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Abstract

We investigate the relationship between financial integration and output volatility at micro and macro levels. Using a very large firm-level dataset (AMADEUS) from 16 European countries, we construct a measure of "deep" financial integration at the regional level based on observations of foreign ownership at the firm level. We find a significant positive effect of foreign ownership on the volatility of firms' outcomes in static as well as dynamic empirical frameworks. This effect survives aggregation and carries over to regional output, leading to a positive association between deep international financial integration and aggregate fluctuations. To identify the causal effect of integration on volatility we exploit variation in the transposition dates of the European Union-wide legislative acts from the Financial Services Action Plan (FSAP). We find that high trust regions located in countries who harmonized their capital markets sooner have higher levels of financial integration and higher volatility.

JEL Classification: E32, F15, F36, O16

Keywords: firm volatility, foreign ownership, regional integration, social capital, macro volatility

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1 Introduction

Macroeconomists increasingly recognize the importance of interactions between firm- and aggregate-level outcomes; in particular, aggregate economic growth and volatility is tightly linked to heterogeneity of firm-level activity. Our objective here is to empirically investigate the relationship between financial integration—measured from firm-level foreign ownership—and output volatility at the firm level as well as at the aggregate level.

Although theoretical predictions regarding the effect of financial integration on aggregate volatility are ambiguous, many micro-founded models suggest a positive relationship between foreign ownership and firm-level volatility. Foreign investors may acquire domestic firms for two reasons: a) "diversification" or b) "control." If investors buy stakes in firms for the purpose of *diversification* we expect to find a positive correlation between foreign ownership and firm-level volatility. Foreign investors are likely to be better diversified against shocks to the domestic economy and therefore relatively more tolerant of domestic risk and relatively more likely to invest in volatile firms.[1] While this explanation implies that volatility affects foreign ownership there may also be a causal effect from foreign ownership to volatility. When a firm is more diversified the domestic majority owner is less impacted by the firm's volatility and hence more willing to allow the firm to undertake high variance-high return investments. This argument is detailed in Obstfeld (1994) who shows how diversified capital ownership allows firms to choose risky projects that they would otherwise pass up.[2]

Foreign firms may buy stakes in domestic firms for reasons of *control*; for example, to control their supply chain, or to obtain competitive advantage, economies of scale, market access, etc. Such multinational investors will typically hold majority stakes and therefore decide on the business strategy of their target. Foreign majority investors are likely to be better diversified against domestic risk than domestic majority owners, especially because such investors often are firms with operations in their home economy. They are therefore more willing to accept exposure to domestic risk. As a result volatility will be positively correlated with foreign majority ownership with causation running from ownership to volatility.

The predictions regarding aggregate volatility are ambiguous because the theoretical effects of aggregation rests on a plethora of assumptions about firm heterogeneity, sectoral co-movements and

[1] We outline a model of such investors in Appendix A.

[2] Comin and Mulani (2009) develop a model where availability of financing leads to more research and development, causing firms to take on more risk; i.e., become more volatile.

so forth.[3] This ambiguity underlines the importance of studying financial integration and output volatility in a quantitative framework. Surprisingly, the empirical literature so far fails to deliver a robust relationship—positive or negative—between financial integration and volatility at either the firm level[4] or the aggregate level.[5]

We employ a novel empirical approach. Our exercise starts from the micro level where we use direct observations on foreign ownership over time from the AMADEUS firm-level database. We first study the relation between foreign ownership and firm-level volatility which allows us to test whether or not foreign-owned firms are more volatile. Next, we "aggregate our way up" to regions within countries by 1) calculating a weighted average of firm-level foreign ownership,[6] which we call "deep" financial integration, and 2) aggregate the output of firms by region and calculate regional volatility. Aggregation over firms will give different estimates than firm-level estimates. The differences may be due to aggregation of ownership (our right-hand side variable) or due to aggregation of output. In order to explore this issue we perform aggregation in several "steps." We first regress the volatility of the typical firm; i.e., median volatility in each region, on regional deep integration and, next, we regress volatility of regional aggregated output on deep integration in order to explore if the relation between ownership and volatility carries over to the aggregated data. Finally, we combine our firm-level dataset from AMADEUS with macroeconomic (regional) data from Eurostat and regress volatility of region-level GDP per capita on deep financial integration.

To the best of our knowledge, this is the first paper that performs an integrated investigation of the relationship between finance and volatility at the micro level and, using micro-level outcomes, at the macro level. Focusing on firms and regions within countries is important because cross-country studies suffer from several identification problems that are difficult to resolve using aggregate data alone. By conditioning on country-wide institutional structures together with sectoral and policy shocks using country-, industry-, and time-fixed effects (and their combinations) we can investigate

[3] See the literature survey in the next section.

[4] Thesmar and Thoenig (2004) find an increase in firm-level volatility for listed French companies following financial deregulation, while Correa and Suarez (2007) find less volatile firm-level sales and employment in a sample of listed firms after bank deregulation in the United States.

[5] Bank deregulation dampened U.S. state-level business cycles; see Morgan, Rime, and Strahan (2004), while increased financial openness lead to increased volatility of both consumption and output at the country level; see Kose, Prasad, and Terrones (2003). Similarly, Bekaert, Harvey, and Lundblad (2006) find increased volatility of output and consumption as a result of trade and financial openness although equity-market liberalizations were followed by a decrease in output and consumption volatility in some countries. di Giovanni and Levchenko (2009a), using industry-level data, find that financial openness leads to an increase in aggregate volatility due to higher sectoral specialization.

[6] Our measure of financial integration is based on firm-level foreign ownership and captures foreign direct investment (FDI) and equity liabilities.

whether aggregation "averages away" firm-level volatility in isolation from the first-order general equilibrium effects that affect country-level data. While firm-level data are better—due to the fact that investment decisions are made at the firm level, and firm-level data will improve identification—focusing solely on the firm will leave unanswered the question of whether there is an effect of financial integration on aggregate volatility.

Figure 1, using data from Lane and Milesi-Ferretti (2007), illustrates the identification challenge in country-level data. The relationship between volatility, measured as the standard deviation of real per capita Gross Domestic Product (GDP) growth between 1995 and 2005, and financial integration, measured as sum of foreign assets and liabilities divided by GDP and averaged over 1995–2005, changes dramatically with the sample of countries. The figure suggests there is no relation between volatility and financial integration in the largest sample of 25 EU countries. However, if we omit small, open, and volatile countries, such as Ireland, Malta, and Cyprus, it seems there is a strong negative relation between volatility and integration. If we focus on 15 long-standing EU countries, the relationship turns positive. If one does a similar exercise using a larger sample of countries, including both developed world and emerging markets, the results are equally unstable as shown by Kose, Prasad, Rogoff, and Wei (2009). This survey concludes that there is no systematic relationship between volatility and financial integration given the different results from different country and time samples. The different patterns may be capturing differences in institutions, industrial structures, financial markets, and/or policies but with the small samples available at the country level it is not possible to sort this out.

An additional concern is that financial market integration *within* countries may not be the same for different countries.[7] In this case, any analysis conducted at the country level, based on a representative agent framework, may not be representative of typical agents or regions. It is important to separate the effects of within-country regional integration from international financial integration because international and intra-national integration may be complements or substitutes.[8]

We use firm-level accounting and ownership data from AMADEUS and region-level data from Eurostat for the period 1996–2006. Both databases are for Europe. We focus on 16 European countries (15 EU countries plus Switzerland), with 100+ regions and 4.7 million unique firms (an unbalanced panel), in order to have a homogenous sample.[9] Europe provides an ideal "laboratory"

[7] See Ekinci, Kalemli-Ozcan, and Sørensen (2009).

[8] Recently Mendoza, Quadrini, and Rios-Rull (2007) emphasize the role of domestic financial development for determining patterns of external borrowing and lending.

[9] For our 16 countries, AMADEUS lists a total of 9.9 million firms of which many have very limited data. 4.7 million firms have at least one year with reported assets and an outcome variable—either sales, revenue, or employment.

for our study because financial integration there has dramatically increased cross-country ownership over the last fifteen years. Figure 2 displays foreign equity (FDI+portfolio) and debt liabilities for the aggregate of our 16 countries during 1990–2006 using data from Lane and Milesi-Ferretti (2007). The figure reveals a better-than quadrupling of each liability component as a share of GDP. Foreign debt liabilities are more than twice as large as equity liabilities but the rate of increase is higher for the latter leading to a bigger increase in the share of equity as shown in the second panel.[10]

Foreign ownership is a slowly evolving variable implying that most of the variation in our data is cross-sectional. Thus, we start by running cross-sectional regressions at the firm level. These regressions maximize the number of firms in the regressions. Next, we undertake a panel analysis using firm-fixed effects to control for unobserved firm-level heterogeneity. We find a significant positive relation between foreign ownership and firm-level volatility, both in cross-section and in panel-fixed effect frameworks. Firms with higher levels of foreign ownership are more volatile and changes in foreign ownership over time are positively associated with changes in volatility. The effect is economically significant: if the largest owner of a given firm is a foreign company, sales growth is 20 percent more volatile than the sample mean.

If we identify investment for control with majority ownership and investment for diversification with minority ownership, our data are informative about the role of controlling owners versus diversified investors.[11] We list examples of large ownership changes in Appendix B and these examples all appear to involve control in our broad sense. Plotting foreign ownership shares (see Figures 6–9), we find that foreign investors tend to either be the largest (controlling) owner or hold only small shares consistent with diversification. We find evidence that volatility is positively correlated with foreign minority ownership; however, the correlation is much higher between volatility and foreign ownership involving control, suggesting that this might be the channel of causality.

We find robust evidence that the micro-level patterns carry over to the macro level. We investigate the effect of regional deep financial integration—a weighted average of firm-level foreign ownership—on the volatility of the median firm and on the aggregate volatility, obtaining positive significant results in both cases. We compare the results using our aggregation with results using actual "macro-regional" data from Eurostat and find very similar estimates. The fact that these

Appendix Table B-1 lists the exact number of firms available by year and variable.

[10] Debt liabilities are non-contingent and hence will not be ideal for the purposes of risk diversification. Equity liabilities are subject to large capital gains and losses which may explain the temporary decline after the "dot-com bust" of the early years of the Millennium.

[11] One reason why largest owners can be identified as controlling owners can be found in corporate finance models à la Holmstrom and Tirole (1997), who stress that majority holders need to hold significant ownership stakes in order to align incentives.

two different ways of aggregation yield same result not just assures our methodology but also shows the importance of the firm-level volatility for aggregate fluctuations. These macro-level estimates from the regional analysis are economically significant. After removing the effect of other regressors, the estimated coefficient to financial integration can explain around 12 percent of the variation in regional volatility.

Firms can also obtain diversification by diversifying domestically and we investigate the role of domestic diversification on volatility. Surprisingly, domestic diversification is associated with less volatile output cross-sectionally, although there is no significant association between domestic diversification and volatility in the dynamic framework with firm-fixed effects. In our regional analysis, we similarly find no robust effect of domestic financial integration on regional volatility.

We are not concerned about potential endogeneity due to country- and industry-level factors because we control for these using country and industry dummy variables in the cross-section and, in panel regressions, using country-year and industry-year dummies. Nonetheless, our results are likely to be partly driven by reverse causality and/or time-varying firm- and region-level omitted factors. Documenting a strong relation between volatility and foreign ownership is an important contribution of this article but it is also important to know whether there is a causal effect from foreign ownership to volatility. To sort this out at the firm level, we undertake two different exercises. First, we use propensity score matching methods to obtain a sample of domestic firms with no foreign ownership that are observationally similar to the firms with foreign ownership. Combining these firms with our firms with foreign ownership and repeating the regressions we obtain similar results. This does not prove causality but it shows that our results are not spuriously caused by firms with foreign ownership being observationally different from other firms. Second, we find that lagged foreign ownership predicts *changes* in volatility. While possibly such patterns could be non-causal, for example due to foreigners investing based on firms' plans for future production, these results are consistent with a causal effect of foreign ownership on volatility.

At the regional level, we obtain direct evidence of causality exploiting variation from a policy experiment, the Financial Services Action Plan of the EU (FSAP), using instrumental variables regressions. In 1999 the European Commission launched an ambitious plan, FSAP, to integrate EU financial markets. The FSAP, which focuses on financial services, securities regulation, and corporate governance issues was implemented in the following five years through a flow of new legislative measures. The main purpose of the FSAP was to provide a legal platform for EU financial market integration by providing a high level of investor protection and reduced cost of cross-border

transactions. Each member state transposed these policies into national laws at different times.[12]

We argue that these country-level financial harmonization policies effects regions differently depending on their level of social capital. We proxy regional social capital by measures of trust, which we obtain from survey responses in the European Social Survey. These measures have been shown by Guiso, Sapienza, and Zingales (2004, 2006, 2009) to predict many financial decisions—of particular relevance is their 2004 finding that individuals in high-trust regions are more likely to hold stock and use formal financial institutions and their 2009 finding that savers direct their international investments to countries in which they have high trust. While these papers consider mainly the side of investors, a similar pattern can be expected when looking at the hosting economy. High social capital regions will likely to be more receptive to foreign investments, especially because capital owners in these regions are themselves more diversified.[13]

We instrument time-varying regional financial integration—based on weighted average of foreign ownership—with regional trust interacted with country-wide financial laws. Our reduced form estimates indicate that, after removing the component that is correlated with other regressors, our instrument can explain about 15 percent of the variation in regional volatility. Two-Stage Least Squares (2SLS) estimation delivers significant estimates of the impact of financial integration: the first-stage implies that a one-standard-deviation change in the instrument (corresponding to three laws implemented in a region with average trust) will result in an increase in regional financial integration of about 35 percent while the second-stage estimates implies that this increase may explain about a third of the variation in volatility across regions.

The paper proceeds as follows. Section 2 reviews the literature. Section 3 describes our data and variable definitions. Section 4 discusses our empirical specification and presents our results. Section 5 concludes.

2 Aggregate Volatility: Literature

Higher firm-level volatility does not necessarily imply larger aggregate fluctuations. Theoretically, carrying the micro-level predictions to aggregate level requires various assumptions, all of which

[12] The coding of these EU-wide policies comes from Kalemli-Ozcan, Papaioannou, and Peydró (2010) who find a positive association between implemented harmonization policies and bilateral financial integration of EU countries.

[13] Another mechanism might be at work through the organizational structure of the firm as shown by Bloom, Sadun, and Van Reenen (2009). They argue that areas with higher trust specialize in industries that rely on decentralization allowing more efficient firms to grow in scale. It is plausible there will be more foreign investment in such areas as well.

change the nature of i.i.d firm-level shocks in different ways. For example, in the Obstfeld (1994) model, more risk-taking by firms will affect aggregate fluctuations only if firm-level shocks are correlated (not independent) such that shocks do not average out in the aggregate. An example could be a region where most activity is in a certain industry such as Alaska which is highly dependent on oil. If the risk of oil-price shocks is shared with outsiders, more firms will be willing to undertake investments in oil-related industries and if more firms are in the same (oil) industry aggregate (oil) shocks result in aggregate volatility.[14] Another mechanism that will violate the independently distributed firm-level shocks is shown by Caballero and Engel (1999) where aggregate investment fluctuations are born out by "lumpy" firm-level investments with adjustment costs. Recently, Bloom, Floetotto, and Jaimovich (2009) propose that time-varying uncertainty combined with micro rigidities can have important general equilibrium effects. If a change in foreign ownership leads to a change in uncertainty across a firms this may in turn impact aggregate volatility.

If firm-level shocks are caused by independent firm-level innovations, on the other hand, the law-of-large numbers makes such shocks irrelevant in the aggregate assuming the economy consists of a large number of small firms. The model of Acemoglu and Zilibotti (1997) also implies that integration may lead to a larger number of smaller firms.[15]

Firm-level shocks may also carry over to the aggregate level if the firm-size distribution is fat-tailed, violating the assumption that the shocks are identically distributed. In such a case, a few large firms can drive aggregate volatility as suggested by Gabaix (2009). He shows that when the distribution of firm size follows a power law, idiosyncratic shocks to firms can have a large impact on aggregate volatility and he provides evidence for such fat-tailed distributions for the U.S.[16]

Finally, aggregate correlations between financial integration and volatility may be determined by how aggregate foreign capital flows respond to aggregate shocks. The multi-region extension of the Holmstrom and Tirole (1997) model by Morgan, Rime, and Strahan (2004) predicts, on the one hand, a positive association between financial integration and state business cycles if negative shocks are associated with loss of collateral value of firms in a region. In this case, foreign lenders may contract capital provision in bad times (and vice versa in good times), exacerbating fluctuations. On

[14] Kalemli-Ozcan, Sørensen, and Yosha (2003) find a positive effect of risk sharing on industrial specialization using regional data. However, it is possible that a higher level of sectoral specialization is associated with lower co-movement between sectors, as argued by Koren and Tenreyro (2007). In this case specialization may lead to lower aggregate volatility.

[15] Black and Strahan (2002), Kerr and Nanda (2007), and Cetorelli and Strahan (2006) find an increase in the number of firms and a decrease in the average size of firms as a result of various financial innovations.

[16] di Giovanni and Levchenko (2009b) show evidence of fat tails using firm-level data from AMADEUS/ORBIS for several countries.

the other hand, if negative shocks affect the supply of credit while having little effect on collateral, foreign lenders will supply scarce capital in times where local credit contracts cannot, smoothing fluctuations.

