-book value of assets of firm i in country j at time t after deregulation. $Z_{i,t-1}$ is our instrumental variable: firms' tangible assets lagged one period, and it enters our first-stage regression directly and also interacted with the deregulation dummy variable. Hence, the coefficient α_1 captures the effect of tangible assets before deregulation on leverage after deregulation, and the coefficient α_2 captures the effect of tangible assets after deregulation on post-deregulation leverage. X_{it-1} is the set of excluded instruments which corresponds to the covariates in our two-stage least squares regression below. We also include firm and year fixed effects and clustered errors at the country level.

We run the following instrumental variables regression using two-stage least squares:

$$\begin{aligned} y_{it}^{j} &= X_{it-1}\gamma_2 + 1_{dereg(j,t)}\sigma + Lev_{it}\beta_3 + (\widehat{1_{dereg(j,t)}} * Lev_{it})\beta_4 \\ &\quad + Mkt.\ lev_t^j\beta_5 + (1_{dereg(j,t)} * Mkt.\ lev_t^j)\beta_6 + \delta_t + \delta_i + u_{it} \end{aligned}$$

where y_{it}^{j} is a measure of competition of firm i in country j at time t. The main variables of interest are: firms' individual leverage after deregulation ($1_{dereg(j,t)} * Lev_{it}$) instrumented; firms' individual leverage before deregulation (Lev_{it}); average market leverage after deregulation ($1_{dereg(j,t)} * Mkt.\ lev_t^j$); and average market leverage before deregulation ($Mkt.\ lev_t^j$). Average market leverage is calculated as the average debt to assets ratio of all electricity firms each year in each country. Additional independent variables are a set of firm-level covariates X_{it-1} usual in the literature,[16]

[16] See Zingales (1998).

and lagged one period. These covariates are firm revenues and costs, intangible assets, and the return on sales. We expect return on sales and firm revenues to have a positive effect on firms' competitivity; and we expect firms' costs to have a negative effect. Intangible assets account for the licences granted to these firms, customer listings, acquisition value, or strategic alliances of firms; and hence we expect them to have a positive effect. We also include cash as a percentage of total assets because in a recent paper Fresard (2010) shows that cash has significant effects on the competition of firms, that go beyond the effect of leverage. Also following Fresard (2010) we include the same competition measure (as our dependent variable) lagged one period to capture any characteristic not included in the covariates and that could affect the competitivity of firms in the previous period. For further robustness, we also include our previous covariates: growth opportunities, profitability, size, and collateral. And finally all our regressions include firm fixed effects, common time effects, and robust and clustered errors at the country level.

The coefficients β_3 and β_4 capture the effect of individual firms' leverage on competition before and after deregulation respectively. The coefficients β_5 and β_6 capture the effect of average market leverage on competition before and after deregulation respectively..

6.1 Gross profit margins

First we use the log of firms' profit margins, defined as the ratio of operating income to net sales, as a proxy for competition[17]. Table 5 in the appendix reports the regression results.

Column (1) shows the results of a simple OLS model. In the other columns post-deregulation leverage is instrumented.[18] Column (2) displays the results of the first stage regression of our IV analysis. Clear patterns emerge regarding the effect of our instruments on leverage after deregulation since both coefficients are statistically significant. Also, the joint F-statistic is 26.53 which rejects the null hypothesis that all coefficients are 0 at the 1% level. As expected, having more tangible assets after deregulation increases collateral value which allows for increased firm leverage. The fact that tangible assets before deregulation is negatively correlated with post-deregulation leverage can be due to a debt overhang problem.

[17] We take the log of operating profit margin (instead of the same variable in levels) because the distribution of the log transformation is closer to a normal distribution.

[18] A Hausman test rejects the exogeneity of post-deregulation leverage (prob>chi2 = 0.13), which provides support for our instrumentation strategy.

The results of the OLS model in column (1) show that the coefficient of the interaction term of firms' individual leverage with deregulation is negative and significant at the 1% level. This result is further supported by the IV results in columns (3) to (5), where the coefficient also appears negative and significant at the 1% level. When post-deregulation leverage increases by 1 percentage point, firms' profit margins decrease by about 3%. This result means that firms that have higher leverage after deregulation have lower margins. This can be due to predatory behavior as explained by BS90, to the fact that leverage retracts investment and the customer base (Myers, 1977; and Titman, 1984), or to the more aggressive behavior of the limited liability leveraged firm as argued by BL86.

These results on the other hand contradict the model by CS96 that predicts that highly levered firms are inclined to charge higher prices to obtain higher profits, even though this means disinvesting in future market share. But this model is based on the idea that managers can take all the profits out of the highly levered firm prior to its liquidation. However, the idea of managers stealing all profits seems less applicable to large firms. A further exploration of our data suggests that the negative effect found is in fact driven by the large survivor firms. If we separate the sample into two subsamples of small survivor firms (i.e. firms with total assets below the median of 1.5 million euro) and large survivor firms (i.e. with assets above the median), the negative coefficient of leverage on margins remains negative and significant for large firms, but it turns positive and significant for small firms: a 1 percentage point increase in leverage increases small survivor firms' margins by 19%, and it decreases large survivor firms' margins by 4.2% as reported by columns (6) and (7) respectively. Thus, the behavior of small survivor firms seems to be in line with the model of CS96 whereas large survivor firms behave according to several models. We explore the nature of these results further in the following sections where we study the effect of leverage on market shares, prices, and investment.

The coefficient of average market leverage represents the effect of leverage of all firms in the market on the margins of a firm operating in that market. As reported in table 5, the effect of market leverage post-deregulation is also different for large and small survivor firms. Small survivor firms see their margins decrease as market leverage goes up: a 1 percentage point increase in market leverage decreases firms' margins after deregulation by 15%. If the strategy of more levered small firms is to behave in a way to increase their margins, then with higher market leverage, the margins

of small firms should go up. However, as we just saw, when the leverage of large survivor firms is higher, their margins are lower; hence, if small firms are operating in markets with large firms, higher market leverage could drive the margins of small firms down due to the actions of large firms. Finally, when the leverage of small survivor firms is higher, it is also more likely that large survivor firms prey in those markets (e.g. by cutting prices or increasing output) as argued by BS90, in which case small firms' margins should also go down. The net effect is negative in the data suggesting that in markets where leverage is high, the strategic behavior by large rivals plays a significant role for the outcome of small firms.