All said, the literature regarding aggregate shocks fails to deliver robust predictions and findings regarding the effect of financial integration on volatility.[17] We believe that in order to estimate the effect of financial integration on aggregate fluctuations, one must first pin down the effect of foreign ownership on firm-level volatility.

3 Data and Construction of Variables

We construct a unique data set composed of firm-level observations from the AMADEUS database (Analyze Major Databases from European Sources), provided by Bureau van Dijk Electronic Publishing (BvD), and region-level observations corresponding to the Nomenclature of Territorial Units for Statistics of Europe (NUTS-2), provided by Eurostat. We focus on 16 countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom which gives us a fairly homogenous sample. The time coverage of each firm is a subset of the sample period 1996–2006, leading to an unbalanced panel.

The AMADEUS database comes in two modules: AMADEUS Financials, which provides financial information—both balance-sheet and off-balance sheet items such as income statements and profit and loss accounts—and AMADEUS Ownership, which provides information on foreign and domestic owners of each firm. Data on ownership are available biennially since 2000. For each firm, we have locational information which allows us to assign firm-level data from AMADEUS to Eurostat's NUTS-2 level regions.

[17]The evidence on the co-evolution of the firm- and aggregate-level volatility is also mixed. There has been a significant decline in aggregate volatility in the United States and in most other industrial countries over the last thirty years, (e.g., McConnell and Perez-Quiros (2000), and Stock and Watson (2003)). But findings regarding U.S. firm-level volatility during the same period are not conclusive: Chaney, Gabaix, and Philippon (2002) and Comin and Philippon (2006) find increased volatility of sales and employment while Davis and Kahn (2008) and Davis Haltiwanger, Jarmin, and Miranda (2007) find declining firm-level volatility.

3.1 Firm-Level Data and Variables

From the AMADEUS Financials database, we draw firm-level information for 1996–2006 requiring that firms have at least one of the three outcome variables non-missing (sales, operating revenue, or employment) in a given year.[18] We combine these data with data on foreign ownership from the AMADEUS Ownership database, using firm IDs. During this process, we loose firms for which data are not available in both samples, as documented in Appendix Table B-1.

We work with two types of samples. In the *permanent* firm sample over a specified period, say, 2000–2006, we keep all firms with outcomes non-missing in every year. In the sample of *all* firms, we allow firms to have missing outcomes at the beginning or the end of any given regression sample but we drop firms that have "holes" in the time-series. In other words, we allow firms to disappear or appear; but not appear, disappear, and reappear.

Figure 3 presents the distribution, with the number of firms on the vertical axis, of the logarithm of the firm-level operating revenue for four years and Figure 4 shows total assets and other outcomes for 2006. Assets, sales, and operating revenue are measured in euros while employment is in persons. The distribution of these (logged) variables does not change much over time and is very close to normal; i.e., the distribution of the data before the log-transformation is very close to log-normal. One noticeable thing is the skewed distribution of employment with many small firms with as little as one employee (lawn mowers, painters, house repairs, etc.). To limit the potential impact of outliers, we winsorize variables before performing our empirical analysis (Figure 4 displays the distribution of assets both before and after winsorizing).

Volatility Measures

We calculate firm-level volatility using three different outcomes: firm sales, operating revenue, and number of employees. Operating revenue is sales plus other revenues such as interest. For robustness and comparability with previous work, we experiment with three different measures of volatility. We follow the literature on firm-level volatility, which mostly focuses on large publicly traded firms, and use the standard deviation of firm outcome growth ("SD") as our first measure.[19] The distributions of (winsorized) standard deviations of sales and operating revenue are displayed

[18] While the Financials database reports financial information over 1996–2008, the best firm coverage is for 2001–2006. Delays in financial reporting make the database incomplete for later years while earlier years have relatively few firms.

[19] We calculate firm outcome growth as a rate of change (rather than log-differences since at the firm level, growth-rates are so large that the usual logarithmic approximation sometimes is a bad approximation to the growth-rate.

in Figure 5. The distributions are fairly close to normal except for the pile-ups at the points of winsorizing.

For small firms, measures based on standard deviations may have bad properties because, say, a firm growing from 1 to 2 employees in a given year will have a growth rate of 100 percent and such large growth rates some years but not in others will lead to correspondingly large standard deviations. Because we have many small private firms, we use the coefficient of variation ("CV") as our second measure of volatility.

These measures are well-suited for cross-sectional analysis or for a panel analysis where there are enough time-series observations to be able to calculate time-varying standard deviations (or coefficients of variation) over "rolling windows." Given our limited time-series dimension (ten years of accounting data and only four years of ownership data), we construct a year-by-year volatility measure that can be used for panel-data analysis. We follow Morgan, Rime, and Strahan (2004) and construct a year-by-year measure of volatility as follows. First, we regress firm-level outcome growth on firm-fixed effects and year-fixed effects:

$$\frac{Y_{it} - Y_{it-1}}{Y_{it-1}} = \phi_i + \gamma_t + v_{it} \ . \tag{1}$$

The residuals v_{it} reflect how much outcome growth differs from average (across firms) growth in year t and from the average (over time) growth of firm i. For each firm, we use the absolute value of these residuals as our time-varying volatility measure: $\text{SD}_t \equiv |v_{it}|$. Intuitively, the SD_t measure is the one year equivalent of the standard deviation measure, SD.[20]

Foreign Ownership

The AMADEUS Ownership database contains detailed information on firms' owners for both listed and private firms including name, country of residence, and type (e.g., bank, industrial or financial company). The database refers to each record of ownership as an "ownership link" and BvD traces a link between two entities even when the ownership percentage is very small (sometimes less than 1 percent). For listed firms, very small stock holders are typically unknown.[21]

[20] Using data from the ZEPHYR database, we dropped firms involved in a merger or acquisition when the merger resulted in spuriously high growth for the acquirer. The number of firms involved in M&A activity as defined in ZEPHYR is, however, a small fraction of our sample so our results do not depend on whether we drop such firms or not.

[21] Countries have different rules for when the identity of a minority owner needs to be disclosed; for example, France, Germany, the Netherlands, and Sweden demand that listed firms disclose all owners with more than a five percent stake, while disclosure is required at three percent in the UK, and at two percent in Italy. See Schouten and Siems

At the firm-level, we compute *Foreign Ownership* (FO) as follows. For a firm i, FO_i is the sum of all percentages of direct ownership by foreigners as reported in AMADEUS. For example, if a Company A has three foreign owners with stakes 10 percent, 15 percent, and 35 percent, respectively, FO for this company is 60 percent. Owners of unknown origin (typically small) are assigned to the home country.

Figure 6 presents the distribution of foreign ownership for different years. The distribution is concentrated around 0 with less than 1 percent of firms 100 percent foreign owned. In order to get a clearer picture, Figure 7 presents the distribution of foreign ownership for the subset of firms with strictly positive foreign ownership. There is a noticeable spike in the number of firms around 50 percent ownership which likely reflects the desire of large investors to obtain a controlling interest over 50 percent.

Other Measures of Ownership

We measure each firm's *Foreign Minority Ownership* (FMO) by computing the sum of all percentages of foreign direct ownership after excluding the largest stake in the company; *Domestic Minority Ownership* (DMO) is computed analogously, for domestic owners. If a Company A has two foreign owners with stakes 50 percent and 15 percent, and two domestic owners with stakes 25 percent and 10 percent, the largest owner for this company is foreign (with stake 50 percent), FMO is 15 percent, and DMO is 35 percent. We define a binary variable *Largest Owner is Foreign* (LOF) taking the value unity if the largest owner is foreign and zero otherwise.[22]

Figure 8 shows the distribution of foreign ownership for the sample of firms where the largest owner is foreign. Not surprisingly, the majority of these firms have a foreign ownership share of 100 percent. Few of the firms have a foreign ownership share under 40 percent and there is a spike around 50 percent.

Figure 9 presents the distribution of FMO and DMO in 2006. Most companies have a very small degree of minority ownership and firms are more diversified domestically than internationally, an observation that is consistent with the home bias literature. The upper right graph shows that among all firms with *non-zero foreign ownership*, the amount of foreign minority ownership is concentrated at ownership shares up to 20 percent. Domestic minority owners' share (DMO) exhibits much more variation as can be seen from the lower right panel. Overall we have companies

(2009).

[22] In the rare case of a tie between the largest foreign and the largest domestic investor, we assign the value 1 to the LOF-dummy.

with very diffused ownership as can be detected from the histograms, where largest owner might be owning 1.1 percent, and the rest 98.9 percent is all owned by minority owners.

Finally, we use the number of foreign and domestic owners, respectively, listed in AMADEUS as alternative measures of ownership. The number of owners can also be thought as a concentration measure.

Firm-Level Controls

We use firms' total assets as a size control because large firms potentially are better able to smooth shocks through averaging of shocks to different products, processes, etc. We control for firm age because young firms tend to be more volatile.

3.2 Region-Level Data and Variables

We use regional NUTS-2 level data for 100+ regions from our 16 countries. Countries with only one NUTS-2 region during the years of our analysis, such as Denmark, are left out in the regional analysis.

Regional Volatility Measures

We measure regional volatility in three ways. First, we use volatility of the median firm in the region. Second, we aggregate firm-level outcomes to the regional level and calculate the volatility of the aggregated outcomes. Third, we calculate regional volatility using data on regional output from Eurostat. We use nominal GDP per capita in euros, deflated by national CPI.[23] Volatility is calculated from formulas similar to those used at the firm level.

Deep Financial Integration

Our measure of deep financial integration is calculated using firm-level measures of foreign ownership aggregated to the regional level. We have different firm-level foreign ownership variables, such as total amount of foreign ownership (FO), largest-owner-is-foreign dummy (LOF), and foreign minority ownership (FMO) and our regional equivalents—proxies for regional financial integration which we label FI, FI (majority), and FI (minority). For the domestic integration we use FI (domestic). All these regional variables are the asset-weighted averages of the corresponding firm-level

[23] We use the Harmonized Consumer Price Index from Eurostat.

ownership measures:

$$\mathrm{FI}_j = \sum_i w_{ij} \mathrm{FO}_{ij} \ , \tag{2}$$

where FO_{ij} is the percentage foreign ownership at the firm-level for a firm i located in region j, and w_{ij} represents the weight for firm i in region j. We find the sum of total assets in region j, $\mathrm{TOAST}_j = \sum_i \mathrm{TOAS}_{ij}$, where TOAS_{ij} is the total assets of company i and use as weights $w_{ij} = \mathrm{TOAS}_{ij}/\mathrm{TOAST}_j$.

Figure 10 displays distributions of ownership for small, medium, and large firms for two regions, Scotland and Bavaria (Bayern), in 2006. The upper panel displays the distribution of direct foreign ownership FO_i. In Bavaria about 30,000 firms have foreign ownership shares less than 20 percent—of these more than 20,000 are small, about 5,000 are medium size, and the rest are large. The majority of companies within each size group have no foreign owners. The mid-panel shows that the share owned by the largest owner most commonly is 100 percent. The lower panel shows, for Bavaria, the distribution of foreign and domestic minority ownership; i.e., when the ownership share of the largest owner is excluded and it appears that foreign minority owners typically hold very small stakes while the stakes of domestic minority owners are quite evenly distributed.

Regional Controls

We compute average firm size in a region as the sum of total assets divided by the number of firms. This variable partially controls for selection problems in AMADEUS where some countries are less likely to collect data for smaller firms. We proxy region size by the sum of total assets of the firms in that region and, as another control, use annual average population series from Eurostat. It is important to control for region size because volatility may be lower in large regions due to averaging over a larger number of firms.

3.3 Descriptive Statistics

Table 1 shows mean, standard deviation, min and max values of our variables both at the firm level as well as at the regional level. The statistics displayed are for filtered and winsorized data. Volatility has a mean of 0.34 with a standard deviation of 0.62 with a maximum of 4.79 and a minimum very close to 0. Foreign ownership is 1.26 percent on average with a standard deviation of about 11. Foreign minority ownership is typically small while domestic minority ownership is larger at 4.13 percent with a large standard error of about 14 percent. Average firm assets are about 3.7 million euros but the standard deviation of assets is very large and the (winsorized)

maximum is 43 million euros. Average assets of foreign owned firms are much larger, 32 million and maximum is 24 billion. Clearly foreign owned firms are larger firms in general. Firm age is 18 year on average with a large standard deviation and a maximum of 907.[24]

About 4 percent of all firms have some foreign ownership while 7 percent are exporters and 0.1 percent are listed. Exporters appear to have lower volatility on average, maybe due to diversified markets. Of firms with some foreign ownership, 27.1 percent are fully owned by foreigners while 18.6 percent are "subsidiaries;" i.e., firms with only one foreign owner. More than half of the firms with some foreign ownership have more than 50 percent foreign ownership.

Panel B displays region-level statistics. The time varying volatility measure, using AMADEUS data, has a mean of 2 percent with a standard deviation of 3 percent, a minimum near 0 and a maximum of 24 percent. Average volatility and its dispersion is lower when calculated from Eurostat regional GDP data. On average, in a region about 8 percent of companies' assets are majority-owned by foreigners, where we have one region having more than 50 percent of assets controlled by foreign majority owners. Asset-weighted foreign minority ownership is small on average while domestic minority ownership is 5 percent of assets in a region on average. The average amount of assets in a given region is about 26 billion euros. We also report statistics to gauge the importance of the foreign owned firms for regional volatility. These foreign-owned firms make up a significant share of regional economic activity as shown; 17 percent of the regional assets are owned by firms that have some foreign ownership in a typical region with the maximum being 73 percent for one region.

4 Empirical Analysis

We start by examining the relation between firm-level ownership patterns and firm-level volatility. We focus on the SD measure for cross-sectional regressions and the SD_t measure for the panel regressions. For firm-level outcomes, we use operating revenue and sales, and we briefly show results for employment for completeness. Sales are typically used to study volatility but we prefer operating revenue because sales are not available for firms in Denmark, Ireland, Norway, and the UK. Employment is less appropriate for our purposes since many European countries have labor

[24] We checked on some of the firms of very high age and while we cannot with certainly rule out typos, it appears that some European firms indeed are extremely old. The oldest firm is an Italian publishing house in Rome"A.T.S. ITALIA EDITRICE S.R.L." while the hotel "HOTEL PICHLMAYRGUT GMBH & CO KG" in Austria is incorporated in 1117 according to AMADEUS. The latter date corresponds to the date given on the cote of arms displayed at the hotel's WEB-page.

regulations aimed at limiting employment volatility.

4.1 Firm-Level Specifications and Results

We regress volatility of firm outcomes on indicators of foreign and domestic ownership and firm size and age. We include country (or region) and sector dummies implying that these regressions solely exploit firm-level variation. Our specification is in log-log form in order to limit the influence of firms with extremely high levels of volatility. The firm-level regression data are winsorized at the 99 percent level to remove large outliers.

Cross-Sectional Regressions

For the cross-sectional specifications, we estimate models using various samples for calculating volatility and foreign ownership. The majority of the results are presented for firm-level volatility measured over 2002–2006 and ownership variables measured in 2002. Our regressions use two basic specifications:

$$\log(VOL_{ijc}) = \mu_c + \mu_s + \alpha \log(1 + FO_{ijc}) + \mathbf{X}'_{ijc}\delta + \epsilon_{ijc}\,, \tag{3}$$

and

$$\log(VOL_{ijc}) = \mu_c + \mu_s + \alpha\, LOF_{ijc} + \beta \log(1 + FMO_{ijc}) + \gamma \log(1 + DMO_{ijc}) + \mathbf{X}'_{ijc}\delta + \epsilon_{ijc}\,, \tag{4}$$

where VOL_{ijc} is one of our cross-sectional volatility measures for firm i in region j in country c. μ_c is a country or region-specific constant and μ_s is a set of industry dummies that are based on the firm's primary industry code at the 2-digit NACE level.FO_{ijc} is percent foreign ownership, LOF_{ijc} is a dummy that takes the value 1 if the largest owner is foreign, FMO_{ijc} is percent foreign minority ownership, and DMO_{ijc} is domestic minority ownership. We take the logarithm of the ownership data to make the distribution less skewed—the number 1 is added because most firms have 0 foreign ownership. $\mathbf{X}'_{ijc}$ is a vector of controls.

Table 2 displays the results of Ordinary Least Squares (OLS) regressions of equation (3) in panel A and equation (4) in panel B, using the sample of "all firms." We display results in each panel using SD for all our outcomes—sales, operating revenue, and employment. In panel A, we find that foreign ownership has a positive and highly significant effect on volatility of all three firm-level outcomes, regardless of using country- or region-fixed effects. When we divide the foreign ownership into largest owner and minority owners in panel B, we find that firms for whom the

largest owner is foreign have significantly higher volatility of sales and operating revenue than firms for which the largest owner is domestic (with t-statistics of about 20). The estimated coefficient implies that foreign ownership is of economic importance: the coefficient of about 0.2 implies that firms whose largest owner is foreign has 20 percent higher volatility. Foreign minority ownership is associated with higher volatility while domestic ownership is associated with lower volatility. The coefficients to these regressors are also highly significant although the economic significance appears smaller with coefficients around 0.04 for foreign minority ownership and –0.02 for domestic minority ownership. A coefficient of 0.04 implies that an increase in foreign minority ownership of 50 percentage points will increase volatility by about 2 percent. Large firms (as measured by assets) are less volatile with strong statistical and economic significance. Finally, firm age is highly statistically significant, although the elasticity of –0.01 makes this variable less important in economic terms. While the results are very similar for sales and operating revenue, they differ quite a bit for employment. The foreign ownership variables are barely significant—the dummy is significant at the 5 percent level, which is not impressive given the sample sizes, and foreign minority ownership is insignificant. Domestic minority ownership has a negative effect of the size found for sales and operating revenue, with very large statistical significance. The elasticity for age is similar to the age elasticities of sales and operating revenue but the elasticity of employment volatility with respect to firm size is very large at about –0.20. Large firms clearly tends to avoid employment volatility. When we use region-fixed effects the effect of foreign ownership on employment volatility turns out to be insignificant.

The OLS results are driven by small firms because there are many more small than large firms; however, large firms may be more important for macroeconomic volatility. We perform Weighted Least Squares (WLS) regressions, weighting the observations by log-assets, but the WLS-results are very similar and we do not tabulate them.

Table 3 explores robustness to the choice of volatility measure and to the samples of firms used. We show results for operating revenue for which sample is largest—the results for sales are similar and therefore not displayed. The two left-most columns consider the volatility measures, CV or SD_t. The latter measure is constructed for use in panel-data regressions but we wish to ascertain beforehand that the change of measure in itself doesn't change the results. We find very similar coefficients for these volatility measures, with highly significant positive coefficients to foreign ownership and negative coefficients to domestic ownership.

Column (3) considers large firms—a sample closer to the samples used in many previous studies. The impact of foreign ownership on volatility is somewhat smaller for these firms as we get a

coefficient of about 0.11 to the foreign ownership dummy compared to an estimate of about 0.21 in Table 2. Nonetheless, the value is still large in economic terms and the t-statistic remains huge at about 10 even if the sample of large firms is much smaller at about 55,000. The coefficients to other variables for ownership and age are also about half the size found for the full sample while the coefficient to assets is much larger numerically at –0.16. The decline in volatility with size is even accelerating as the firms get larger.

One may worry that firms that enter or drop out of our sample are affecting the results so we alternatively select "permanent" firms. These are firms for which operating revenue is available in all years 2002–2006 with no missing values. The results, in column (4), are quite close to those found for all firms and do not warrant further comments. The same is true for permanent large firms in column (5) for which the results are quite similar to those of all large firms in column (3).

Our results so far are strongly in agreement with our assumption that foreign investors invest in more volatile firms and firms that are foreign owned are more willing to take risk than domestically owned firms. We do not have a set of firm-level instruments which deliver "smoking gun" evidence on causality but we proceed as follows in an attempt to advance on this issue.

Propensity Score Matching

Propensity score matching addresses a self-selection problem arising if firms' foreign-owned status is non-random. In particular, systematic correlations between foreign-ownership and other firm characteristics could lead to biased estimates. The matching procedure controls for this potential selection bias by creating an appropriate control group of domestic firms and repeating our regressions using this, smaller, matched sample. This is particularly relevant in our case as only a minority of firms have foreign owners. The matching proceeds as follows.

We match domestic firms with no foreign ownership to the set of firms with non-zero foreign ownership. The matching is done for the year 2002. The match is based on the estimated "propensity score," the logistic probability of having some foreign ownership. We allow the probabilities to depend on firm age, total assets, country- and industry-dummies at the 2-digit NACE level. The coefficients obtained from the logistic estimation reveals, not surprisingly, that firm size is the most important determinant of foreign ownership (with a t-statistic of 175), age is a negative predictor of foreign ownership (with a t-statistic of around 9), and certain countries and sectors are significantly more likely to attract foreign ownership.

Based on the estimated propensity scores we select the sample of firms with no foreign ownership

which best match the sample of firms with non-zero foreign ownership. We apply nearest neighbor propensity score matching without replacement, a procedure which matches each firm with foreign ownership to the firm without foreign ownership that have the closest propensity scores.[25] In Figure 11, we display the frequency distributions of estimated propensity scores for firms with non-zero foreign ownership, for the matched firms with no foreign ownership, and for the un-matched firms with no foreign ownership. The sample of matched firms with no foreign ownership displays a distribution of propensity scores which is very similar that of the firms with foreign ownership indicating that these are observationally similar. Average age and average size are very close in the matched samples.[26]

The results for the volatility regression using the matched sample, in Table 4, indicate that our findings are not spurious due to certain observable characteristics being different for foreign owned firms since matching results are very similar to those obtained using the full sample. The average effect of foreign ownership is estimated to be about 0.1—close to our un-matched estimates. We have 24,697 firms with foreign ownership in the matched sample resulting in matched sample of 49,294 firm.

"Granger Causality"

We explore the dynamic patterns in the data. We verified that our results are robust to further lagging of the ownership variables but since those results are very similar to those displayed we do not tabulate them. Table 5 asks the harder question, if volatility tends to *increase* more in firms that are foreign owned. We calculate yearly volatility for 2005–2006 and for 2003–2004 and use the change in volatility as the dependent variable which we regress on 2002 ownership. We display results for both the SD and CV measures and find that firms whose largest owner is foreign increase volatility by about 5 percent over a two-year period. This effect is estimated with statistical significance at the 10 percent level. The other regressors, except for firm age, are not significant (older firms are, somewhat surprisingly estimated to increase volatility more, although the size of this effect appears negligible in terms of economic relevance). These results are consistent with more diversified owners allowing firms to take more risk and hence suggest a causal effect from foreign ownership to volatility—although it should be kept in mind that such "Granger causality" regressions are not the final word on causality. It appears that although domestic investors a priori

[25] We use Stata's `psmatch2` command, ver 3.0.0 written by Leuven and Sianesi (2003).

[26] The mean of log-assets in the sample with foreign ownership is 15.29 and in the matched sample of firms with no foreign ownership is 15.33, compared to 13.69 in the sample of unmatched firms. Formally doing the balancing tests, we find that 42 out of 48 variables that we match on pass the test as 5 percent level.

prefers less volatile firms, once firms has obtained domestic diversification they are not averse to increasing volatility.

Robustness Regressions

We show a large number of robustness exercises in Appendix Tables A-1 and A-2. In the first column of Table A-1, we use average values of the independent variables over all years for which data are available for a given firm (including the smaller year 2000 sample). The results are quite similar to those of the first column of Table 2 except that the effect of size, which isn't our focus, is estimated to be smaller. In column (2), we regress volatility calculated for 2004–2006 on 2004 ownership which gives us a much larger sample of 1.3 million observations but with a more noisy volatility measure. The results are similar to those found earlier with the estimated coefficients slightly smaller (0.17 versus 0.21 for the foreign ownership dummy) but with similar statistical significance. Clearly, our cross-sectional results are highly robust to how the sample is chosen.

In columns 3–5 of Table A-1, we include average firm-level growth during 2002–2006. Growth is a potentially important variable as many models stress a trade-off between volatility and growth.[27] We find that growth is highly significant with a t-statistic of 120 and a magnitude of high economic importance consistent with a trade-off between high growth and high volatility of sales. The results are quite similar for operating revenue and employment. The coefficient to foreign ownership is virtually unchanged whether growth is included or not. Thus, we prefer to not include the endogenous growth variable in our main regressions.

Appendix Table A-2, using sales, reports a large number of sensitivity regressions. One might worry that trade is an omitted variable or the effect of foreign ownership differs among exporters and non-exporters. There might also be issues such as transfer pricing where multinational companies setting up exporter affiliates (which will show up as foreign owned firms) for the purpose of paying less taxes on imported inputs. Hence, we run our regressions for these two samples obtaining similar results. We also drop listed firms and subsidiaries to examine if our results are driven by these certain firms. We want to ascertain that our results are not driven by 100 percent foreign owned companies, because Alfaro and Charlton (2009) show that foreign subsidiaries often produce highly specialized inputs for their parents. These robustness exercises show that our results remain unaffected. We exclude government-owned firms since these firms might be in strategic industries.

[27] Arnold and Javorcik (2009) use propensity score matching combined with a difference-in-difference approach to establish that foreign ownership leads to significant productivity improvements in acquired plants. See also Chari, Chen, and Dominguez (2009).

We use a sample of limited liability companies since these companies are all required to file and hence we have minimum selection issues. We run our regressions on a sample of firm with non-zero foreign ownership. We split the sample into firms in countries with good and bad coverage. Finally we report a regression with only 9 Central and Eastern European countries to examine whether the effect of foreign ownership on volatility differs in a developing country context.

The results are amazingly robust to all of these sample adjustments. In the case of "foreign owned" which is a sample of firms with *some* foreign ownership, the coefficient to the foreign ownership dummy is smaller (although still strongly significant) while the coefficient to foreign minority ownership becomes close to zero.[28] This result is, however, not surprising as we remove a lot of the variation in foreign ownership across firms by dropping every single fully domestically owned firm. We repeat the analysis for operating revenue, but the results are similar and not reported.

Panel Regressions

For our panel regressions we use permanent firms only and run the specification:

$$\log(SD_{ijct}) = \mu_i + \mu_t + \mu_c \cdot \mu_t + \mu_s \cdot \mu_t + \alpha\, LOF_{ijct} + \beta \log(1+FMO_{ijct}) + \gamma\, \log(1+DMO_{ijct}) + \mathbf{X}'_{ijct}\delta + \epsilon_{ijct}\,, \tag{5}$$

where SD_{ijct} is the time-varying volatility measure for firm i in region j in country c at time t. μ_i is a firm-specific constant, μ_t is a time-fixed effect and $\mu_c \cdot \mu_t$ and $\mu_s \cdot \mu_t$ are country×year (or region×year) and industry×year fixed effects. The time-varying volatility measure allows us to track year-to-year changes in volatility and hence the purpose of these regressions is to examine if the results still hold when we include firm-fixed effects which control for firm-level unobserved heterogeneity. We also include country×year and industry×year dummies—if foreigns invest in countries/regions or sectors that they correctly anticipate will be volatile over the relevant years, the interacted dummies will absorb the impact of this. Of course, by including these effects we stack the cards against finding results because some sectors may become more volatile *because* they have gained in foreign diversification.

Table 6 shows the results. The first column in Table 6 includes year dummies but no other dummies and the results are similar to those of Table 2 with the exception of domestic cross-ownership which is now estimated to be positive—an estimate which reverses sign when we include

[28] Note that we have 40,000 firms with some foreign ownership on average, we have less in regressions since we drop financial firms.

dummy variables for country×year and industry×year. This may reflect that domestic investors prefer certain sectors. Overall, the first two columns establish that the results found in the cross-sectional regressions are quite robust to the change in measure and inclusion of country×year and industry×year fixed effects.

The focus of Table 6 is columns (3) and (4), where firm-specific fixed effects are included—these fixed effects remove permanent differences between firms and therefore remove most of the variation in the data. The results are then driven by changes over time and reveal if increasing foreign ownership goes hand-in-hand with increasing volatility. It does: the largest foreign owner dummy is significant at the 5 percent level with a positive sign although the coefficient is smaller than found in the cross-section. The economic effect is not that big but considering the limited time variation this coefficient is identified from, this result is about as strong as one could expect. Firm size remains significant indicating that volatility becomes smaller when assets grow.

The largest-owner-is-foreign dummy variable has limited time variation and we show results, in columns (4) and (5), using overall foreign ownership as our regressor of interest. This variable is significant at the 1 percent level for all firms. The estimated coefficient is an elasticity of 0.01 which is not large in economic terms but the point of the regression is to make the qualitative point that increasing foreign ownership and increasing volatility goes hand-in-hand, not just cross-sectionally but also for firms over time. A positive effect of foreign ownership on volatility in these regressions points to foreign diversification allowing for more risk taking, although these results do not rule out that foreigners invest based on expected future volatility growth. The impact of firm size is estimated to be negative for all firms.

In column (5), we include the number of domestic owners, which we interpret as a measure of ownership concentration. The results indicate a negative effect—as found in cross-section—for domestic diversification with a t-statistic that is significant at the 10 (near 5) percent level. For completeness, in columns (6) and (7), we include the concentration of foreign ownership as measured as the number of foreign owners. This variable is insignificant in column (6), but this is explained by the results in column (7) which includes both the foreign ownership share and the number of foreign owners. The former is now more significant than found in columns (4) and (5) and the latter is negatively significant. This pattern is consistent with foreign owned firms being more volatile. However, this partial effect gets weaker when the number of foreign owners are high for given total foreign ownership share. Possibly, this is due to foreign minority owners having a hard time being influential, maybe due to the cost of traveling abroad for meetings. These results suggest that indeed when a low number of foreign shareholders own a controlling stake, they might

have a bigger say in the production decision of the firm, inducing more risk-taking.

Overall, the results of Tables 5 and 6 are consistent with a direction of causality going from foreign ownership to volatility as one would expect given the strong cross-sectional results. To make stronger statements on causality, one needs instrumental variables.

4.2 Region-Level Specifications and Results

We now shift attention to region-level regressions with much lower degrees of freedom. We construct region-level deep financial integration measures by aggregating our firm-level ownership variables. These are noisy measures because we don't have all the firms in any given region and this will tend to attenuate significance in our regressions. In order to minimize this measurement error, we use only regions that have observations for 50 or more firms. As before, we restrict ourselves to permanent firms so changes in the ownership variable will not be due to some large firms switching in or out of the sample.

Median Volatility

We first ask if average foreign ownership affects median volatility, which we interpret as the typical level of volatility for a firm in a given region. We expect to find results similar to those at the firm level. We might find no significant result; for example, if variation in ownership is concentrated in a small section of the distribution which do not include the median firm. We estimate the relation between regional financial integration and median volatility using the specification:

$$\log(SD^{MED}_{jct}) = \mu_j + \mu_t + \mu_c \cdot \mu_t + \alpha \log(1 + FI)_{jct} + \mathbf{X}'_{jct}\delta + \epsilon_{jct}\,, \tag{6}$$

where SD^{MED}_{jct} is the median firm volatility in region j in country c, μ_j is a region-specific constant, and μ_t is a year-specific constant, and $\mu_c \cdot \mu_t$ are country×year dummies. In this regression, FI_j refer to the asset-weighted average percent foreign ownership in the region. We will also investigate the majority ownership based integration measure that is the asset weighted average of the largest owner foreign dummy, which has the interpretation of the share of assets in a region that belongs to firms whose largest owner is foreign. $\mathbf{X}'_{jt}$ is a vector of regional controls.

Table 7, panel A considers whether volatility of the median firm correlates with deep financial integration; that is, the average level of foreign ownership in the region.[29] The volatility of the

[29]Note that as regional size controls we have total number of firms, average firm size, and total assets and only two

median firm is of some interest in itself but one of our goals in this paper is to examine how aggregation affects the patterns of ownership and volatility across regions. The regression in Table 7 can be seen as a step towards this goal, as the ownership variable here is aggregated but the outcome variable is not—such a regression will not give significant results unless the aggregation of ownership shows variation across regions over time. There is a positive significant effect of financial integration on the volatility of the typical firm with significance at the 10 percent level for the operating revenue but not for sales. The coefficient is larger and significant for both outcomes when country×year dummies are included in the right-most two columns.

Panel B shows that the financial integration measure based on shares of largest foreign owners is important for median volatility with statistical significance levels between 1 and 5 percent when we include country×year effects, while the shares owned by minority owners and domestic owners are not robustly estimated.

Aggregate Volatility

The volatility of *aggregated* (by us) and *aggregate* (Eurostat) outcomes may or may not show the same patterns as median volatility. For example, if the majority of variation for the firm-level outcomes is distributed i.i.d. across firms and regions, aggregate volatility will be low and unlikely to co-vary with average foreign ownership. Figure 12 compares the volatility of our aggregated data and the Eurostat data. Both measures are high in 2001 and decline in 2002; the trend for both measures is downwards although Eurostat volatility has a peak in 2003 which is not found in the AMADEUS aggregate. The volatility of the Eurostat output data is the lowest, which is intuitive as this is the average over a much larger set of firms (including the government sector).

We estimate the effect of regional financial integration on aggregate volatility using a specification similar to the one used for median volatility:

$$\log(SD^{AGG}_{jct}) = \mu_j + \mu_t + \mu_c \cdot \mu_t + \alpha \log(1 + FI)_{jct} + \mathbf{X}'_{jct}\delta + \epsilon_{jct}\,, \tag{7}$$

where SD^{AGG}_{jct} is the time-varying standard deviation of aggregated firm outcome growth, (i.e., the sum of, say, firm-level operating revenue, in 2005 constant prices) or the time-varying standard deviation of Eurostat output. As before, μ_j is a region-specific constant, μ_t is a year-specific constant, and $\mu_c \cdot \mu_t$ is a country×time dummy. FI is the asset-weighted average of the total foreign ownership (or majority foreign ownership). $\mathbf{X}'_{jct}$ is the vector of controls.

of these variables are linearly independent. We choose to include the latter two in our regressions.

The left-most four columns of Table 8 display results for the volatility of AMADEUS aggregated outcomes while the right-most two columns display results for the volatility of regional GDP from Eurostat. Using asset-weighted foreign ownership for financial integration we find a coefficient of around 0.7 (0.635–0.862) with significance at 5 percent (1 percent for operating revenue when country×year dummies are included).