Individual leverage before deregulation appears positively and significantly correlated with margins at the 10% level in our IV regressions of columns (4), (5), and (7). This result means that higher leverage during the regulated period results in higher margins of firms. For example, for large survivor firms, a 1 percentage point increase in leverage leads to a 2.5% increase in margins before deregulation. This is consistent with the fact that firms in regulated industries maintain higher debt levels to be able to negotiate higher prices with the market regulator obtaining in this way higher margins (Taggart, 1985). It also makes sense that this result is driven by the large survivor firms, as these firms are the ones with more political power. Alternatively, this positive effect could also be the result of competitive behavior by firms in line with the model by CS96, after which levered firms strategically charge higher prices to obtain higher margins at the expense of future market share. However, the fact that during regulation firms are in a non-competitive environment and protected from bankruptcy suggests that this is not the case. On the other hand, pre-deregulation firm leverage has a negative effect on the margins of small firms (column (6)). This can be due to the underinvestment problem or their inability to preserve their customer base. Finally, pre-deregulation market leverage has a positive and significant effect on the margins of small firms. Since small firms operate in markets with both large and small rival firms, and the leverage of large firms has a positive effect on pre-deregulation margins, it is possible that in markets with more leverage (of large firms), the pre-deregulation margins of small firms are pushed upwards. These ideas will be explored further when we study prices and investment in the next section.

Intangible assets positively affect the margins of firms as expected. Return on sales appears positively correlated with the profit margin as expected. The negative correlation between profit

margins and revenues comes naturally from the definition of margins that includes revenues from sales at the denominator. Also, more profitable large firms have higher margins as expected; but this is not true for small firms. Among small firms, size negatively affects margins, and collateral has a positive effect on margins of all firms. The previous year margin positively affects margins next year as expected. The Cragg-Donald Wald statistics corresponding to the IV regressions in column (3) to (7) are 26.53, 18.59, and 16.2, 7 and 6 respectively, thus showing that our instruments have power. Our instruments also satisfy the exclusion restriction as the p-value of the Sargan test is 0.14, 0.12, 0.5, respectively.[19] As mentionned above, for robustness we use an alternative specification of the IV model in which we instrument leverage before and after deregulation with tangible assets before and after deregulation (not reported). Even though instrumenting two endogenous variables is initially complicated because of the difficulty in finding instruments, we are lucky that our endogenous variables are very similar and hence we can use the same set of instruments to instrument both variables. The results of these regressions are qualitatively similar to the reported results. However, in these regressions we cannot test the exclusion restriction since the models are exaclty identified.

The results of the analysis in this section suggest that the effect of firm and market leverage on margins is different depending on the size of firms. Moreover, margins are a function of prices, output and costs. In the next section we study market shares which will help us gain further insight on the output decisions and hence the margins of firms.

6.2 Market shares

Market shares are computed as the ratio of sales by firm i in year t to the total sales of the market in which the firm operates in year t.[20] In our regressions, market shares are explained by our four leverage measures and the same controls as in the previous section. In this case our leverage measures are lagged one period to capture their effect on future market shares. We also include

[19] The Sargan test cannot be performed in the regressions of only entrant and exitor firms because in these specifications the regression model is exactly identified.

[20] This measure of market share does not take into account firms that are not in our sample but might be competitors of our firms. Unfortunately, an overall measure of concentration such as the Herfindahl Index or the market shares of all the electricity operators does not exist for our sample period. Eurostat provides the market shares of the largest operator in each country from 1999 onwards, however this reduces our number of cases to 13, and the number of years to mainly post-deregulation period; and hence we choose not to use this data.

past market shares to capture the influence of other firm characteristics that may have driven competitive performance in the recent years, for example due to a change in the distribution or transmission networks or a change in the location of the power plants. Table 6 in the appendix shows the results. In column (1) we show the results of the OLS model, and in columns (2) to (6) of the IV model. A As shown in column (2), the results of the first stage regression are very similar to the ones in the previous section. The F-statistic for the significance of our instruments in this case is 11.2.

Post-deregulation leverage has a negative (although not significant) effect on the market shares of small firms as reported in column (5): a 1 percentage point increase in leverage decreases their market share by 1.4 percentage points, an increase of 5.9% with respect to the mean. For small firms, this negative effect taken together with the positive effect of leverage on margins suggests that small firms behave as predicted by CS96 and DT98: higher debt induces these firms to obtain higher margins (maybe charging higher prices), but this comes at the expense of their future market shares.

The coefficient of the effect of post-deregulation firm leverage on market shares appears positive and significant for large survivor firms (column (6)): a 1 percentage point increase in leverage increases the market share after deregulation by 0.5 percentage points, which represents an increase of 2.1% with respect to the average market share after deregulation. If, as we saw in the previous section, large firms with high leverage see their margins decrease because of their actions (underinvestment) or the actions of others (predation by rivals), then their market shares should remain the same or even decrease, but not increase. This suggests that these two arguments are not a convincing explanation for these results. A plausible explanation is that large survivor firms with more debt are competing more aggressively as predicted by BL86. These authors argue that more levered firms increase output, and this results in a reduction in prices. Since the revenues from sales of these firms (i.e. their market shares) increase, this means that the output of these firms increases provided that prices remain the same or decrease. Moreover, a natural way for these firms to increase output is to acquire other firms. This is a reasonable hypothesis since the majority of exiting firms in our sample are acquired. This allows these firms to increase their output and gain market share. Judging by the size of the large firms in the electricity industry, large survivor firms enjoy economies of scale, and in the event of financial distress they would probably be considered

by governments as too big to fail. Hence, an aggressive competitive behavior à la BL86 is plausible for this type of firms. If these ideas are true we should find that large firms that are more levered invest more and that their leverage has a negative effect on prices. This is what we find out in the next section.

Market leverage after deregulation has a negative and significant effect on the market shares of large survivor firms. This result is just a consequence of the previous one. It means that in markets with more leverage, since competition by large firms is more aggressive in the sense that large firms compete for market share, more market leverage has a negative effect on the market share of a large firm competing in that market: a one percentage point increase in post-deregulation market leverage decreases the large survivor firm's market share by 2.8%. For the subsample of small firms, the average market leverage post-deregulation has no effect on market shares.

It is interesting that individual leverage before deregulation appears negative and significant in the regression of large survivor firms: a one percentage point increase in firm pre-deregulation leverage decreases the market share of the firm by 0.3 percentage points, i.e. by 1%. This result suggests that increases in firm leverage before deregulation reduce the competitivity of firms causing a decrease in their market shares. This result, taken together with the result in the previous section that higher leverage leads to higher margins pre-deregulation reflects the very nature of the regulated markets. On the one hand the firm is able to negotiate higher prices with the regulator when it increases its leverage, obtaining in this way higher margins. However, higher margins do not reflect more efficiency or competitivity thus allowing the firm to gain market share, they are just an artifact of regulation. In fact, the higher debt level may even lead the firm to pass up positive investment opportunities (Myers, 1977) and maybe even lose customers (Titman, 1984), hence the reduction in market share. The coefficient of pre-deregulation leverage is not significant for small firms. The results of the rest of covariates are similar to those in the previous section.