The variation in region-level financial integration, which is a weighted average of foreign ownership, is obviously smaller than the variation in firm-level foreign ownership so we evaluate the economic significance of the coefficient by comparing the implied variation in volatility when financial integration moves from the 10th percentile to the 90th percentile, evaluated after controlling for other regressors, in particular the dummy variables, to the actual variation in volatility.[30] We find that the 90-10 range of integration (after controlling for other regressors) explains 12 percent of the 90-10 percent range in the (raw) volatility data. The result for Eurostat volatility is similar with a coefficient of 0.603 without the country×year dummies and 0.573 with. The statistical significance is at the 1 percent and 10 percent level, respectively, and the economic significance is that, for the last column, the 90-10 range of financial integration (after controlling for other regressors) explains 8 percent of the 90-10 range of volatility. The similarity of the Eurostat results to the results using the AMADEUS aggregate is extremely reassuring because the Eurostat data contain the output of all establishments in a region while AMADEUS is a sample of firms. The main drawback of our aggregation is that there are not a lot of firms in many regions and a few outliers can therefore easily distort the results. Another issue is that the location of a firm's headquarters may not indicate where most of the firm's output is produced. The similarity of the two sets of results indicates strongly that our results are not spuriously driven by these issues. In the case of Eurostat volatility, we, with high significance, find lower volatility in large populous regions, likely due to averaging over a larger number of firms.

4.3 Endogeneity

It is important to know whether there is a causal effect of financial integration on volatility. We attack this issue using a policy experiment, namely the Financial Services Action Plan (FSAP) of the EU. The FSAP was a major policy initiative aimed at removing regulatory and legislative

[30] If X_{90} and X_{10} denote the 90th and 10th percentile of the residual of $\log(1+FI)$, respectively, m is mean log-volatility, and the regression coefficient is α, we consider the predicted variation to be $\exp(m+\alpha*X_{90})-\exp(m+\alpha*X_{10})$. The variation need to be evaluated around the mean of log-volatility because the exponential function is highly non-linear.

barriers in the financial sector. To achieve this goal, the FSAP was launched at the end of 1998 and introduced a host of legislative-regulatory harmonization policies. The plan included 27 Directives which are legal acts that do not become immediately enforceable in member countries which are given time to adopt, modify, and eventually transpose the Directives into domestic law. This transposition may take many years as some countries delay adaptation for various reasons.

We use this time variation in the number of directives adapted to instrument our financial integration measure—different directives are adopted at different times by different member countries. In order to obtain regional variation within countries, we interact the FSAP directives with regional indicators of social capital, which we proxy with trust. We argue that country-level financial harmonization policies effect regions differently depending on their distribution of trust. This instrumental variable strategy is appealing because one can link policy changes in financial sector with outcomes in the same industry. Our assumption is that the effect of these country-wide policies on regional integration depends on the extent of the regional trust. The trust data come from the European Social Survey and has been shown by Guiso, Sapienza, and Zingales (2004, 2006, 2009) to predict many financial decisions.[31]

Our instrument is the interaction of the level of regional trust with the index of financial harmonization. Specifically, we use 3 different indictors of trust and 10 directives out of 27 that are related to easing restrictions on foreign ownership.[32] Our index of financial harmonization will be a sum of indicator variables where each indicator will be one in the year the particular directive is adapted and after. The 3 indicators for regional trust are "trust in other people," "general level of trust," and "trust in institutions.[33]" We use each of the trust variables interacted with the index of financial harmonization as instruments.

We first show results from a reduced form regression. We regress the standard deviation of GDP per capita from Eurostat on our instrument. The reduced form estimates are proportional to the causal effect of interest. We find a strong positive effect of our instrument regardless of the trust variable used, see Table 9. The estimated coefficients to the instrument are significant at the 5-10 percent level. It is highly reassuring that the estimated effect is very robust to which trust measure is used. The reduced form coefficient to the instrument in the first column, to pick one, implies that the 90-10 range of the instrument (after controlling for other regressors) explains

[31]The European Social Survey were designed to enable cross-national, cross-cultural comparisons of values and norms on a wide variety of topics and to monitor changes in values and attitudes across the globe. We take the average of individual responses for each region.

[32]We exclude the directives that relate to banking integration. See Appendix B for details.

[33]See Appendix B for the exact questions.

15 percent of the 90-10 range in the raw volatility data. The results are consistent with the OLS findings and say that financial laws interacted with social capital, which can be interpreted more of a structural measure of financial integration, having a statistical and economically significant effect on volatility.

Next, we proceed with 2SLS estimation. The bottom panel of Table 10 displays the first-stage regression results. For either of the trust measures, the instrument predicts an increase in deep financial integration across regions with high levels of significance at better than 1 percent. The effect is also economically significant. A one-standard-deviation change in the instrument (corresponding to 3 laws implemented in a region with average trust) will imply an increase in regional financial integration of about 35 percent.[34] The F-test for the exogenous instrument is about 10 and satisfies the rule-of-thumb for instruments not being weak suggested by Stock and Yogo (2002). Overall, the first-stage results are quite convincing. Figure 13 shows a strong first-stage fit when we plot financial integration against our instrument.

Financial integration is statistically significant in all the second-stage regressions with confidence levels around 10 percent. Given that we have large number of dummy variables and limited time variation, we find these results convincing—especially because of the robustness to measure of trust is used. The estimated coefficients are large: between 1.97 and 2.44. Considering the 90-10 range of instrumented financial integration after controlling for other regressors we find, picking the first column, that the estimated coefficient of 2.44 implies that financial integration explains a large share, 34 percent, of the 90-10 range of raw volatility. The fact that the IV results are larger than OLS results suggests that the OLS results are biased downwards. This is the direction of bias one should have expected given the possibility of classical measurement error in our regional financial integration measure.

The validity of our results rests on the exclusion restriction that the instruments do not affect volatility directly but only through the effect of regional financial integration which is proxied by the average level of foreign ownership. This restriction is plausible for two reasons: First, we use the directives that relate specifically to increasing foreign ownership. Second, the dummy for adoption of a directive turns on at the same time for all regions in a country, independently of volatility or other characteristics of regions.

[34]The standard deviation is about 1.5 and average trust is about 0.5. Multiplying 1.5 with a coefficient of around 0.7 results in a value of $\log(1 + FI)$ about 1 which corresponds to a value of FI of about 1.6, corresponding to 35 percent of the mean value of FI.

4.4 Reconciling the Results with the Macro Literature

Going back to Figure 1, our firm- and region-level results might be different from country-level regressions for three reasons: First, the effect of financial integration on volatility might be different for developed and developing countries and so far we have used a set of developed countries. Table 11 tackles this issue by repeating our estimation for the entire sample of the 25 EU countries, including emerging economies, but the results are very similar to those of Table 2. This is also consistent with the previously shown robustness result in Table A-2, where we did our regression only for 9 developing CEE countries.

Second, our measure of financial integration (which is a weighted average of firm-level foreign ownership) might capture a different aspect of financial integration than the standard country-level measures used in Figure 1. Our measure is based on FDI and portfolio equity holdings and does not include any debt liabilities. However, our measure is highly correlated with various standard country-level measures of financial integration as shown in Table 12. The cross-country correlations in panel A are 0.80 for both equity and total liabilities and the time-series correlations, displayed for 8 random countries, are very high for most countries, especially considering the fact that the Lane and Milesi-Ferretti measures are constructed in a quite different manner. In particular, the large valuation movements in equity over the last two decades creates large variation in country level asset-liability shares of GDP while our ownership shares do not, everything else equal, vary with valuation.

The third reason why our results might differ from the literature is classic identification problems in country-level studies. At the aggregate level integration and volatility are determined simultaneously and both are affected by country-level omitted factors such as policy shocks. Industry-level shocks and global factors may also contribute to spurious results at the country level. We can deal explicitly with these type of identification problems in this paper. We therefore believe our results show a more robust and well-identified effect of financial integration on volatility.

5 Conclusion

We uncovered a strong, highly significant, positive association between firm-level volatility and foreign ownership. A firm whose largest owner is foreign is 20 percent more volatile. The positive association between foreign ownership and volatility carries over to the regional level where our results imply that financial integration can explain up to 15 percent of the variation in aggregate

volatility.

Our results hold in both static and dynamic regressions with firm- and region-fixed effects. We demonstrate that our results are, at the least, strongly consistent with a causal effect from foreign ownership to volatility using different identification techniques such as propensity score matching, dynamic patterns, and instrumental variables regressions. We argue that country-level studies deliver ambiguous results due to omitted variables such as country- and industry-level shocks, which we can control for.

Our instrumental variables regressions exploit variation from a policy experiment, the Financial Services Action Plan (FSAP) of the EU. The instrument is constructed by interacting the regional distribution of social capital (measured as trust) with an index of financial harmonization, which is derived from the transposition dates of the FSAP to country-level laws. Using this instrument, we find quite strong support for a causal effect of deep financial integration on volatility—our IV estimates imply that variation in financial integration can explain 30 percent of the variation in aggregate volatility.

Our results further suggest that some foreign investors purchase small stakes in domestic companies for the purpose of diversification. Because such investors are diversified they are relatively more willing to purchase shares of high-volatility firms. We sketch a simple mean-variance model of foreign diversification in Appendix A with two otherwise symmetric countries with different volatilities of aggregate output. However, a large share of foreign investment are due to investors—often other firms—taking majority stakes in domestic companies. Because majority owners control production, our results suggest that the causal effect of foreign ownership on volatility to a large extent is due to foreign controlling majority owners being willing to engage in more risky production.

Our results should not be interpreted as implying that financial integration is not a desired outcome because of the high volatility associated with it. Our findings have the interpretation that high volatility results from investments in high return-high variance projects which are likely to increase growth. If financial integration has enhancing effects on economic growth then volatility can be seen as a side-effect. This is especially because regardless of the effects on output volatility, theory suggests that financial integration should reduce consumption volatility relative to output volatility because capital income, and possibly wage income, gets smoothed via diversification. A promising area for future research is to examine this question using combined micro and macro data.

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Appendix A: A Model of International Diversification

We present a stylized static model. For simplicity, we consider a two country framework where the two countries are symmetric, except for different volatilities of output. The notation for the foreign country is similar to that of the domestic country, except the variables are labeled with a "*." Assume that each of the two countries has two types of investors: small investors (households) has an amount S^i available for financial investment while large (institutional) investors has an amount S^I. Investors can chose to invest in a safe asset with gross return R and in two types of "representative" firms with exogenous output ("fruit on trees"). One type of firm has low variance of output (and thus dividends) while the other type has high variance. We assume there is one unit of equity available to investors ("one tree") for each type of firm.

We assume each representative low (high) variance firm has output Y_L (Y_H) normalized to have mean 1. The variance of low volatility output is $(\sigma_L^Y)^2$ while that of high volatility output is $(\sigma_H^Y)^2$. Output is sold to investors and the price of one unit of low (high) variance output is $1/\mu_L$ ($1/\mu_H$). With our normalization this is also the market value of each type of production ("tree"). The expected gross returns to investing in, say, low volatility output, is then μ_L while the standard deviation of the return from investing in one unit of output is

$$\sigma_L = \sigma_L^Y/\mu_L \ , \tag{8}$$

and

$$\sigma_H = \sigma_H^Y/\mu_H \ . \tag{9}$$

Next, we assume a simple structure for dividends. This is equivalent to making assumptions on the exogenous output, but simplifies notation. We then postulate a mean variance trade-off for investors and solve for both home and foreign investors' demands for different types of output. Investors take the mean returns from investing in home and foreign high- and low-volatility output as given. Finally, we use the market clearing conditions to determine the mean returns and solve for the general equilibrium.

We denote the gross dividends from investing in the low variance firm by X_L ($= Y_L/\mu_L$) and dividends from investing in high variance firms with X_H ($= Y_H/\mu_H$). We assume that firm shocks are composed of an aggregate shock ϵ and a idiosyncratic firm shock ϵ_L (ϵ_H) that is specific to low

(and high) variance firms. The shocks are best thought of as productivity shocks.[35] Given these assumptions, we can write the dividends as;

$$X_L = \mu_L + \gamma_L \times \epsilon + \epsilon_L \ ,$$

and

$$X_H = \mu_H + \gamma_H \times \epsilon + \epsilon_H \ .$$

The country-wide shock ϵ affects all firms but the effect differs between low and high variance firms due to the respective γ parameters. All shocks are identically independently distributed (i.i.d.) across firms with the following mean and variances: $\epsilon \sim (0, \sigma^2)$; $\epsilon_L \sim (0, \sigma_L^2)$; $\epsilon_H \sim (0, \sigma_H^2)$. The i.i.d. assumption implies: $cov(\epsilon, \epsilon_L) = 0$; $cov(\epsilon, \epsilon_H) = 0$; $cov(\epsilon_L, \epsilon_H) = 0$. We assume shocks in the foreign country have a similar structure and all foreign shocks are independent of domestic shocks.

There is a fixed cost κ of investing abroad such that small investors will only invest domestically. A small home investor can invest a share λ_L^i in domestic low variance firms and a share λ_H^i in high variance firms while large home investors can invest a share λ_L^I in domestic low variance firms, a share λ_H^I in high variance firms, and a share λ_{HF}^I in foreign high variance firms. Companies do not have access to low variance technology in the foreign country. We assume this is due to frictions in information or communication.[36]

A small investor maximizes his or her utility, U_i, from investing a given amount of savings. We assume that the utility for each dollar invested can be couched in terms of mean and variance consistent with approximating utility with a quadratic utility function, and the optimal investment shares being independent of the total amount invested. This approximation is reasonable as we only model the allocation of given savings (since we do not observe savers a more ambitious approach would serve little purpose for us).

Thus the small investor maximizes (with respect to λ_L^i and λ_H^i):

$$U^i = (1 - \lambda_L^i - \lambda_H^i)R + \lambda_L^i \times \mu_L + \lambda_H^i \times \mu_H - \text{Var}(\ \epsilon + \lambda_L^i(\gamma_L \times \epsilon + \epsilon_L) + \lambda_H^i(\gamma_H \times \epsilon + \epsilon_H)) \ ,$$

where R is the gross safe world rate of return. We assume the country-wide shock ϵ enters the utility function directly, in addition to its effect on production. We refer to this as "background

[35] Note that aggregate shocks can also be thought of country or industry specific.
[36] See Iacoviello and Minetti (2008).

noise" (this may enter the decision problem, for example, because country-wide shocks also affect wage income of the domestic investor).

A large investor can invest also in foreign firms and hence maximizes

$$\begin{aligned} U^I &= (1-\lambda_L^I-\lambda_H^I-\lambda_{HF}^I)R+\lambda_L^I\times\mu_L+\lambda_H^I\times\mu_H+\lambda_{HF}^I\times\mu_H^* \\ &- \operatorname{var}(\epsilon+\lambda_L^I(\gamma_L\times\epsilon+\epsilon_L)+\lambda_H^I(\gamma_H\times\epsilon+\epsilon_H)+\lambda_{HF}^I(\gamma_H^*\times\epsilon^*+\epsilon_H^*)) \ . \end{aligned} \tag{10}$$

Using the abbreviation V^i for the variance of the portfolio of small savers, we find:

$$\begin{aligned} V^i &= \operatorname{Var}(\epsilon+\lambda_L^i(\gamma_L\times\epsilon+\epsilon_L)+\lambda_H^i(\gamma_H\times\epsilon+\epsilon_H)) \\ &= \sigma^2(1+\gamma_L\times\lambda_L^i+\gamma_H\times\lambda_H^i)^2+\sigma_L^2(\lambda_L^i)^2+\sigma_H^2(\lambda_H^i)^2 \ . \end{aligned}$$

Taking the first order condition for optimum wrt. λ_L^i, we find

$$\lambda_L^i=\frac{(\mu_L-R)/2-\gamma_L(1+\gamma_H\times\lambda_H^i)\times\sigma^2}{\sigma^2\times\gamma_L^2+\sigma_L^2} \tag{11}$$

and by symmetry

$$\lambda_H^i=\frac{(\mu_H-R)/2-\gamma_H(1+\gamma_L\times\lambda_L^i)\times\sigma^2}{\sigma^2\times\gamma_H^2+\sigma_H^2} \ . \tag{12}$$

We have

$$V^I=\operatorname{var}\left[\epsilon+\lambda_L^I(\gamma_L\times\epsilon+\epsilon_L)+\lambda_H^I(\gamma_H\times\epsilon+\epsilon_H)+\lambda_{HF}^I(\gamma_H^*\times\epsilon^*+\epsilon_H^*)\right]$$

so

$$V^I=\sigma^2\left\{(1+\gamma_L\times\lambda_L^I+\gamma_H\times\lambda_H^I)^2\right\}+\sigma^{*2}(\gamma_H^*)^2(\lambda_{HF}^I)^2+\sigma_L^2\left(\lambda_L^I\right)^2+\sigma_H^2\left(\lambda_H^I\right)^2+\sigma_H^{*2}(\lambda_{HF}^I)^2$$

The derivative of V^I wrt. λ_L^I and λ_H^I are similar to those found earlier, so

$$\lambda_L^I=\frac{(\mu_L-R)/2-\gamma_L(1+\gamma_H\times\lambda_H^I)\times\sigma^2}{\sigma^2\times\gamma_L^2+\sigma_L^2} \ , \tag{13}$$

and

$$\lambda_H^I=\frac{(\mu_H-R)/2-\gamma_H(1+\gamma_L\times\lambda_L^I)\times\sigma^2}{\sigma^2\times\gamma_H^2+\sigma_H^2} \ . \tag{14}$$

The share invested abroad is

$$\lambda^I_{HF} = \frac{\mu^*_H - R}{2 \times (\sigma^{*2} \times \gamma^{*2}_H + \sigma^{*2}_H)} \tag{15}$$

The market clearing conditions for low and high-variance output, respectively, are:

$$S^i \lambda^i_L + S^I \lambda^I_L = 1/\mu_L \ , \tag{16}$$

and

$$S^i \lambda^i_H + S^I \lambda^I_H + S^{*I} \lambda^{*I}_{HF} = 1/\mu_H \ , \tag{17}$$

where S^{*I} denotes the savings of large foreign investors, and λ^{*I}_{HF} denotes the investments share of these investors in the home economy.

The nine equations, together with the equivalent equations for the foreign country, (two resource constraints, five equations for investment shares, and the relations between means and variances) form a set of non-linear equations which can be solved for mean returns and investment shares.

We numerically solved the model with the following values:

Exogenous values for model simulation

	S^i	S^I	σ	σ^Y_L	σ^Y_H	γ_L	γ_H	R
Home	10	10	0.3	0.2	0.3	0.05	0.1	1.05
Foreign	10	10	0.1	0.2	0.3	0.05	0.1	1.05

which yields the solutionss:

	μ_L	μ_H	λ^i_L	λ^i_H	λ^I_L	λ^I_H	λ^I_{HF}
Home	1.064	1.069	0.047	0.0002	0.047	0.0002	0.039
Foreign	1.055	1.057	0.047	0.028	0.047	0.028	0.093

Notes: Variances are not displayed as they are trivially determined from equations (8) and (9).

We do not observe mean returns and risk premiums in our data but for our choice of exogenous variables, the solutions for the risk premium $\mu - R$ are reasonable (i.e., positive, higher for high

volatility output than for low volatility output, and higher in the home country with higher aggregate "background" volatility).

Our simple model sketch is designed to interpret patterns of foreign investment and implies by design that domestic small investors only invest in domestic firms given the fixed cost of investing abroad. The model implies that domestic investment in high volatility firms is small (shares of 0.0002 for both small and large investors) relative to own-country investment in high volatility firms in the foreign economy (shares of 0.028) with lower background noise. The more interesting implication of the model is the clear difference between domestic investment abroad and foreign investment in the home economy. Large investors abroad behave similarly to large domestic investors, but the high domestic background noise makes foreign investment in the domestic economy much larger. This shows that our simple framework captures the positive correlation between regional volatility and foreign investment, although our static framework cannot model the dynamic patterns found in our data.

In reality, and outside of our model, entrepreneurs who create firms will typically need to hold some equity in the firm—whether it is of high- or low-variance type.[37] In our regressions, we include a dummy that is unity if the largest owner is foreign and the left-out dummy, which is captured by the constants, is then the largest domestic owner. We implicitly interpret the constant as capturing domestic entrepreneurs. A reasonable assumption, we believe, is that domestic entrepreneurs typically are individuals who happen on a business idea, independently of whether this leads to high or low variance output. By contrast, domestic minority investors seek out low-variance investments and, therefore, domestic minority ownership will have a negative coefficient. The model deliver the solution that high-volatility firms are partly owned by foreign investors although the foreigners' choice between being minority owner or largest owner is not modeled. (Our empirical analysis reveals that foreigners most often prefer to be the largest owner for reasons such as information or control.)

[37]This is due to moral hazard. A standard reference is Holmstrom and Tirole (1997).

Appendix B: Data

Sample Selection

AMADEUS is a database of firm-level information such as sales, employment, and assets for 41 countries with varying coverage. The database totals over 15 million public and private companies of large, medium, and small size with listed companies comprising only a small fraction of about 10 thousand companies.[38] A company which has subsidiaries is required to prepare consolidated accounts; however, we use only *unconsolidated* accounts to avoid double counting.[39]

We focus on 16 countries with 9.9 million unique firms, of which many have missing outcomes and/or assets. Once we require firms to have at least 1 year of assets and 1 year of an outcome—either sales, operating revenue, or employment, we have 4.7 million firms. From this sample we drop all financial firms, firms that in any year have assets less than 1,000 euros, employment negative, zero, or larger than 2 million, negative sales, or negative operating revenue. We drop firms that do not have ownership information and firms below the 0.1th percentile and above the 99.9th percentile in the distribution of sales to assets, operating revenue to assets, and employment to assets in any year. For the ratio of revenue to sales we drop firms above the 95th percentile in order to eliminate firms with high financial income. Although we drop all financial firms, many companies that are not financial but have significant investment income. An extreme example is Warren Buffett's Berkshire Hathaway, even that started as a textile firm and then became only an investment company over time. We also eliminate firms with sales larger than operating revenue. Overall, these filters allow us to get rid of phantom firms, tax-fronts, etc. In addition, we drop firms where growth of sales, operating revenue, or employment is more than 100 percent for larger companies (100 employees), more than 300 percent for medium-sized companies (20-100 employees), and more than 500 (1000)

[38] While collecting firm-level data, BvD takes advantage of legal requirements for European companies to file their accounts at official government registries. The data are then organized in a standardized format.

[39] Even though the number of consolidated accounts is less than 1 percent of all accounts, it is important to use just the unconsolidated accounts. AMADEUS categorizes all companies as subsidiaries regardless of the percentage of ownership: In standard accounting, a company A will be classified as a subsidiary of a company B if company B owns more than 50 percent of company A, while in AMADEUS company A will be called a subsidiary even company B owns a 1 percent stake. There can be direct subsidiaries and also indirect subsidiaries owned by the direct subsidiaries. For example, BMW has 186 recorded subsidiaries, 54 of which are outside Europe (like BMW United States) and hence not in our data set. 77 out of the remaining 132 are direct subsidiaries owned more than 50 percent by the parent company. The remaining 55 companies are subsidiaries of these 77 companies. Another example is LEGO, that has 38 subsidiaries where only 3 of these are directly owned while the rest are subsidiaries of these 3. By using unconsolidated accounts outcomes do not include the outcome of parents and subsidiaries. By looking at the consolidated accounts of the 3 direct subsidiaries, we verified that the sum of sales and employment of the indirect subsidiaries is less than the numbers reported in the consolidated accounts of the 3 direct subsidiaries. (It will not be an exact match since we do not have data for subsidiaries outside Europe).

percent for smaller companies with 11-20 (0-10) employees. If employment is missing we drop firms with growth rates over 2000 percent.

Firms that acquire other companies may experience "spurious" increases in assets, sales, and employees. For example, if two firms with 100 employees merge to a firm with 200 employees which continue to operate as one of the original firms this will appear as a growth rate of 100 percent for the continuing firm and –100 percent for the acquired firm. However, there might have been no change in employment of the combined firm. We use the global ZEPHYR database from the BvD which contains "deal records;" i.e., in each M&A, the target, the acquiring party or parties, the dates when the deal was announced and completed, and the type of the deal (e.g., Acquisition, Acquisition of 15%, Merger, Joint Venture, etc.). The ZEPHYR data can easily be matched with our data because a BvD company identifier is included in both databases. We eliminate acquirer firms which may have spurious growth following an acquisition. After this selection process we end up with a sample of a little over 1 million unique firms.

To give an example how each step eliminates firms consider 2006 in which we have 3 million firms with at least 1 year of assets and outcome. Out of these, 100,000 do not report ownership information and 500,000 firms have assets less than 1000 euros. 100,000 are financial firms and 1 million has faulty records such as no, or negative, employment. Another 100,000 firms are dropped due to our procedures explained above that filters out firms in the tails, etc., which brings us to 1.2 million firms.

One might worry about selection issues where firms that report ownership information are unrepresentative. Figure 14 shows the distribution of assets for all available firms in 2006, and for firms that report ownership information and for the non-reporting firms. The distribution of assets is very similar across these groups indicating that the firms which report ownership are similar to the sample as a whole.

Our firms represent a wide range of industries. We drop firms in certain industries for robustness checks as detailed in the paper. The classification of 2 digit NACE industries are as follows:

Code	Name of the Level 2 NACE sector
AA	Agriculture, hunting, and forestry
BA	Fishing
CA	Mining and quarrying of energy producing materials
CB	Mining and quarrying, except of energy producing materials
DA	Manufacturing of food products, beverages, and tobacco
DB	Manufacturing of textile products
DC	Manufacturing of leather products
DD	Manufacturing of wood products
DE	Manufacturing of pulp, paper products, publishing and printing
DF	Manufacturing of coke, refined petroleum products, and nuclear fuel
DG	Manufacturing of chemical products
DH	Manufacturing of rubber and plastic products
DI	Manufacturing of other non-metallic mineral products
DJ	Manufacturing of basic metals and fabricated metal products
DK	Manufacturing of machinery and equipment n.e.c.
DL	Manufacturing of electrical and optical equipment;
DM	Manufacturing of transport equipment
DN	Manufacturing n.e.c.
EA	Electricity, gas and water
FA	Construction
GA	Wholesale and retail trade; repair
HA	Hotels and restaurants
IA	Transport, storage, and communication
JA	Financial intermediation
KA	Real estate, renting, and business activities
LA	Public administration and defence, compulsory social security
MA	Education
NA	Health and social work
OA	Other community, social and personal service activities
PA	Activities of households
QA	Extra-territorial organizations and bodies (such as UN, EC, etc)

What does Foreign Ownership capture and why does it change over time?

As explained in the data section, we construct foreign ownership *FO* using the information from the AMADEUS Ownership database. We verified that this database completely includes the information in the ZEPHYR database of Mergers and Acquisitions and adds to this since foreign ownership can change over time due to other reasons then M&As.

Let us consider some examples. Example 1 is the French steel company ***Usinor SA*** which is now part of the world's largest steel company *ArcelorMittal*. Based on the information from the AMADEUS Ownership database the FO for the Usinor SA was 2.9 percent in 2000, 97.58 percent in 2002, and 100 percent in 2006 and 2008. In 2000, *FO* consists of two identified non-French owners (*Lucchini International SA* and *Gruppo Lucchini*, both Italian) and the company had a significant stake owned by "public" (>70 percent), which we assume consists of French small investors. In 2002 the company has just two owner records: *Arcelor SA* (Luxembourg) with 97.58 percent and "public" with 2 percent. In 2006 the company changes the name to *Arcelor France* and the single owner is *Arcelor SA* (Luxembourg) with a 100 percent stake. In 2008 the company changes the name to *ArcelorMittal France* with the same owner and stake. The BvD ID of the company remains unchanged in all 4 Ownership vintages despite the name changes.

Using this BvD ID for *Usinor SA*, we can locate the records for this company in ZEPHYR we find a single record where *Usinor SA* was involved in the deal "Acquisition 97.58 percent" by the *Arcelor SA* of Luxembourg, announced on 12/12/2001 and completed on 14/03/2002.

Example 2 is the French lawn care company ***Top Green SAS*** (www.topgreen.com). Based on the information in the AMADEUS Ownership database FO for the *Top Green SAS* was 50 percent in 2004, 67 percent in 2006, and 66 percent in 2008. From 2004 to 2008, *FO* consists of one identified non-French owner *DLF Trifolium A/S* of Denmark which holds stakes in the French company. The only other owner is the French firm *Vilmorin Clause et Compagnie*.

Using the BvD ID for *Top Green SAS* we locate the records for this company in ZEPHYR and obtain a single record where *Top Green SAS* was involved in the deal "Acquisition increased from 50 percent to 67 percent" by *DLF Trifolium A/S* which was announced on 19/09/2006. As a result, the stake of *DLF* in *Top Green SAS* went up from 50 percent to 67 percent between 2004 and 2006. The 1 percent sale by *DLF* between 2006 and 2008 is not found in ZEPHYR.

Example 3 is the French software firm ***PTV Online*** (www.ptv-vision.fr). Based on information in the AMADEUS Ownership database FO for *PTV Online* was 40 percent in 2004 and 100 percent

in 2006. In 2004, *FO* consists of one identified non-French owner *PTV Planung Transport Verkehr AG (PTV AG)* of Germany, owning 40 percent. The additional two owners of the company in 2004 are the French company *01Direct* with 40 percent and an individual, Mr. Stern, with 20 percent.

Using the BvD ID for *PTV Online* we locate the records for this company in ZEPHYR and obtain a single record where *PTV Online* was involved in the deal "Acquisition increased from 40 percent to 100 percent" by *PTV AG* which was announced and completed on 12/9/2005. *PTV AG* is a global company with the head office is located in Karlsruhe which specializes in traffic and logistics software, and transport consulting and has branches in 11 countries.

The examples demonstrate that ownership information in ZEPHYR is clearly reflected in our FO variable, but there is some additional information in the AMADEUS Ownership database which ZEPHYR misses. The following examples show companies that had changes in FO based on the Ownership database but which do not appear in ZEPHYR.

The French defense company ***NHIndustries SAS*** (NHI) is, according to the company website, the prime contractor for design and development, industrialization, production and logistic support of the naval/tactical helicopter NH90 used by the armed forces of several European NATO countries. Based on information in the AMADEUS Ownership database FO for *NHI* was 37 percent in 2002, 68 percent in 2004, 68.01 percent in 2006, and 68.51 percent in 2008. In 2002, *FO* consists of two identified non-French owners: *Agusta Westland* (Italy) with 32 percent and *Stork Fokker Aerospace NV* (The Netherlands) with 5 percent. The other owner of the company is the French company *Eurocopter France* with 32 percent. In 2004 FO becomes 68 percent due to the divestment of *Eurocopter France* in favor of the German company *Eurocopter Deutschland GmbH*. In 2006 an Italian firm *Finmeccanica - Societa' Per Azioni* appears as a new owner with a small stake and in 2008 the stake of *Stork NV* increases to 6 percent.

The French fashion and perfume company ***Parfums Nina Ricci SA*** (www.ninaricci.com) has operated since 1932 and is a private company. Based on information in the AMADEUS Ownership database FO for *Nina Ricci SA* was 50 percent in 2000 and 2002, 51 percent in 2004, and 0 percent in 2006 and 2008. In 2000–2004 the company was 50 percent owned by *Jorba BV* of the Netherlands and a Spanish company Antonio Puig SA appears to hold a minority stake of around 1 percent in 2004. The domestic owners are *Paco Rabanne Parfums* with 36 percent and *Puig France* and *Puig International SA* with 5 percent each. From 2006 on the only owner of the company is the French *Puig France* with a 100 percent stake. According to the company website, *Parfums Nina Ricci SA* now operates as a subsidiary of *Puig Prestige Beaute* (France).

Constructing the Instrument

The Financial Harmonization Directives Index is the sum of individual financial directive dummies. Directive dummies take the value of 1 if a Directive has been implemented in given year in given country; 0 otherwise. The Directives that we use are as follows:

1998/26/EC	Implementation of the Settlement Finality Directive
2001/86/EC	Directive supplementing the Statute for a European Company with regard to the involvement of employees
2002/13/EC	Directive amending the solvency margin requirements in the insurance directives
2003/48/EC	Directive on the taxation of savings income in the form of interest payments
2002/83/EC	Directive amending the solvency margin requirements in the insurance directives
2003/41/EC	Directive on the prudential supervision of pension funds
2003/71/EC	Directive on prospectuses
2004/25/EC	Directive on Take Over Bids
2006/48/EC	Directive relating to the taking up and pursuit of the business of credit institutions
2006/49/EC	Directive on the capital adequacy of investment firms and credit institutions

The regional trust variables are as follows: "Trust in Other People" varies from 0 to 10 and is the answer on an increasing scale to the question "Most people can be trusted"; "General Level of Trust" takes values 0–10 and averages answers on an increasing scale to the questions "Most people can be trusted" and "Most people try to be fair"; "Trust in Institutions" varies between 0 and 10 and averages answers to the following questions: "Do you trust in country's parliament", "Do you trust in the legal system", "Do you trust in the police", "Do you trust in political parties", "Do you trust in the European Parliament", "Do you trust in the United Nations."

Regions Excluded from Region-Level Regressions

"Island" and Overseas Regions

We exclude all islands and overseas regions: Ciudad Autónoma de Ceuta (ES63), Ciudad Autónoma de Melilla (ES64); Canarias (ES70), Åland (FI20), Guadeloupe (FR91), Martinique (FR92), Guyane (FR93), Reunion (FR94), Valle d'Aosta/Vallée d'Aoste (ITC2), Região Autónoma dos Açores (PT20), Região Autónoma da Madeira (PT30).

Underdeveloped and Small Regions

We exclude *sparsely populated regions* with population density less than the 10th percentile. These are Extremadura (ES43), East Finland (FI13), West Finland (FI19), Agder og Rogaland (NO04), and Alentejo (PT18).

We also exclude relatively *small and poor regions* with the average GDP per capita less than 15th percentile in the distribution within the corresponding country. These are Hainaut (BE32), Campania (ITF3), East Middle Sweden (SE12), Tees Valley and Durham (UKC1), Merseyside (UKD5), South Yorkshire (UKE3), and Lincolnshire (UKF3).

We exclude regions with *high share of agriculture*, specifically a share of agriculture larger than 85th percentile in the distribution across all regions. The regions excluded are Murcia (ES62), Champagne-Ardenne (FR21), Poitou-Charentes (FR53), Algarve (PT15), and Alentejo (PT18).

Outlier Regions

We exclude regions which experienced a change in ownership above 20 percent during our sample period: Auvergne (FR72), Border, Midland and Western (IE01), Friuli-Venezia Giulia (ITD4), North Middle Sweden (SE31), Upper Norrland (SE33), and Gloucestershire, Wiltshire and North Somerset (UKK1);

Some regions are outliers in partial correlation plots in a particular year only. These regions might have coverage related issues because certain years look very different and we eliminated those. These are Antwerpen (BE21), Limburg (BE22), Vlaams-Brabant (BE24), Brabant Wallon (BE31), Namur (BE35), Dresden (DED2), Comunidad Foral de Navarra (ES22), Midi-Pyrénées (FR62), Provincia Autonoma Bolzano/Bozen (ITD1), Abruzzo (ITF1), Sardegna (ITG2), Cheshire (UKD2), Kent (UKJ4), Shropshire and Staffordshire (UKG2), Rhône-Alpes (FR71), Greater Manchester (UKD3), Surrey, East and West Sussex (UKJ2), Eastern Scotland (UKM2), and Highlands and Islands (UKM4).