The Cragg-Donald statistics for the test of weak instruments in our IV regressions in panel A are 15.06, 11.1, 7 and 6 respectively. The p-value of the Sargan test for the models in columns (3) and (4) are 0.28 and 0.75 respectively thus showing that our instruments are valid.

6.3 Why does leverage affect competition?

Leverage at the firm and market level clearly affect the competitivity of firms; however, the consequences seem to be very different for large and small firms. In this section we try to uncover the mechanisms behind these effects.

6.3.1 Prices

We first study leverage effects on prices. We obtained data on industrial prices at the market level from Eurostat. Table 7 in the appendix shows the results of the OLS model where the left-hand side variable is the industrial prices, and the right-hand side variables correspond to the four measures of leverage (firm and market leverage, before and after deregulation), a dummy for deregulation, and the usual covariates. All the explanatory variables are lagged one period.[21]

As shown in columns (1), (2), and (4), deregulation has a negative and significant impact on prices, i.e. after deregulation prices fall by 0.6 cents, which represents an 8% decrease with respect to the mean. This suggests that deregulation was effective in opening the market to competition. In addition to that, post-deregulation firm leverage has a significant impact on prices, and this effect is different for large and small firms. The higher leverage of small survivor firms pushes prices up (column (3)). A one percentage point increase in firm leverage causes an increase in prices of 0.05 cents, an increase of 0.7% in the average price. This is in accordance with the previous findings that leverage has a positive effect on the margins and a negative effect on the market shares of small firms. Hence, levered small firms' strategy is consistent with the theories of DT98 and CS96.

For small firms, higher post-deregulation leverage at the market level causes a reduction in prices (column (3)) which is consistent with the reduction in margins found above. A one percentage point increase in market leverage causes a decrease in prices of 0.05 cents, a decrease of 0.7% with respect to the mean price. If it is true that in markets where the average leverage of small firms is higher there is more aggressive competition by large firms causing a reduction in market prices, then we should find that large firms' competitive strategy is to put more downward pressure on industrial

[21] The results of an instrumental variable specification are qualitatively the same as the OLS regression. However, we chose not to use the IV approach because the results of the Hausman test lead us to reject the endogeneity of leverage in the OLS specification (chi2=15.55, p-value=0.7439). Moreover, by lagging leverage one period we address potential reverse causality.

prices the more levered they are.

Column (4) shows that for large firms, higher post-deregulation firm leverage has a negative effect on industrial prices. When the leverage of large survivor firms increases by 1 percentage point, prices decrease by 0.02 cents which represents a decrease of 0.3% with respect to the mean price. This provides support for our conjecture in the previous section that highly levered large survivor firms compete as argued by BL86: reducing prices thereby causing a reduction in their and the small firms' margins. The idea of too big to fail put forward in the previous section also receives support from the fact that among large firms, those with more growth opportunities have a larger effect in the price reduction. Market leverage has no effect on the prices of large firms.

The coefficient of market leverage before deregulation is positive and significant at the 1% level in the first three columns, and hence, this positive effect is driven by the small firms. In markets with more small firms, a 1 percentage point increase in market leverage before deregulation increases prices by 0.6%. Thus, regulators seem indeed to take into account firms' debt when setting prices. The effect is also positive but not significant for large firms.

Since the economic effects on prices are small, it is possible that firms undertake other strategies to affect competition in addition to trying to affect prices, for example, investing in new power plants or in aggressive marketing campaigns. We analyze investment in the next section.

6.3.2 Investment

According to Myers (1977), it is possible that highly levered firms have difficulties to compete or are even forced to exit the industry because they cannot successfully finance new investments. In addition, as argued by BS90 and FT86 it is possible that deep pockets firms interfere in the profits of financially constrained companies reducing their ability to obtain funds to invest. This could be true for small firms, that are less likely to be financially strong. If this is the case, we should find that for these firms their leverage reduces their ability to invest. On the other hand, we found above that large survivor firms seem to be increasing their leverage which allows them to increase their market shares, and we conjectured that this could be due to the fact that large survivor firms are acquiring small or inefficient firms. If this is true, we should find that large survivor firms with more leverage invest more.

We estimate a regression where the dependent variable is investment defined as the firm's

capital expenditures and explained by our four measures of leverage and the usual controls. We divide investment by 1 million, and hence coefficients must be interpreted accordingly. Table 8 in the appendix shows the results of several specifications of this regression. After deregulation, the investment of all firms decreases on average by about 0.27 million euro, but this effect is driven by the firms in the 80th percentile (the largest survivor firms displayed in column (4)). For these firms, after deregulation their investment decreases 36%.

It is true in the sample that leverage harms firms' ability to invest, as it can be seen from the coefficient of pre-deregulation leverage in columns (1), (2), and (4). However, since this effect is due to pre-deregulation leverage which means that firms are operating in a non-competitive environment, it is more plausible that the underinvestment problem comes from the actual debt level (as in Myers 1977) rather than from the predation of other firms. The underinvestment problem seems to affect small and large firms. This result sheds light on the undesirable impact of regulatory measures: they induce firms to increase their leverage but this curtails their investment. The problem with that is that their inability to invest reduces these firms' margins as found in the section above.

The leverage of firms post-deregulation has a positive effect on investment as reported in column (1). When we divide the sample into small and large firms by the median total assets (columns (2) and (3)), the coefficient of post-deregulation leverage is positive in both cases but not significant. However, when we take into account only the largest firms (e.g. firms in the 80th percentile in terms of total assets), the effect is positive and significant, as reported in column (4). This is consistent with our previous conjecture: large survivor levered firms compete more aggressively by making large investments (to acquire other firms) relative to low levered firms. For these firms, a 10 percentage point increase in leverage increases their investment by 272,000 euro, which represents an increase of 15% with respect to their investment pre-deregulation. This effect gets slightly stronger if we take into account firms in even higher percentiles. This result provides evidence that large survivor firms compete as predicted by BL86.

We make sure that our results are driven by leverage, and not by firms' heterogeneity like differences in their quality, by controlling for factors such as growth opportunities, efficiency, size, and profitability in our regressions. The retun on sales positively affects the investment of the largest firms, hence, among largest firms, those that are more efficient invest more. Size affects

investment also positively, as expected. And finally, firms with higher costs invest more. This is specially true for large firms and is in line with their acquisition strategy.