Table 1: Descriptive Statistics

Panel A: Firm-level data

Firm Outcome	Operating Revenue (1,047,463 firms)			
	Mean	Std. Dev.	Min	Max
Volatility, SD	0.34	0.62	0	4.79
Foreign Ownership (%)	1.26	10.75	0	100
Foreign Minority Ownership (%)	0.04	1.23	0	75.00
Domestic Minority Ownership (%)	4.13	14.06	0	95.87
Total Assets (million 2005 euros)	3.73	81.98	0	43.62
Firm Age (years)	17.89	12.09	1	907
Total Assets, Firms w. Non-Zero Foreign Ownership (mill 2005 euros)	32.89	257.7	0	24,430

	Percent Firms	Average Volatility
	Out of All Firms (1,047,463 firms)	
Non-Zero Foreign Ownership	4.1	0.37
Exporters	7.0	0.24
Listed	0.1	0.36
	Out of Firms with Non-Zero Foreign Ownership (42,428 firms)	
100% Foreign Ownership	27.1	0.36
Foreign Subsidiaries	18.6	0.37
Largest Owner is Foreign	43.3	0.34
Foreigners Hold $> 50\%$	52.7	0.38

Panel B: Region-Level data

	Mean	Std. Dev.	Min	Max
Time-varying Volatility (AMADEUS), SD_t	0.02	0.03	0.00003	0.24
Time-varying Volatility (EUROSTAT), SD_t	0.01	0.01	0.00006	0.07
Financial Integration (%)	7.00	7.91	0	51.84
Financial Integration (Majority Owners) (%)	8.36	8.99	0	51.98
Financial Integration (Minority Owners) (%)	0.25	0.61	0	5.74
Financial Integration (Domestic) (%)	4.79	4.91	0.0002	25.51
Total Assets (billion 2005 euros)	25.85	45.90	0.32	349.8
Fraction of Foreign-Owned Assets	0.17	0.16	0	0.73

Notes: "Exporters" are firms reporting non-zero export revenue. "Listed" are public companies listed on stock exchanges. "100% Foreign Ownership" are companies that are fully owned by foreigners, while "Foreign subsidiaries" are companies that are fully owned by a *single* foreign owner. "Largest Owner is Foreign" refers to firms where the owner with the largest stake is foreign, while "Foreigners Hold $> 50\%$" are companies where foreigners own more than 50 percent. "Fraction of Foreign-Owned Assets is the fraction of assets owned by firms who have non-zero foreign ownership in a given region. See Appendix B for detailed explanations.

Table 2: Firm-Level Volatility and Foreign Ownership

Sample: All firms

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variable: Log Volatility of firm outcome					
Volatility Measure	Std. dev. of firm outcome growth, SD					
Firm Outcome	Sales	Operating Revenue	Employment	Sales	Operating Revenue	Employment
	Panel A: Effects of Foreign Ownership					
Log Foreign Ownership	.050***	.040***	.004**	.043***	.032***	–.000
	(.002)	(.001)	(.002)	(.002)	(.002)	(.002)
Log Total Assets	–.079***	–.081***	–.204***	–.078***	–.081***	–.203***
	(.001)	(.001)	(.001)	(.001)	(.001)	(.001)
Firm Age	–.011***	–.011***	–.009***	–.011***	–.011***	–.009***
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
	Panel B: Effects of Majority/Minority Foreign Ownership					
Largest Owner is Foreign	.211***	.168***	.015*	.178***	.134***	–.004
	(.010)	(.008)	(.008)	(.010)	(.008)	(.008)
Log Foreign Minority Ownership	.036***	.038***	–.007	.033***	.033***	–.008
	(.008)	(.008)	(.008)	(.008)	(.008)	(.008)
Log Domestic Minority Ownership	–.014***	–.027***	–.016***	–.015***	–.027***	–.016***
	(.001)	(.001)	(.001)	(.001)	(.001)	(.001)
Log Total Assets	–.079***	–.081***	–.203***	–.077***	–.080***	–.202***
	(.001)	(.001)	(.001)	(.001)	(.001)	(.001)
Firm Age	–.011***	–.011***	–.008***	–.011***	–.011***	–.009***
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Country Fixed Eff.	yes	yes	yes	no	no	no
Region Fixed Eff.	no	no	no	yes	yes	yes
Industry Fixed Eff.	yes	yes	yes	yes	yes	yes
Firms	760,260	1,047,463	577,196	745,047	1,030,619	567,706

Notes: Standard errors are clustered at the firm level and reported in parentheses. *** , **, * and † denote significance at 1%, 5%, 10%, and 15% levels, resp. SD is the standard deviation of growth of firm outcome over 2002–2006. The explanatory variables are for 2002. Log Foreign Ownership denotes the logarithm of 1+percent ownership share that belongs to foreigners. Largest Owner is Foreign is a dummy variable that takes a value of one if the largest owner of a given firm is a foreigner. Log Foreign Minority Ownership denotes the logarithm of 1+the remaining percent ownership share belonging to foreigners after the share of the largest owner is excluded; Log Domestic Minority Ownership is calculated similarly. Firm Age is the difference between the end year in our sample and the date of incorporation. Sales, Operating Revenue, and Assets are all in 2005 constant euros. For firms in Denmark, Ireland, Great Britain, and Norway, sales are not available. Employment is the number of full-time employees. Industry-fixed effects at the 2-digit NACE level. See Appendix B for detailed explanations.

Table 3: Firm-Level Volatility and Foreign Ownership: Alternative Volatility Measures and Samples

	(1)	(2)	(3)	(4)	(5)
	Dependent Variable: Log Volatility of Firm Outcome				
Firm Outcome	Operating Revenue				
Volatility Measure	CV	SD_t	SD		
Firm Sample	All firms	All firms	Large firms	Permanent firms	Large permanent firms
Largest Owner is Foreign	.210***	.155***	.111***	.163***	.089***
	(.007)	(.007)	(.013)	(.009)	(.013)
Log Foreign Minority Ownership	.037***	.027***	.021*	.037***	.026***
	(.007)	(.007)	(.013)	(.008)	(.012)
Log Domestic Minority Ownership	−.012***	−.023***	−.011***	−.025***	−.013***
	(.001)	(.001)	(.004)	(.001)	(.004)
Log Total Assets	−.064***	−.067***	−.161***	−.078***	−.158***
	(.001)	(.001)	(.005)	(.001)	(.005)
Firm Age	−.008***	−.008***	−.005***	−.011***	−.005***
	(.000)	(.000)	(.000)	(.000)	(.000)
Country Fixed Eff.	yes	yes	yes	yes	yes
Industry Fixed Eff.	yes	yes	yes	yes	yes
Firms	1,083,902	1,047,463	55,099	808,055	45,639

Notes: Standard errors are clustered at the firm level and reported in parentheses. *** , **, * and † denote significance at 1%, 5%, 10%, and 15% levels, resp. CV is the standard deviation of the level of the firm outcome normalized by the mean level of outcome, estimated over 2002–2006; SD_t is a time-varying volatility measure based on firm outcome growth as in Eq. (1), averaged over 2002–2006; and SD is the standard deviation of growth of firm outcome over 2002–2006 . The explanatory variables are for 2002. The "Large firms" sample excludes firms with assets less than 10 million euros. The "Permanent firms" sample is composed of firms with non-missing outcomes in every year between 2002–2006. Log Foreign Ownership denotes the logarithm of 1+percent ownership share that belongs to foreigners. Largest Owner is Foreign is a dummy variable that takes a value of one if the largest owner of a given firm is a foreigner. Log Foreign Minority Ownership denotes the logarithm of 1+the percent ownership share that belonging to foreigners after the share of the largest owner is excluded; Domestic Minority Ownership is calculated similarly. Firm Age is the difference between the end year in our sample and the date of incorporation. Operating Revenue and Assets are in 2005 constant euros. Industry-fixed effects at the 2-digit NACE level. See Appendix B for detailed explanations.

Table 4: Firm-Level Volatility and Foreign Ownership: Propensity Score Matching

	(1)	(2)
	Dependent Variable: Log Volatility of Firm Outcome	
Volatility Measure	Std. dev. of firm outcome growth, SD	
Firm Outcome	Operating Revenue	
Firm Sample	All firms	Large firms
Average Effect of Foreign Ownership	.152*** (.010)	.117*** (.014)
	Regressions using Matched Sample	
Largest Owner is Foreign	.121*** (.010)	.085*** (.014)
Log Foreign Minority Ownership	.028*** (.008)	.019* (.011)
Log Domestic Minority Ownership	–.015*** (.005)	–.015** (.007)
Log Total Assets	–.081*** (.003)	–.149*** (.010)
Firm Age	–.006*** (.000)	–.004*** (.000)
Country Fixed Eff.	yes	yes
Industry Fixed Eff.	yes	yes
Firms	49,394	19,326

Notes: Standard errors are clustered at the firm level and reported in parentheses. *** , **, * and † denote significance at levels 1%, 5%, 10%, and 15%, resp. Matching is performed on firm age, total assets, country, and industry at the 2-digit NACE level. In col (1), the matching is based on the "All firms" sample; in col (2) it is based on the "Large firms" sample. SD is the standard deviation of growth of the firm outcome over 2002–06. The explanatory variables are for 2002. In the lower panel, we estimate our main OLS specification using the matched sample. Foreign Ownership denotes the percent ownership share that belongs to foreigners. Largest Owner is Foreign is a dummy variable that takes a value of one if the largest owner of a given firm is a foreigner. Foreign Minority Ownership denotes the remaining percent ownership share that belongs to foreigners after the share that belongs to the largest owner is excluded; Domestic Minority Ownership is calculated similarly. Firm Age is the difference between the end year in our sample and the date of incorporation. Operating Revenue and Assets are in 2005 constant euros. Industry-fixed effects at the 2-digit NACE level. See Appendix B for detailed explanations.

Table 5: Changes in Firm-Level Volatility and Lagged Ownership

Sample: Permanent firms, 2002–2006

	(1)	(2)
	Dependent Variable: Change in Log Volatility of Firm Outcome	
Volatility Measure	SD	CV
Firm Outcome	Operating Revenue	Operating Revenue
Firms Included	All	All
Lagged Largest Owner is Foreign	.056*	.051*
	(.030)	(.031)
Log Lagged Foreign Minority Ownership	.006	–.001
	(.026)	(.024)
Log Lagged Domestic Minority Ownership	.004	–.001
	(.003)	(.003)
Log Lagged Total Assets	–.014	.003†
	(.002)	(.002)
Firm Age	.001***	.001*
	(.000)	(.000)
Country Fixed Eff.	yes	yes
Industry Fixed Eff.	yes	yes
Firms	296,515	296,513

Notes: Standard errors are clustered at the firm level and reported in parentheses. *** , **, * and † denote significance at 1%, 5%, 10%, and 15% levels, resp. The "Permanent firms" sample is composed of firms with non-missing outcomes in every year between 2002–2006. Changes in volatility are computed between 2005–06 and 2003–04. The explanatory variables are for 2002. Log Foreign Ownership denotes the logarithm of 1+percent ownership share belonging to foreigners. Largest Owner is Foreign is a dummy variable that takes a value of one if the largest owner is foreign. Log Foreign Minority Ownership denotes the logarithm of 1+the percent ownership belonging to foreigners after the share of the largest owner is excluded; Domestic Minority Ownership is calculated similarly. Firm Age is the difference between the end year in our sample and the date of incorporation. Operating Revenue and Assets are in 2005 constant euros. Industry-fixed effects at the 2-digit NACE level. See Appendix B for detailed explanations.

Table 6: Firm-Level Volatility and Foreign Ownership: Dynamics

Sample: Permanent firms, 2000–2006

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Dependent Variable: Log Volatility of Firm Outcome						
Volatility Measure	Time-varying std. dev. of firm outcome growth, SD_t						
Firm Outcome	Operating Revenue						
Largest Owner is Foreign	.207***	.188***	.028**				
	(.007)	(.007)	(.014)				
Log Foreign Minority Ownership	.009	.017***	.006				
	(.007)	(.007)	(.010)				
Log Domestic Minority Ownership	.021***	–.010***	–.001				
	(.001)	(.001)	(.001)				
Log Foreign Ownership				.009***	.007**		.014***
				(.003)	(.003)		(.003)
Log Number of Domestic Owners					–.010*	–.014**	–.011*
					(.006)	(.006)	(.006)
Log Number of Foreign Owners						–.011	–.047***
						(.013)	(.017)
Log Total Assets	–.077***	–.080***	–.023***	–.024***	–.023***	–.023***	–.023***
	(.001)	(.001)	(.003)	(.003)	(.003)	(.003)	(.002)
Firm Fixed Eff.	no	no	yes	yes	yes	yes	yes
Year Fixed Eff.	yes	yes	yes	yes	yes	yes	yes
Country×Year Fixed Eff.	no	yes	yes	yes	yes	yes	yes
Industry×Year Fixed Eff.	no	yes	yes	yes	yes	yes	yes
Observations	2,262,723	2,235,264	2,235,264	2,235,264	2,235,264	2,235,264	2,235,264
Firms	763,360	754,126	754,126	754,126	754,126	754,126	754,126

Notes: Standard errors are clustered at the firm level and reported in parentheses. *** , **, *, and † denote significance at 1%, 5%, 10%, and 15% levels, resp. The "Permanent firms" sample excludes all firms with missing outcomes in any year of the specified period; however, many firms have missing ownership information in one or more years, making the estimation panel unbalanced. SD_t is the time-varying volatility measure based on firm outcome growth as in Eq. (1). Log Foreign Ownership denotes the logarithm of 1+the percent ownership share that belongs to foreigners. Largest Owner is Foreign is a dummy variable that takes a value of one if the largest owner is foreign. Log Foreign Minority Ownership denotes the logarithm of 1+the percent ownership share belonging to foreigners after the share of the largest owner is excluded; Domestic Minority Ownership is calculated similarly. Number of Owners give the number of foreign and domestic owners, respectively. Firm Age is the difference between the end year in our sample and the date of incorporation. Operating Revenue and Assets are in 2005 constant euros. Industry-fixed effects at the 2-digit NACE level. See Appendix B for detailed explanations.

Table 7: Regional Volatility and Financial Integration: Typical Firm

	(1)	(2)	(3)	(4)
	Dependent Variable: Log Median Volatility			
Volatility Measure	Time-varying std. dev. of regional outcome growth, SD_t			
Firm Outcome	Sales	Operating Revenue	Sales	Operating Revenue
	Panel A: Effects of Foreign Ownership			
Log Financial Integration	.020	.022*	.034*	.030*
	(.021)	(.013)	(.020)	(.017)
Log Region Total Assets	.212***	.140**	.010	.022
	(.079)	(.070)	(.092)	(.084)
	Panel B: Effects of Majority/Minority Foreign Ownership			
Log Financial Integration	.024	.013	.059**	.038*
(Majority Owners)	(.024)	(.017)	(.029)	(.021)
Log Financial Integration	–.030*	–.002	–.027	.013
(Minority Owners)	(.017)	(.025)	(.029)	(.039)
Log Financial Integration	.029*	.007	.009	.020*
(Domestic)	(.015)	(.008)	(.013)	(.011)
Log Region Total Assets	0.199***	0.133*	.006	.029
	(.078)	(.069)	(.090)	(.078)
Region Fixed Eff.	yes	yes	yes	yes
Year Fixed Eff.	yes	yes	yes	yes
Country×Year Fixed Eff.	no	no	yes	yes
Observations	248	368	248	368
Regions	62	92	62	92

Notes: Standard errors are clustered at the region level and reported in parentheses. *** , **, *, and † denote significance at 1%, 5%, 10%,and 15% levels, resp. Denmark, Ireland, Great Britain, and Norway firms and hence regions have no data for sales. See appendix B for the excluded outlier regions. SD_t is a time-varying volatility measure based on firm outcome growth as in Eq. (1). Log Financial Integration (Total) is the logarithm of 1+the weighted average of firm-level foreign ownership percentages within a given region using firm assets as weights. Log Financial Integration (Majority Owners) represents the logarithm of 1+the percentage share of total assets of all firms whose largest owner is foreign in a given region. Log Financial Integration (Minority Owners) is the logarithm of 1+the weighted average of firm-level foreign Minority Ownership percentages using firm assets as weights; regional Financial Integration (Domestic) is calculated similarly from firm-level domestic Minority Ownership percentages. Region Total Assets is the sum of total assets of firms within a given region. Sales, Operating Revenue, and Assets are all in 2005 constant euros. See Appendix B for detailed explanations.

Table 8: Regional Volatility and Financial Integration: Aggregation

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent Variable: Log Volatility of Aggregated Firm Outcome or Regional GDP					
Volatility Measure	Time-varying std. dev. of regional outcome growth, SD_t					
Aggregated Firm Outcome	Sales	Operating Revenue	Sales	Operating Revenue		
Regional Outcome					Regional GDP per capita	
Log Financial Integration	.635**	.649**	.681**	.862***	.603***	.573*
	(.318)	(.305)	(.321)	(.259)	(.246)	(.304)
Log Region Total Assets	–.187	1.01	–.880	–.124		
	(1.92)	(1.65)	(2.14)	(1.66)		
Log Population					–20.4***	–18.2***
					(6.08)	(6.19)
Region Fixed Eff.	yes	yes	yes	yes	yes	yes
Year Fixed Eff.	yes	yes	yes	yes	yes	yes
Country×Year Fixed Eff.	no	no	yes	yes	no	yes
Observations	186	276	186	276	255	255
Regions	62	92	62	92	85	85

Notes: Standard errors are clustered at the region level and reported in parentheses. *** , **, *, and † denote significance at 1%, 5%, 10%, and 15%, resp. SD_t is a time-varying volatility measure based on firm outcome growth as in Eq. (1). Log Financial Integration (Total) is the logarithm of 1+the weighted average of firm-level foreign ownership percentages within a given region using firm assets as the weights. Log Financial Integration (Majority Owners) is the logarithm of 1+the percentage share of total assets of all firms whose largest owner is foreign in a given region. Log Financial Integration (Minority Owners) is the logarithm of 1+the weighted average of the firm-level foreign Minority Ownership percentages using firm assets as weights; Log Financial Integration (Domestic) is calculated similarly from firm-level domestic Minority Ownership percentages. Region Total Assets is the sum of total assets of firms within a given region. Sales, Operating Revenue, and Assets are all in 2005 constant euros. See Appendix B for detailed explanations. Population data are from Eurostat.

Table 9: Regional Volatility and Financial Integration: Reduced Form Regressions

	(1)	(2)	(3)
	Dependent Variable: Log Volatility of Regional GDP per Capita		
Volatility Measure	Time-varying std. dev. of growth of operating revenue, SD_t		
Social Capital Measure	Trust in People	General Level of Trust	Trust in Institutions
(Social Capital × Financial Harmonization)	1.69** (.731)	2.08** (.980)	1.88* (1.12)
Log Population	–23.4*** (6.15)	–24.8*** (6.45)	–23.4*** (6.77)
Region Fixed Eff.	yes	yes	yes
Year Fixed Eff.	yes	yes	yes
Country×Year Fixed Eff.	yes	yes	yes
Observations	255	255	255
Regions	85	85	85

Notes: Standard errors are clustered at the region level and reported in parentheses. *** , **, *, and † denote significance at 1%, 5%, 10%, and 15%, resp. SD_t is a time-varying volatility measure based on firm growth of operating revenue as in Eq. (1). The Financial Harmonization Index is the sum of indicator variables which take the value of one for each law when the law is adopted. Each column uses a different trust variable to measure social capital. Population data are from Eurostat. See Appendix B for detailed explanations.

Table 10: Regional Volatility and Financial Integration: IV Regressions

	(1)	(2)	(3)
	Panel A: Second Stage Regression		
	Dependent Variable: Log Volatility of the Regional GDP per capita		
Volatility Measure	Time-varying std. dev. of outcome growth, SD_t		
Log Financial Integration	2.44*	2.39*	1.97†
	(1.34)	(1.28)	(1.33)
Log Population	–19.9**	–19.8**	–19.4**
	(8.77)	(8.72)	(8.39)
	Panel B: First Stage Regression		
	Dependent variable: Log Financial Integration (Total)		
Trust in Other People × Financial Harmonization	.692***		
	(.212)		
General Level of Trust × Financial Harmonization		.871***	
		(.256)	
Trust in Institutions × Financial Harmonization			.954***
			(.305)
Log Population	–1.45	–2.06	–2.01
	(2.12)	(2.17)	(2.20)
F stats for excluded inst.	10.68	11.58	9.81
p value	0.001	0.001	0.002
Region Fixed Eff.	yes	yes	yes
Year Fixed Eff.	yes	yes	yes
Country×Year Fixed Eff.	yes	yes	yes
Observations	255	255	255
Regions	85	85	85

Notes: Standard errors are clustered at the region level and reported in parentheses. *** , **, *, and † denote significance at 1%, 5%, 10%, and 15%, resp. SD_t is a time-varying volatility measure based on firm outcome growth as in Eq. (1). Log Financial Integration (Total) is the logarithm of 1+the weighted average of firm-level foreign ownership percentages within a given region using firm assets as weights. The Financial Harmonization Index is the sum of indicator variables that takes the value of one for each law when the law is adopted. We use laws from the Financial Services Action Plan (FSAP) of the EU. Each column uses a different trust variable to measure social capital. Population data are from Eurostat. See Appendix B for detailed explanations.

Table 11: Firm-Level Volatility and Foreign Ownership: 25 EU Countries

Sample: All firms, 2002–2006

	(1)	(2)	(3)
	Dependent Variable: Log Volatility of firm outcome		
Volatility Measure	Std. dev. of firm outcome growth, SD		
Firm Outcome	Sales	Operating Revenue	Employment
Largest Owner is Foreign	.194***	.169***	.009
	(.009)	(.008)	(.007)
Log Foreign Minority Ownership	.024***	.034***	–.001
	(.006)	(.006)	(.006)
Log Domestic Minority Ownership	–.013***	–.019***	–.020***
	(.001)	(.001)	(.001)
Log Total Assets	–.051***	–.053***	–.176***
	(.001)	(.001)	(.001)
Firm Age	–.018***	–.017***	–.012***
	(.000)	(.000)	(.000)
Country Fixed Eff.	yes	yes	yes
Industry Fixed Eff.	yes	yes	yes
Firms	1,116,248	1,443,445	767,304

Notes: Standard errors are clustered at the firm level and reported in parentheses. *** , **, * and † denote significance at 1%, 5%, 10%, and 15% levels, resp. Firms in Slovenia are excluded due to missing age data while employment data are missing for Cyprus. SD is the standard deviation of growth of firm outcome 2002–2006. The explanatory variables are for 2002. Largest Owner is Foreign is a dummy variable that takes a value of one if the largest owner is a foreigner. Log Foreign Minority Ownership is the logarithm of 1+the percent ownership share belonging to foreigners after the share of the largest owner is excluded; Domestic Minority Ownership is calculated similarly. Firm Age is the difference between the end year in our sample and the date of incorporation. Sales, Operating Revenue, and Assets are all in 2005 constant euros. Employment is the number of full-time employees of the firm. Industry-fixed effects at the 2-digit NACE level. See Appendix B for detailed explanations.

Table 12: Correlations of Financial Integration Measures: AMADEUS versus Country (LM) Data

	Financial Integration (Total), AMADEUS							
	Panel A: Correlations over all Countries in 2006							
Financial Integration, LM								
FDI Liability	0.28							
FDI and Portfolio Equity Liability	0.80							
Total Assets and Liabilities	0.80							
	Panel B: Correlations Over Time for Selected Countries, 2000–2006							
Countries	BE	DE	DK	NL	FR	GB	PT	AT
Financial Integration (LM)								
FDI Liability	0.90	0.72	0.70	0.41	0.39	0.76	0.76	0.65
FDI and Portfolio Equity Liability	0.90	0.45	0.19	0.64	0.02	0.30	0.84	0.62
Total Assets and Liabilities	0.91	0.80	0.55	0.96	0.54	0.86	0.86	0.76

Notes: The table reports the correlations between Lane and Milesi-Ferretti (LM) and AMADEUS financial integration measures. We calculate the country-level integration measures from AMADEUS data as the asset weighted average of firm-level foreign ownership in a similar fashion to the regional measures. Country total assets is the sum of total assets of firms within a given country. Financial integration from calculated from the LM data is based on different type of capital flows: FDI Liability represents the stock of FDI external liabilities relative to GDP; FDI and Equity Liability is the sum of foreign direct and portfolio equity investment liabilities relative to GDP; Gross Assets and Liabilities is the sum of the absolute value of external assets and liabilities of FDI, portfolio equity, debt, and financial derivative investments to GDP.

A Robustness

Table A-1: Firm-Level Volatility and Foreign Ownership: Robustness I

Sample: All firms

	(1)	(2)	(3)	(4)	(5)
	Dependent Variable: Log Volatility of Firm Outcome				
Volatility Measure	Std. dev. of firm outcome growth, SD				
Firm Outcome	Operating Revenue	Operating Revenue	Sales	Operating Revenue	Employment
Time Period	2000–2006	2004–2006	2002–2006	2002–2006	2002–2006
Largest Owner is Foreign	.229***	.169***	.199***	.178***	.042***
	(.009)	(.008)	(.010)	(.008)	(.008)
Log Foreign Minority Ownership	.043***	.029***	.029***	.029***	–.009
	(.006)	(.008)	(.008)	(.007)	(.008)
Log Domestic Minority Ownership	–.017***	–.016***	–.008***	–.016***	–.013***
	(.001)	(.001)	(.001)	(.001)	(.001)
Log Total Assets	–.048***	–.076***	–.072***	–.068***	–.188***
	(.001)	(.001)	(.001)	(.001)	(.001)
Firm Age	–.015***	–.013***	–.009***	–.008***	–.006***
	(.000)	(.000)	(.000)	(.000)	(.000)
Average Outcome Growth Rate			1.203***	1.075***	1.574***
			(.010)	(.006)	(.009)
Country Fixed Eff.	yes	yes	yes	yes	yes
Industry Fixed Eff.	yes	yes	yes	yes	yes
Firms	1,089,699	1,313,726	760,260	1,047,463	577,196

Notes: Standard errors are clustered at the firm level and reported in parentheses. *** , **, * and † denote significance at 1%, 5%, 10%, and 15% levels, resp. SD is the standard deviation of growth of firm outcome, estimated over the stated period. The explanatory variables are for the first year of the stated period. Largest Owner is Foreign is a dummy variable that takes a value of one if the largest owner of a given firm is a foreigner. Foreign Minority Ownership denotes the remaining percent ownership share that belongs to foreigners after the share that belongs to the largest owner is excluded; Domestic Minority Ownership is calculated similarly. Firm Age is the difference between the end year in our sample and the date of incorporation. Sales, Operating Revenue, and Assets are all in 2005 constant euros. Industry-fixed effects are at 2-digit NACE level. See the Appendix B for detailed explanations.

Table A-2: Firm-Level Volatility and Foreign Ownership: Robustness II

Sample: All firms, 2002–2006

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Dependent Variable: Log Volatility of Firm Sales										
Volatility Measure	Std. dev. of sales growth, SD										
Firm Sub-sample	Exporters	Excluding Exporters	Limited Liability	Excluding Listed	Foreign Owned	Independent Companies	Majority stake >50%	Excluding Public Sectors	Good Coverage Countries	Poor Coverage Countries	9 CEE Countries
Firm Outcome	Sales	Sales	Sales	Sales	Sales	Sales	Sales	Sales	Sales	Sales	Sales
Largest Owner is Foreign	.176***	.187***	.199***	.212***	.054***	.133***	.184***	.213***	.226***	.134***	.166***
	(.017)	(.013)	(.012)	(.010)	(.017)	(.042)	(.012)	(.010)	(.011)	(.025)	(.021)
Log Foreign Minority Ownership	.035**	.035***	.033***	.033***	.008	.038***	.021**	.034***	.037***	.039***	.023**
	(.015)	(.010)	(.009)	(.009)	(.008)	(.015)	(.010)	(.009)	(.010)	(.015)	(.011)
Log Domestic Minority Ownership	−.016***	−.015***	−.013***	−.015***	−.028***	−.028***	−.018***	−.015***	−.012***	−.026***	−.005
	(.003)	(.001)	(.001)	(.001)	(.006)	(.002)	(.002)	(.001)	(.001)	(.003)	(.004)
Log Total Assets	−.115***	−.082***	−.082***	−.079***	−.104***	−.076***	−.083***	−.081***	−.078***	−.081***	−.109***
	(.003)	(.001)	(.001)	(.001)	(.004)	(.003)	(.002)	(.001)	(.001)	(.003)	(.0013
Firm Age	−.009***	−.012***	−.012***	−.011***	−.008***	−.012***	−.007***	−.011***	−.012***	−.006***	−.011***
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.001)
Country Fixed Eff.	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Industry Fixed Eff.	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Firms	59,985	700,275	673,107	759,836	22,825	89,793	116,034	730,699	689,118	71,142	46,648

Notes: Standard errors are clustered at the firm level and reported in parentheses. *** , **, * and † denote significance at 1%, 5%, 10%, and 15% levels, resp. The EXPORTERS sample consists of firms reporting non-zero export revenue in 2002. The LIMITED LIABILITY sample are public or private limited liability companies; the excluded companies correspond to partnerships, sole proprietorships, and cooperatives. The EXCLUDING LISTED sample excludes companies listed in stock exchanges. The FOREIGN OWNED sample is composed of firms with non-zero foreign ownership. The INDEPENDENT COMPANIES sample consists of firms classified by BvD as "independent." These companies have no shareholder owning more than 50 percent. For the MAJORITY STAKE >50% sample, we drop firms where the ownership percentage of largest owner is less than 50 percent. The EXCLUDING PUBLIC SECTORS sample drops firms in government and public-regulated sectors, which are: Electricity, gas and water (NACE1=E), Public administration and defence, compulsory social security (NACE1=L), Other community, social and personal service activities (NACE1=O), Extra-territorial organizations and bodies (NACE1=Q). The columns Good/Poor Coverage Countries split the sample into companies from countries with relatively good AMADEUS firm coverage (Belgium, Denmark, Finland, France, Norway, Spain, Sweden, and the UK.) and from countries with relatively poor coverage (Austria, Germany, Greece, Ireland, Italy, Netherlands, Portugal, and Switzerland). Central and Eastern European (CEE) countries are Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, and Slovakia.

B Data and Descriptive Statistics

Table B-1: Number of Firms by Country: Raw and Merged Data

Country	Firm-Level Var.	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Per 10,000 of population 2006
AT	Total Assets		26	53	76	106	222	508	1298	34528	69273	77388	93
(raw)	Operating Rev.					1		6	119	983	2527	2762	3
	Ownership					5715		84314		104780		122988	148
AT	Total Assets		12	28	37	50	116	299	785	24754	50454	56763	68
(merged)	Operating Rev.							3	50	504	1402	1590	2
	Ownership					1		12274		27995		50031	60
BE	Total Assets	19561	80329	188445	210523	226870	243274	262668	281696	301652	282802	324790	308
(raw)	Operating Rev.	8934	34200	76884	88393	90675	93291	96269	97313	99029	82637	85207	81
	Ownership					9457		299840		320843		341000	324
BE	Total Assets	17329	74152	175254	195704	211199	226730	245092	262641	279990	288193	295435	280
(merged)	Operating Rev.	7668	30439	68146	78533	80311	82587	85169	85678	86551	78370	71117	67
	Ownership					3943		223938		260080		278761	265
CH	Total Assets	12	76	191	287	352	398	443	545	581	626	629	1
(raw)	Operating Rev.	17	88	209	304	373	417	457	558	593	650	638	1
	Ownership					2390		29346		32609		31886	42
CH	Total Assets	10	49	136	196	234	267	301	355	370	380	373	<1
(merged)	Operating Rev.	14	59	151	211	251	283	314	368	380	397	380	1
	Ownership					12		244		334		372	<1
DE	Total Assets	57	137	386	1872	4407	10874	21695	50517	93960	215026	280720	34
(raw)	Operating Rev.	54	133	373	1746	3838	9293	18335	35084	53184	62894	46436	6
	Ownership					48371		494703		797281		833243	101
DE	Total Assets	20	52	159	827	2187	5970	12624	32646	63710	151406	197879	24
(merged)	Operating Rev.	19	48	148	735	1775	4693	9797	19394	29565	34099	25866	3
	Ownership					751		9173		59436		193244	23
DK*	Total Assets	1	6	16	100	3343	7517	26353	114694	131993	144309	160818	296
(raw)	Operating Rev.		3	8	40	908	1935	7621	32562	35580	35721	33781	62
	Ownership					3167		112711		141766		167228	308
DK*	Total Assets		3	14	89	3124	6996	24776	108337	123638	135398	147138	271
(merged)	Operating Rev.		2	7	34	832	1759	7035	30161	32509	32512	30027	55
	Ownership					71		21700		110046		131839	242
ES	Total Assets	72733	198713	245443	289772	333638	434360	533227	620388	709507	732724	623275	141
(raw)	Operating Rev.	67636	191224	233847	274789	315232	409187	493715	564530	637882	661790	570485	129
	Ownership					16545		407895		683643		858303	195
ES	Total Assets	52628	156820	193230	228461	263744	347457	411669	450400	474353	467671	405212	92
(merged)	Operating Rev.	49423	152119	185461	218045	250442	328336	384087	416854	438706	436338	381171	86
	Ownership					9086		217017		391136		401910	91
FI	Total Assets	1962	12305	33095	39572	43213	46984	51788	58813	63819	70704	76001	144
(raw)	Operating Rev.	1900	12009	32354	38697	42214	45714	50079	56445	61015	67210	72167	137
	Ownership					3071		63913		71412		84355	160
FI	Total Assets	1256	8198	22727	27345	29960	32813	36374	41339	44732	48103	51400	98
(merged)	Operating Rev.	1219	8009	22255	26789	29318	31973	35150	39641	42722	45835	48816	93
	Ownership					1041		27080		33200		44424	84
FR	Total Assets			337874	472885	513170	564313	624135	685484	775205	840977	872235	138
(raw)	Operating Rev.			325277	456359	494303	542249	598333	655912	739707	799939	828422	131
	Ownership					28988		848405		910559		974227	154
FR	Total Assets			222695	313825	342374	379132	422486	464933	521232	555990	566987	90
(merged)	Operating Rev.			213141	301094	327627	361597	401913	441408	493838	526195	537146	85
	Ownership					10929		362572		453597		521021	82
GB*	Total Assets	22494	88888	336280	625526	743161	849593	968352	1151118	1448453	1559654	1659400	274
(raw)	Operating Rev.	8874	35975	115921	188954	211336	227614	245922	273265	332544	329056	333728	55
	Ownership					26240		1211150		1631909		1994926	329
GB*	Total Assets	18710	75250	268558	452543	518870	576725	642494	751083	895441	953103	1004915	166
(merged)	Operating Rev.	7128	29418	94863	150048	164422	174355	185530	203572	226461	225659	221189	37
	Ownership					16770		548718		782685		931759	154
GR	Total Assets	875	3558	13459	14856	16525	18176	19965	22197	24249	25911	26311	24
(raw)	Operating Rev.	851	3490	13156	14559	16191	17814	19476	21677	23766	25295	25702	23
	Ownership					2345		23850		26965		28073	25
GR	Total Assets	677	2860	11255	12383	13639	14905	16174	17719	18897	19819	20174	18
(merged)	Operating Rev.	665	2816	11066	12192	13430	14671	15860	17398	18629	19497	19880	18
	Ownership					1293		13048		16328		18038	16
IE*	Total Assets	6808	12850	16346	38180	63029	75918	85583	94871	105584	108743	108440	255
(raw)	Operating Rev.	369	639	791	2104	4317	6007	6799	7621	9006	10728	10775	25
	Ownership					775		24362		117072		141005	332
IE*	Total Assets	6235	11882	14860	32100	51181	60245	66334	71808	77933	78206	75186	177
(merged)	Operating Rev.	313	540	670	1747	3484	4901	5438	5951	6982	8117	7955	19
	Ownership					348		16548		69032		73188	172