It seems clear from this and the previous section that firm and market leverage are strategic parameters that affect the competitive behavior and the competitive outcome of firms. If it is true that leverage affects firms' competitivity, then we should find that it affects exiting and entrant firms competitivity and it shapes the market strucutre affecting the likelihood of entry and exit of firms. This is what we analyze in the next section.

6.4 Market structure

We first study the effect of leverage on exit, then on entry.

6.4.1 Exit

In this section we study how leverage affects the competitivity of exiting firms and their likelihood of exit from the market. Tables 9 and 10 in the appendix show the results. In table 9 we use the same type of IV regressions as in the previous sections to study the effect of firm and market leverage on the margins, market shares, prices, and investment, taking into account only exiting firms. In these regressions, the usual covariates are included but not reported for brevity. Pre-deregulation leverage has a positive effect on the margins of exitor firms, suggesting that exitor firms with more leverage also enjoy the increase in margins granted by the regulators who set higher prices. As reported in column (1), for exiting firms, a 1 percentage point increase in pre-dergulation debt leads to an increase in margins of 0.57%. However, such pre-deregulation leverage negatively affects the investment ability of exitor firms as shown in column (4).

Pre-deregulation market leverage on the one hand reduces the margins of exitor firms as reported in column (1), but on the other hand it increases their investment: a one percentage point increase in market leverage before deregulation increases exitors' firms investment by 52,000 euro, an increase of 2.85% (significant at the 14% level).

In table 10 we study the effect of leverage on the likelihood of exit of firms. We estimate a linear probability model where the dependent variable is a binary variable that equals 1 the year in which an exiting company exited, and 0 otherwise. Thus, the control group in this model are all the firm-year observations of those firms that did not exit, and the firm-year observations of the

firms that ended up exiting, the years before they exit.[22] The covariates of interest are individual firms' leverage and market leverage up to the year of exit. The objective is to study the effect of these two leverage measures, both their current and past levels, on the probability of exit. For this, we run several regressions with these two variables and the usual set of covariates lagged various periods. We also include year fixed effects as well as country-level clusters[23]. The fact that we lag our leverage variables several periods takes care of reverse causality. Other endogeneity issues like ommited variables do not seem to be a concern in this analysis since the results of a Hausman test comparing an instrumentation strategy (using tangible assets as instruments) with the OLS model do not provide support for the IV strategy (prob>chi2=0.96).

Column (1) reports the effect of individual and market leverage on exit the same year that the company exits. Column (2) reports the effect of individual and market leverage on exit with the leverage measures set one year before the company exits. Column (3) shows the effect of individual and market leverage both lagged two years before exit. In columns (4), (5) and (6) we lag leverage three, four and five years respectively. The covariates are lagged in each regression the same number of years as the leverage measures.

Columns (1), (2), and (3) show that market leverage has a negative and significant effect on the probability of exit. Specifically, in column (1) when market leverage increases by 10 percentage points, the chances that a firm exits the industry that year decrease by 3.5 percentage points, 26% with respect to the mean probability of exit. Also, in columns (2) and (3), a 10 percentage points increase in market leverage decreases the probability of exit one year and two years after by 1.8 and 3.6 percentage points respectively. This result means that those markets with higher leverage the same year and up to two years before deregulation, experienced a lower number of exits when deregulation took place. Our findings in the previous table suggest that more market leverage increases exitor firms' ability to make new investments. Thus, even though higher market leverage also reduces their margins, more market leverage seems to induce firms to exit less.

Individual firm leverage does not have a significant effect on exit. Similarly, market leverage 3

[22] Alternatively we could define our dependent variable as a binary variable that equals 1 if the company exits (for all exit years) and equals 0 otherwise. The estimated coefficient in this model gives the effect of average debt of exiting versus non-exiting firms on the probability of exit. Thus, this model implicitly assumes that the leverage of firms does not vary a lot along the years. The model we use captures these changes.

[23] For brevity, we do not report the results of the covariates in our table.

or 4 years before exit does not affect signficantly the chances of exit 3 or 4 years later. Interestingly, market leverage 5 years before exit seems to have a positive and significant impact meaning that those markets that accumulated more leverage during the regulated period are the ones that experienced more exit afterwards. A plausible explanation is that firms in markets that accumulated more debt during the regulated period became inefficient and were not able to catch up when deregulation occurred. This might mean that the poor quality of firms, and not the market leverage, are responsible for their exit after deregulation. The included covariates should address this concern. For example, the return on sales, tobin's q, and profitability measures are proxies for the efficiency of firms. However, in the event that our measures of efficiency do not fully capture firms' quality, we repeat all regressions with a measure of firms' ex-ante probability of default, namely Altman's zscore[24]. The results of our regressions remain qualitatively the same when we add this control:[25] the coefficient on the zscore is not significant, and the significance of our measure of market leverage is slightly reduced (from 1% to 5% level) but the economic effect remains the same. As a result, we are confident that market leverage affects the likelihood of exit of firms from the market, beyond their quality.

6.4.2 Entry

In this section we study how leverage affects the competitivity of entrant firms and their likelihood of entry. Tables 11 and 12 in the appendix show the results. In table 11 we use the same type of IV regressions as in the previous sections to study the effect of firm and market leverage on the margins, market shares, prices, and investment, taking into account only entrant firms. In these regressions, the usual covariates are included but not reported for brevity. According to the results in column (1), high firm leverage makes entrant firms less competitive reducing their margins in the post-deregulation period. This is not due to the fact that they charge lower prices or they invest less, as the coefficient of leverage is not significant in columns (3) or (4). This, on the other hand, might be due to losses in the customer base as firm leverage as a negative impact on the market shares of these firms (column (2)): a 1 percentage point increase in firm leverage reduces entrant

[24] Altman's zscore is calcualted as $3.3X_1 + 1.4X_2 + X_3 + 1.2X_4 + 0.6X_5$, where X_1 is the ratio of firm's earnings before interest and taxes to total assets, X_2 corresponds to retained earnings to total assets, X_3 is sales to total assets, X_4 is working capital to total assets, and X_5 is the market value of equity to total liabilities.

[25] Results of these regressions are not reported but are available from the authors.

firms' market shares by 6%.

At the same time, higher market leverage makes competition softer and the margins of entrant firms increase. When market leverage is higher these firms also gain market share as shown in column (2): a 1 percentage point increase in market leverage increases entrant firms' market shares by 3.6 percentage points, which represents an increase of 19% with respect to the average market shares of these firms.

In table 12 we study the effect of market leverage on the likelihood of firm entry. The dependent variable in our regressions corresponds to a dummy that equals 1 if a company enters, the year of its entry, and 0 otherwise. Thus, similarly to the previous section, the control group are all firm-year observations that correspond to the firms in our sample that are not entrants, and the entrant firms the years after their entry. Our main variable of interest is market leverage. We run several regressions in which we lag market leverage one more period in each regression, in the same fashion as in the previous section. In these regressions we use, as controls, the market averages of our usual covariates, that is, the average revenues of the market, the average return on sales, the average profitability, growth opportunities, profits, size, and costs. We lag all these covariates one more period in each regression, in the same way as we lag market leverage. For brevity, we do not report the results of the covariates.

Given that more market leverage is favorable for the margins and market shares of entrant firms, we expect more market leverage to accomodate entry. We find that market leverage one and two years before entry has a positive effect on the probability of entry. A 10 percentage points increase in market leverage increases the probability of entry by 2.3 percentage points, that is an increase of 12% with respect to the average probability of entry. Put another way, low levered markets are perceived by potential entrants as more competitive and discourage them to enter.

7 Conclusion

The main message of this paper is that firms' own debt and the debt of their rivals strategically influence product market outcomes. By using firms' individual debt and market debt we are able to disentangle the changes in firms' competitivity due to their own debt charge from the changes in competition due to the rivals' strategic behavior which is affected by their debt charge. Moreover,

these results are dependent on the size of firms.

For small firms we find that their leverage induces them to charge higher prices with the purpose of increasing their margins, even though this results in a reduction of their future market share. Moreover, for these firms debt introduces an additional problem, which is the predation by the rival large firms. Large firms undertake two different behaviors to remain competitive: they take on debt to be able to invest and acquire other firms, and they charge lower prices. This, even though it decreases their margins, it increases the market shares of these large firms. The relative leverage of small firms with respect to the average leverage in the market has a negative impact on the margins and market shares of small firms. Also, lower market leverage encourages exit and reduces the likelihood of entry of new firms.

Our findings are in line with the strategic theory of debt. Small firms behave as predicted by DT90, but the suffer from the behavior adopted by large firms, that behave as predicted by CS96. Overall, these findings are evidence that in a free market, firms incorporate rivals' financial status and competitive position in their decision process. We also shed light on the undesirable effects of some regulatory measures.

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8 Appendix

Table 1 – Electricity transposition dates by country

This table reports the name of the deregulation law and the date at which it was adopted by each country in our sample.

Country	*Law and transposition date*
Austria	Law of Electricity Supply – 1998
Belgium	Law for the Organization of the Electricity Market – April 29, 1999
Denmark	Amendment to Danish Supply Act – 1998
Finland	Electricity Market Act – 1995
France	Law No. 2000-108 – 2000
Germany	Act on the Supply of Electricity and Gas – 1999
Greece	Electricity Law – 2000
Italy	Law 239/2004 – 2004
Luxembourg	Law of 24 July 2000 on the Organization of the Electricity Market – 2000
Portugal	Infringement (implemented August 2006)
Spain	Electricity Power Act – November 1997 and amendments 1998
Sweden	Law for the Supply of Electricity – 1999
United Kingdom	Electricity Act – 1989

Source: European Commission benchmark report 2005

Table 2 – Variable definitions

This table reports the definition of the variables used in our analysis.

Variable	*Definition*
Size	Log of total assets
Growth opportunities	Enterprise value / Total assets
Profitability	Operating income / Total assets
Collateral	(Inventories + PPE) / Total assets
Revenues	Log (Net revenues from sales / Total assets)
Costs	Log (Costs of goods sold / Total assets)
Intangibles	Intangible assets / Total assets
Return on sales	EBITDA / Net revenues from sales
Cash	Cash / Total assets
ROA	EBITDA / Total assets
Total debt	Total debt
Total assets	Total assets
Firm leverage	Total debt / Total assets
Market leverage	Average firm leverage in each market
Profit margins	Operating income / Net revenues from sales
Market shares	Firm sales / Total market sales
Investment	Capital expenditures / 1,000,000
Prices	Industrial prices in each market (from Eurostat)

Table 3 – Effect of deregulation on operating environment

This table shows summary statistics before and after deregulation of the main variables in our analysis.

Variable	*Mean Before (std. dev.)*	*Mean After* (std. dev.)	*Difference*	*t-statistic*	N. obs.
Size	14.06 (2.16)	13.86 (2.33)	-0.19	-1.34	947
Growth opportunities	0.83 (0.59)	0.96 (0.62)	0.13	3.02	717
Profitability	0.041 (0.05)	0.031 (0.13)	-0.009	-1.42	946
Collateral	0.634 (0.23)	0.618 (0.21)	-0.01	-1.05	945
Revenues	0.46 (0.30)	0.59 (0.44)	0.12	4.9	938
Costs	0.34 (0.26)	0.45 (0.40)	0.11	4.42	705
Intangibles	0.033 (0.06)	0.046 (0.08)	0.013	2.74	945
Return on sales	0.58 (2.3)	0.46 (7.8)	-0.12	-0.3	812
Cash	0.07 (0.005)	0.10 (0.006)	0.033	3.87	945
Total debt	2326557 (5563918)	1984392 (5069276)	-342165	-0.98	947
Total assets	7552250 (1.75exp7)	7531526 (2.01exp7)	-20724	-0.017	947
Firm leverage	0.21 (0.18)	0.23 (0.19)	0.01	1.37	947
Market leverage	0.20 (0.005)	0.23 (0.004)	0.02	3.0	862
Profit margins	2.35 (0.05)	2.32 (0.04)	-0.02	-0.41	767
Market shares	0.26 (0.26)	0.22 (0.25)	-0.03	-1.97	862
Investment	0.50 (0.05)	0.40 (0.04)	-0.10	-1.37	800
Prices	0.07 (0.013)	0.06 (0.012)	-0.01	10.9	861

Table 4 – Effect of deregulation on leverage

This table presents the effect of deregulation on firms' capital structure. The dependent variable is firm leverage. It corresponds to the debt-to-book value of the assets in columns (1) to (3), and it is the debt-to-market value of the assets in columns (4) to (6). The independent variables are our difference-in-difference estimator and four balance sheet variables defined in table 2 that potentially affect leverage. Firm and year fixed effects are included but not displayed. Standard errors (shown in parenthesis) are robust to heteroskedasticity and autocorrelation, and are clustered at the country level. All regressions use all observations in our sample except columns (3) and (6) which include only the permanent firms in our sample. Coefficients significant at the 10%, 5% and 1% level are marked with *, **, and *** respectively.

	Debt-to-book value of assets			Debt-to-market value of assets		
	(1)	(2)	(3)	(4)	(5)	(6)
Deregulates	-0.018 (0.02)***	0.007 (0.02)	0.01 (0.02)	-0.24 (0.04)***	-0.09 (0.13)	0.16 (0.17)
Deregulation effect	-0.06 (0.01)***	-0.08 (0.02)***	-0.08 (0.02)***	-0.15 (0.04)**	-0.14 (0.04)***	-0.14 (0.04)***
Growth opportunities	.	-0.008 (0.01)	0.002 (0.01)	.	-0.06 (0.03)*	-0.05 (0.04)
Profitability	.	-0.77 (0.15)***	-0.96 (0.19)***	.	-0.92 (0.3)***	-1.38 (0.31)***
Size	.	0.06 (0.01)***	0.07 (0.02)***	.	0.07 (0.03)**	0.05 (0.04)
Collateral	.	0.003 (0.05)	0.01 (0.05)	.	-0.19 (0.1)*	-0.16 (0.12)**
R^2	0.68	0.78	0.80	0.58	0.65	0.63
Number of observations	947	643	514	717	634	506

Table 5 – Effect of leverage decrease on firms' profit margins

This table presents the effect of leverage decreases after deregulation on firms' gross profit margins. The dependent variable is the log of firms' operating profit margins. The independent variables of interest are the deregulation dummy, firm leverage and its interaction with the deregulation dummy, and the average leverage in each market and its interaction with the deregulation dummy. The rest of independent variables are potential explanatory variables of the dependent variable. Column (1) reports the results of the OLS model; column (2) shows the results of the first stage regression of our instrumental variables specification in columns (3) to (7), where we instrument post-deregulation firm leverage with firms' tangible assets and their interaction with the deregulation dummy. Columns (3) and (4) show results for all firms in the sample, column (5) only for survivor firms and columns (6) and (7) for small and large survivor firms respectively. Firm, and year fixed effects, and clustered errors at the country level are included in all regressions but not displayed. Standard errors (shown in parenthesis) are robust to heteroskedasticity and autocorrelation. Coefficients significant at the 10%, 5% and 1% level are marked with *, **, and *** respectively.

	Gross profit margins						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	OLS	First stage	IV-all	IV-all	IV-survivors	IV-small survivors	IV- large survivors
Margin (lag)	0.27 (0.07)***	.	0.3 (0.05)***	0.18 (0.08)**	0.19 (0.08)**	1.3 (0.4)***	0.05 (0.09)
Leverage	-0.2 (0.3)	.	0.75(0.65)	1.1 (0.65)*	2.1 (1.2)*	-17.5 (9)**	2.5 (1.8)*
Leverage*dereg	-0.73 (0.3)**	.	-2.7(1.17)**	-3.4 (1.2)***	-4.18 (1.6)***	19.4 (10.4)*	-4.2 (2.7)*
Mkt. leverage	0.42 (0.46)	.	-0.89 (0.7)	-0.91 (0.65)	-1.7 (1.09)	12.2 (6.1)**	-2.4 (1.6)
Mkt. leverage*dereg	-0.27 (0.65)	.	2.6 (1.3)**	2.9 (1.3)**	3.6 (1.7)**	-15.2 (7.2)**	4.4 (3.0)
Intangibles	1.5 (0.65)**	.	-0.02 (0.5)	1.33 (0.61)**	1.2 (0.7)	8.8 (3.8)**	-0.04 (1.5)
Return on sales	0.17 (0.16)	.	0.2 (0.1)*	0.14 (0.15)	0.1 (0.2)	4.7 (2.1)**	0.29 (0.18)
Revenues	-0.45 (0.19)**	.	-0.25 (0.14)*	-0.59 (0.19)***	-0.48 (0.21)**	-0.41 (1.03)	-0.6 (0.2)***
Costs	0.02 (0.11)	.	0.03 (0.08)	0.058 (0.1)	0.15 (0.14)	0.56 (0.7)	0.04 (0.13)
Growth opportunities	.	.	.	-0.01 (0.05)	-0.05 (0.06)	0.1 (0.1)	-0.06 (0.19)
Profitability	.	.	.	3.04 (1.6)*	5.3 (2.1)**	-12.7 (6.0)**	13.5 (3.1)***
Size	.	.	.	-0.35 (0.09)***	-0.16 (0.11)	-1.8 (0.7)***	-0.17 (0.17)
Collateral	.	.	.	1.2 (0.34)***	1.4 (0.44)***	0.7 (1.6)	0.29 (0.66)
Cash	.	.	.	-0.06 (0.47)	-0.3 (0.5)	-1.9 (2.4)	2.4 (1.7)
Tangible	.	-0.17 (0.03)***	.	.	.	.	.
Tangible*dereg	.	0.25 (0.03)***	.	.	.	.	.
R^2	0.85	0.95	0.81	0.83	0.82	0.66	0.84
Number of observations	495	495	495	419	327	124	203

Table 6 – Effect of leverage decrease on firms' market shares

This table presents the effect of leverage decreases after deregulation on firms' market shares. The dependent variable is the firm's sales over the total sales in the market. The independent variables of interest are the deregulation dummy, firm leverage and its interaction with the deregulation dummy, and the average leverage in each market and its interaction with the deregulation dummy. The rest of independent variables are the usual covariates. Column (1) reports the results of the OLS model; column (2) shows the results of the first stage regression of our instrumental variables specification in columns (3) to (6), where we instrument post-deregulation firm leverage with firms' tangible assets and their interaction with the deregulation dummy. Column (3) shows the results for all firms in the sample, column (4) only for survivor firms, column (5) for small firms, and column (6) for large firms. Firm, and year fixed effects, and clustered errors at the country level are included in all regressions but not displayed. Standard errors (shown in parenthesis) are robust to heteroskedasticity and autocorrelation. Coefficients significant at the 10%, 5% and 1% level are marked with *, **, and *** respectively.

	Market shares					
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	First stage	IV-all	IV-survivors	IV-small survivors	IV-large survivors
Leverage	-0.03 (0.05)	.	-0.14 (0.11)	-0.22 (0.16)	1.16 (0.7)	-0.38 (0.16)***
Leverage*dereg	0.07 (0.09)	.	0.29 (0.22)	0.49 (0.25)**	-1.4 (1.1)	0.56 (0.22)***
Mkt. leverage	-0.004 (0.11)	.	0.1 (0.13)	0.12 (0.17)	-1.17 (0.45)***	0.52 (0.18)***
Mkt. leverage*dereg	0.007 (0.14)	.	-0.22 (0.24)	-0.45 (0.26)*	1.19 (0.74)	-0.67 (0.26)***
Market share (lag)	0.61 (0.13)***	.	0.59 (0.05)***	0.63 (0.05)***	0.42 (0.13)***	0.54 (0.06)
Intangibles	0.06 (0.13)	.	0.06 (0.09)	-0.04 (0.11)	-1.7 (0.5)***	-0.002 (0.1)
Return on sales	-0.001 (0.002)	.	-0.001 (0.001)	0.03 (0.02)	0.05 (0.2)	0.02 (0.02)
Revenues	0.03 (0.03)	.	0.03 (0.02)*	0.07 (0.02)***	0.12 (0.1)	0.07 (0.02)***
Costs	-0.01 (0.01)	.	-0.01 (0.01)	-0.06 (0.02)***	-0.06 (0.08)	-0.03 (0.01)*
Growth opportunities	0.05 (0.02)**	.	0.05 (0.008)***	0.02 (0.009)***	0.002 (0.01)	0.03 (0.01)
Profitability	-0.22 (0.14)	.	-0.18 (0.11)	-0.03 (0.16)	-0.53 (0.53)	-0.6 (0.2)***
Size	0.01 (0.02)	.	-0.01 (0.01)	-0.03 (0.02)*	-0.008 (0.06)	0.02 (0.01)
Collateral	-0.01 (0.05)	.	-0.02 (0.05)	0.011 (0.06)	0.18 (0.17)	0.005 (0.06)
Cash	0.11 (0.1)	.	0.06 (0.07)	0.05 (0.08)	-0.02 (0.16)	-0.27 (0.14)*
Tangible	.	-0.14 (0.04)***	.	.	.	.
Tangible*dereg	.	0.21 (0.03)***	.	.	.	.
R^2	0.93	0.93	0.93	0.94	0.90	0.97
Number of observations	529	529	529	408	166	242

Table 7 – Effect of leverage decrease on prices

This table shows the results of an OLS model in which the dependent variable is the industrial price in each market and is explained by the deregulation dummy, firm leverage before and after deregulation, and market leverage before and after deregulation. We also include the usual covariates. All explanatory variables are lagged one period. In column (1) we include all the firms in the sample, column (2) includes only survivor firms, in columns (3) and (4) we include small and large survivor firms respectively, which correspond to the firms that have total assets below and above the median of 1.5 million euro respectively. Firm, and year fixed effects, and clustered errors at the country level are included in all regressions but not displayed. Standard errors (shown in parenthesis) are robust to heteroskedasticity and autocorrelation. Coefficients significant at the 10%, 5% and 1% level are

marked with *, **, and *** respectively.

	Prices			
	(1)	(2)	(3)	(4)
	All	Survivors	Survivors-small	Survivors-large
Deregulates	-0.006 (0.001)**	-0.005 (0.002)**	-0.0003 (0.003)	-0.006 (0.002)**
Leverage	0.011 (0.005)**	0.006 (0.007)	-0.01 (0.01)	0.01 (0.01)
Leverage*dereg	-0.008 (0.006)	-0.001 (0.008)	0.05 (0.01)***	-0.02 (0.01)**
Mkt. leverage	0.02 (0.007)***	0.02 (0.009)***	0.04 (0.01)***	0.01 (0.01)
Mkt. leverage*dereg	-0.01 (0.008)	-0.008 (0.01)	-0.05 (0.01)***	0.01 (0.01)
Intangibles	-0.005 (0.008)	-0.01 (0.01)	0.05 (0.03)	-0.02 (0.01)*
Revenues	-0.0002 (0.0001)*	0.005 (0.002)**	0.001 (0.01)	0.001 (0.002)
Costs	-0.003 (0.001)*	-0.002 (0.002)	-0.02 (0.005)***	-0.003 (0.003)
Return on sales	0.002 (0.001)**	-0.0001 (0.0002)	0.02 (0.05)***	-0.003 (0.002)
Growth opportunities	-0.001 (0.0007)***	-0.002 (0.0009)***	0.0001 (0.0007)	-0.008 (0.002)***
Profitability	0.003 (0.009)	-0.004 (0.01)	0.001 (0.02)	0.03 (0.02)
Size	0.003 (0.001)**-	0.005 (0.001)***	0.003 (0.003)	0.001 (0.002)
Collateral	0.01 (0.004)***	0.01 (0.006)***	0.002 (0.001)	0.01 (0.008)**
Cash	-0.004 (0.006)	-0.003 (0.008)	-0.01 (0.01)	0.05 (0.01)***
R^2	0.81	537	155	253
Number of observations	537	0.81	0.87	0.85

Table 8 – Effect of leverage decrease on investment

This table shows the results of an OLS model in which the dependent variable is firm investment (in millions of euros) and is explained by the deregulation dummy, firm leverage before and after deregulation, and market leverage before and after

deregulation. We also include the usual covariates. All explanatory variables are lagged one period. In column (1) we run the regression with all firms in our sample, in column (2) we include only the small firms that survive (i.e. those with total assets below the median of 1.5 million euro), in column (3) we only consider large survivor firms (i.e. with total assets above the median), and in column (4) we include the largest firms in our sample, which correspond to those in the 80th percentile in terms of the total assets. Firm, and year fixed effects, and clustered errors at the country level are included in all regressions but not displayed. Standard errors (shown in parenthesis) are robust to heteroskedasticity and autocorrelation. Coefficients significant

at the 10%, 5% and 1% level are marked with *, **, and *** respectively.

	Investment			
	(1)	(2)	(3)	(4)
	All firms	Survivors-small	Survivors-large	Survivors-largest
Deregulates	-0.27 (0.12)**	-0.002 (0.01)	-0.21 (0.25)	-0.64 (0.29)**
Leverage	-0.54 (0.34)*	-0.16 (0.06)***	-0.35 (0.86)	1.9 (1.11)*
Leverage*dereg	1.04 (0.4)***	0.09).06)	0.61 (0.88)	2.72 (1.3)**
Mkt. leverage	-0.48 (0.53)	-0.09 (0.09)	-1.6 (1.1)	-0.34 (1.3)
Mkt. leverage*dereg	-0.24 (0.58)	0.04 (0.09)	-0.005 (1.22)	-1.3 (1.54)
Intangibles	0.53 (0.58)	-0.15 (0.16)	1.7 (1.2)	3.45 (1.9)*
Return on sales	0.01 (0.009)	-0.07 (0.04)	0.31 (0.27)	1.8 (1.03)*
Revenues	-0.16 (0.13)	0.03 (0.02)	-0.63 (0.36)*	-0.77 (0.87)
Costs	0.15 (0.09)*	-0.02 (0.02)	0.72 (0.23)***	1.04 (0.53)**
Growth opportunities	0.01 (0.05)	0.005 (0.006)	0.39 (0.22)*	0.38 (0.34)
Profitability	-0.87 (0.65)	-0.16 (0.09)*	-2.3 (2.5)	-4.7 (3.7)
Size	0.28 (0.09)***	0.06 (0.02)***	0.4 (0.23)*	0.2 (0.35)
Collateral	-0.6 (0.31)**	0.06 (0.04)	-1.2 (0.76)	-0.8 (1.01)
Cash	0.5 (0.4)	-0.01 (0.04)	1.9 (1.4)	2.5 (1.6)
R^2	0.75	0.82	0.72	0.85
Number of observations	518	149	248	136

Table 9 – Competition of exiting firms

This table reports the results of an IV model where the dependent variable corresponds to the margins (in column (1)), the market shares (in column (2)), the prices (in column (3)), and the investment (in column (4)) of exiting firms. The dependent variable is explained by our four measures of leverage (lagged one period in the case of market shares), and the same covariates as in the previous analysis. We also include a lag of margins and market shares in panels A and B respectively, to capture past possible determinants of margins and market shares not captured by our covariates. The results of the rest of covariates are not reported for brevity. Firm, and year fixed effects, and clustered errors at the country level are included in all regressions but not displayed. Standard errors (shown in parenthesis) are robust to heteroskedasticity and autocorrelation. Coefficients significant at the 10%, 5% and 1% level are marked with *, **, and *** respectively.

	(1)	(2)	(3)	(4)
	Gross profit margins	Market shares	Prices	Investment
Margin (lag) or Market sh. (lag)	-0.7 (0.36)*	0.089 (0.08)	.	.
Leverage	0.57 (0.23)***	0.006 (0.04)	-0.001 (0.004)	-0.37 (0.2)*
Leverage*dereg	.	.	.	.
Mkt. leverage	-2.6 (0.55)***	-0.007 (0.09)	-0.003 (0.008)	0.52 (0.35)
Mkt. leverage*dereg	.	.	.	.
R^2	0.93	0.97	0.97	0.86
Number of observations	79	86	92	86

Table 10 – Effect of leverage decrease on firms' exit

This table shows the effect of changes in leverage at the firm and market level on firms' probability of exit. We run a linera

probability model in all regressions, where the dependent variable is a dummy that takes the value of one if a company exits the year in which it exits and zero otherwise. The main covariates are individual firm leverage and average market leverage. We also include the usual covariates not reported for brevity. In column (1) none of the covariates is lagged, in column (2) we lag all the covariates one period, in column (3) we lag them two periods, and so on until column (7) in which covariates are lagged 6 periods. Firm, and year fixed effects, and clustered errors at the country level are included in all regressions but not displayed. Standard errors (shown in parenthesis) are robust to heteroskedasticity and autocorrelation. Coefficients significant at the 10%, 5% and 1% level are marked with *, **, and *** respectively.

	Exit					
	(1)	(2)	(3)	(4)	(5)	(7)
	same year	exit year -1	exit year -2	exit year -3	exit year -4	exit year -6
Leverage	0.005 (0.04)	0.03 (0.04)	0.0007 (0.05)	0.04 (0.05)	-0.02 (0.06)	-0.044 (0.08)
Market leverage	-0.30 (0.10)***	-0.18 (0.10)*	-0.35 (0.12)***	-0.06 (0.13)	0.19 (0.15)	0.28 (0.18)*
Covariates	yes	yes	yes	yes	yes	yes
Fixed effects	yes	yes	yes	yes	yes	yes
R^2	0.13	0.12	0.14	0.12	0.13	0.18
Number of observations	595	551	504	481	458	364

Table 11 – Competition of entrant firms

This table reports the results of an IV model where the dependent variable corresponds to the margins (in column (1)), the market shares (in column (2)), the prices (in column (3)), and the investment (in column (4)) of entrant firms. The dependent variable is explained by our four measures of leverage (lagged one period in the case of market shares), and the same covariates as in the previous analysis. We also include a lag of margins and market shares in panels A and B respectively, to capture past possible determinants of margins and market shares not captured by our covariates. The results of the rest of covariates are not reported for brevity. Firm, and year fixed effects, and clustered errors at the country level are included in all regressions but not displayed. Standard errors (shown in parenthesis) are robust to heteroskedasticity and autocorrelation. Coefficients significant at the 10%, 5% and 1% level are marked with *, **, and *** respectively.

	(1)	(2)	(3)	(4)
	Gross profit margins	Market shares	Prices	Investment
Margin (lag) or Market sh. (lag)	-0.36 (0.12)***	0.96 (0.27)***	.	.
Leverage	.	.	.	.
Leverage*dereg	-5.4 (1.15)***	-1.13 (0.3)***	0.008 (0.007)	0.02 (0.08)
Mkt. leverage	.	.	.	.
Mkt. leverage*dereg	8.1 (.186)***	3.6 (0.63)***	0.03 (0.02)	0.11 (0.16)
R^2	0.97	0.96	0.96	0.88
Number of observations	20	35	17	35

Table 12 – Effect of leverage entry

This table shows the effect of changes in leverage at the market level on the probability that a new firm enters the market. We run a linear probability model in all regressions, where the dependent variable is a dummy that takes the value of one if a

company enters the market the year it enters and zero otherwise. The main covariate is average market leverage. We also include the usual covariates this time averaged at the market level, their coefficients are not reported for brevity. In column (1) none of the covariates is lagged, in column (2) we lag all the covariates one period, in column (3) we lag them two periods, and so on until column (7) in which covariates are lagged 6 periods. Firm, and year fixed effects, and clustered errors at the country level are included in all regressions but not displayed. Standard errors (shown in parenthesis) are robust to heteroskedasticity and autocorrelation. Coefficients significant at the 10%, 5% and 1% level are marked with *, **, and *** respectively.

	Entry					
	(1)	(2)	(3)	(4)	(5)	(6)
	same year	entry year -1	entry year -2	entry year -3	entry year -4	entry year -5
Market leverage	-0.13 (0.08)	0.16 (0.08)**	0.23 (0.09)***	-0.06 (0.11)	-0.07 (0.12)	-0.04 (0.13)
Covariates (market average)	yes	yes	yes	yes	yes	yes
Fixed effects	yes	yes	yes	yes	yes	yes
R^2	0.27	0.29	0.30	0.28	0.29	0.27
Number of observations	690	655	613	569	523	477