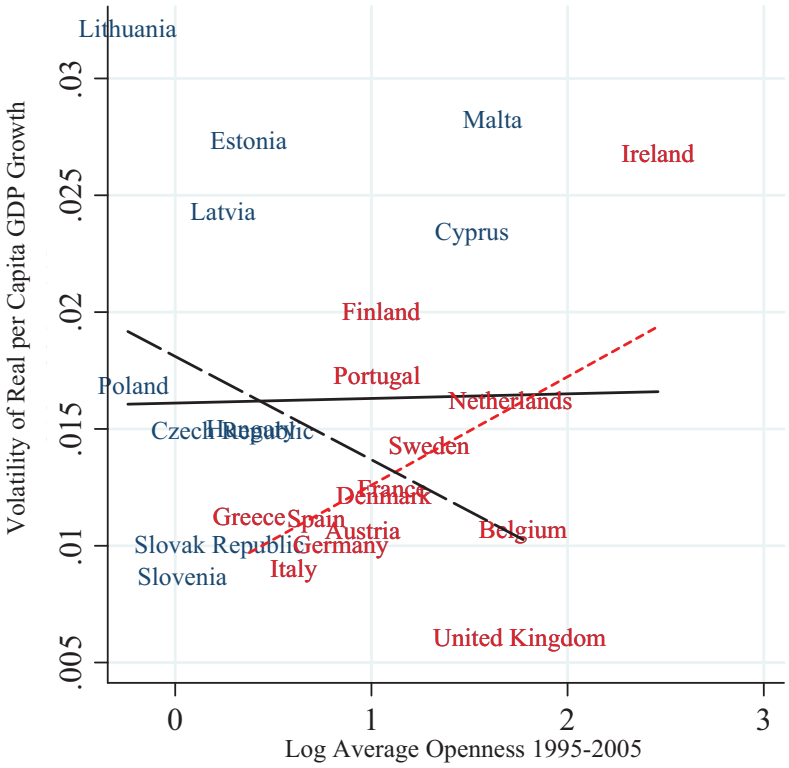
(Continued on next page)

Table B-1: (Continued) Number of Firms by Country: Raw and Merged Data

Country	Firm-Level Var.	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Per 10,000 of population 2006
IT	Total Assets	22160	54489	93967	110900	125013	143883	231230	226458	520281	543467	554622	94
(raw)	Operating Rev.	21909	54152	93340	110055	123685	141370	227546	221807	509651	533243	544656	92
	Ownership					21275		175263		273522		612954	104
IT	Total Assets	7533	19359	35801	43054	49366	59277	105778	102160	242833	272205	279504	47
(merged)	Operating Rev.	7444	19270	35597	42747	48915	58042	104110	99957	238598	268453	274126	47
	Ownership					4984		44604		103676		267034	45
NL	Total Assets	50801	85201	97370	104501	113204	132875	202376	240828	279993	274051	258171	158
(raw)	Operating Rev.	1186	1994	2561	2849	3040	4180	6227	7144	8247	8267	7022	4
	Ownership					6237		208977		305552		353143	216
NL	Total Assets	46117	79882	92032	99394	107286	125336	189749	215482	234955	223100	207289	127
(merged)	Operating Rev.	817	1343	1717	1897	2031	2884	4316	4597	4879	4641	3906	2
	Ownership					1504		107893		202576		200893	123
NO*	Total Assets	5995	47706	85587	93949	104125	113251	122785	132336	144430	158112	182457	392
(raw)	Operating Rev.	5248	42351	76037	82720	90761	98055	105845	114061	123430	128826	138531	298
	Ownership					3776		129933		165992		189868	408
NO*	Total Assets	4775	40739	74339	81429	90037	98022	106345	114808	124337	137486	143781	309
(merged)	Operating Rev.	4278	36940	67232	72989	79925	86264	93218	100585	107996	113314	115448	248
	Ownership					2334		96648		113299		130846	281
PT	Total Assets	13148	17748	20054	31368	35424	33564	47322	69054	77966	271040	287698	272
(raw)	Operating Rev.	12444	16799	19067	29620	33348	31853	44940	65467	73127	245844	258535	244
	Ownership					2043		43292		69333		90155	85
PT	Total Assets	4056	5696	7805	12809	16612	18452	26952	36373	34996	47458	46440	44
(clean)	Operating Rev.	3882	5440	7425	12077	15469	17260	25311	34239	32766	44316	43305	41
	Ownership					529		9587		18028		45361	43
SE	Total Assets	487	35243	145459	156686	167357	179121	190538	201805	216114	231682	249319	275
(raw)	Operating Rev.		24734	136694	147072	156429	165855	174998	184657	195918	207929	221725	245
	Ownership					8571		240415		231389		242834	268
SE	Total Assets	347	23616	106586	115048	123294	132960	142018	151122	162610	175507	187688	207
(merged)	Operating Rev.		16784	99916	107588	114811	122598	130062	138059	147525	158019	167873	185
	Ownership					4343		133308		143506		167198	184
TOTAL	Total Assets	217094	637275	1614025	2191053	2492937	2854323	3388968	3952102	4928315	5556291	5742274	143
(raw)	Operating Rev.	129422	417791	1126519	1438261	1586650	1794835	2096568	2338222	2903662	3210373	3180572	79
	Ownership					188966		4398369		5884627		7066188	176
TOTAL	Total Assets	159693	498570	1225479	1615244	1823157	2085403	2449465	2821991	3324781	3604479	3686164	92
(merged)	Operating Rev.	82870	303227	807795	1026726	1133043	1292203	1487313	1637912	1908611	1997164	1949795	48
	Ownership					57939		1844352		2784954		3455919	86

Notes: "Raw," data are the number of firms with non-missing data as available in the original data source. "Merged," data show the number of firms with non-missing data after we merge ownership data with financial data and apply our sample selection criteria as discussed in detail in Appendix B. The column marked "Per 10,000 of population 2006" reports the number of firms in 2006 reporting year in AMADEUS per 10 thousand of the country population in 2006.
*Firms in countries marked with asterisk do not have sales data in AMADEUS. The country name abbreviations denote Austria (AT), Belgium (BE), Denmark (DK), Finland (FI), France (FR), Germany (DE), Greece (GR), Ireland (IE), Italy (IT), Netherlands (NL), Norway(NO), Portugal (PT), Spain (ES), Sweden (SE), Switzerland (CH), and the United Kingdom (GB).

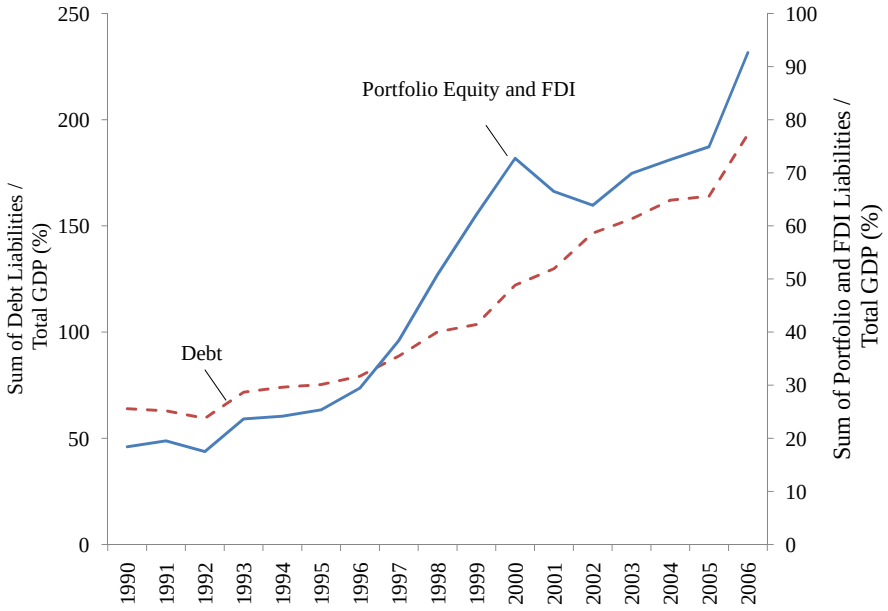
Figure 1: Macroeconomic Volatility and Financial Integration in Europe



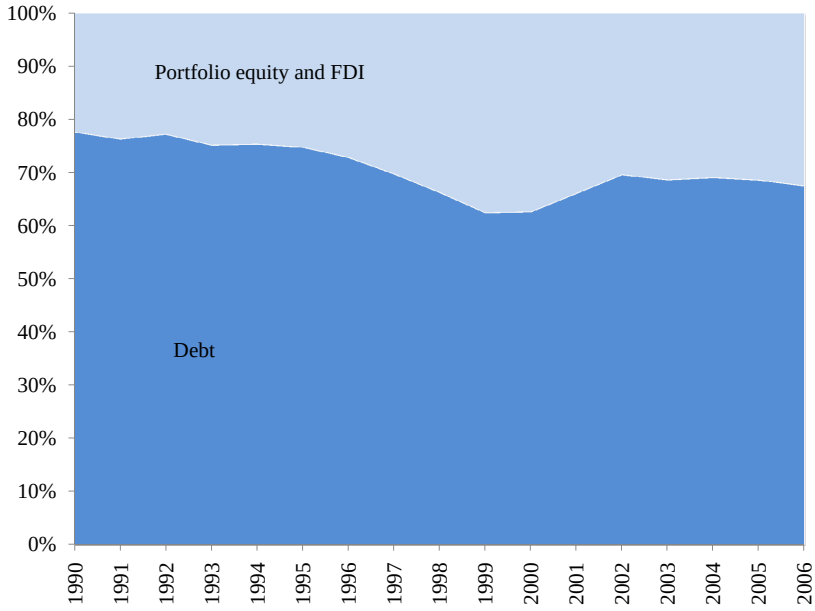
Samples Legend:
Black solid: EU-25 w/o Luxembourg
Red short dash: EU-15 w/o Luxembourg
Black long dash: EU-25 w/o Luxembourg, Ireland, Malta, and Cyprus

Figure 2: Financial Integration in Europe, 1990–2006

Panel A: Sum of foreign labilities of 16 European countries
as percent of total GDP



Panel B: Foreign liability components
as percent of total foreign liabilities for 16 European countries



Notes: Based on Lane and Milesi-Ferretti (2007). The total foreign liability stocks is the sum of FDI, portfolio equity, and debt liabilites. The 16 countries included are Austria, Belgium, Finland, France, Denmark, Germany, Greece, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom.

Figure 3: Distribution of Firm-Level Log Operating Revenue (euros), 2000–2006

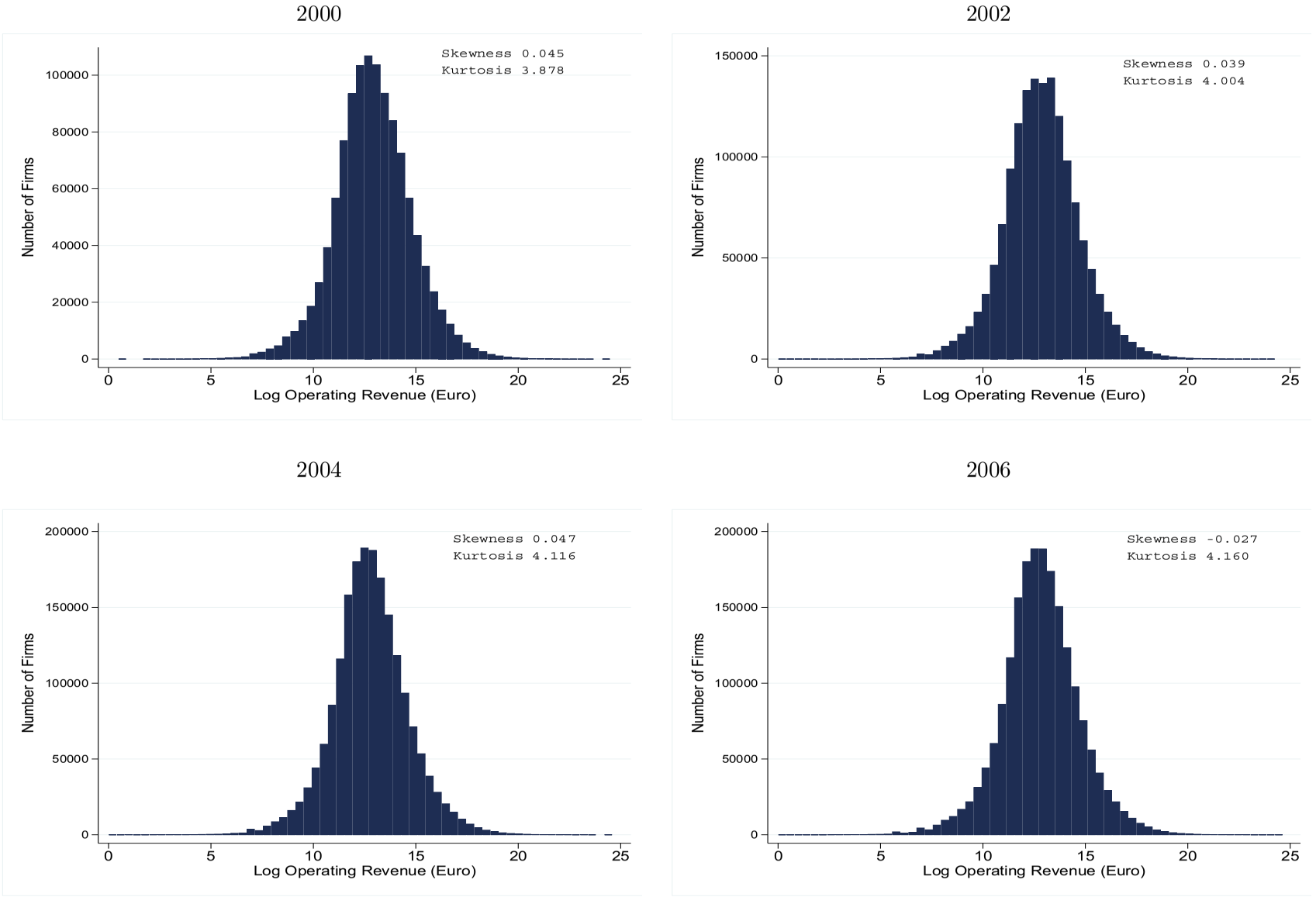
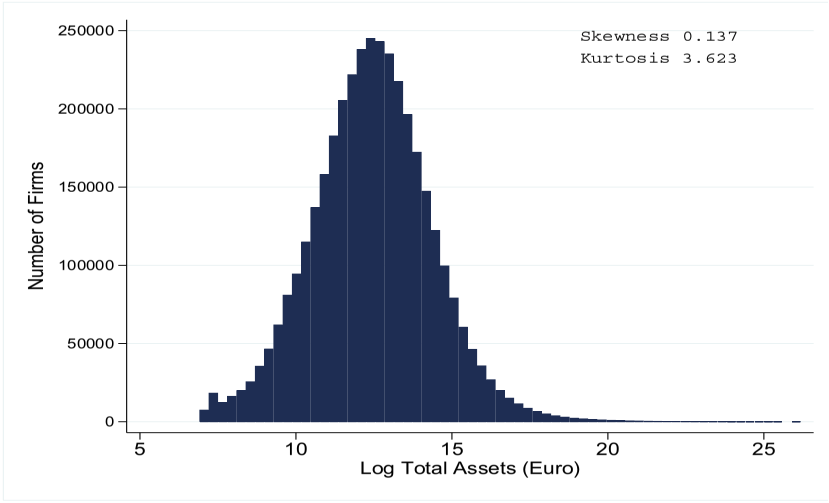
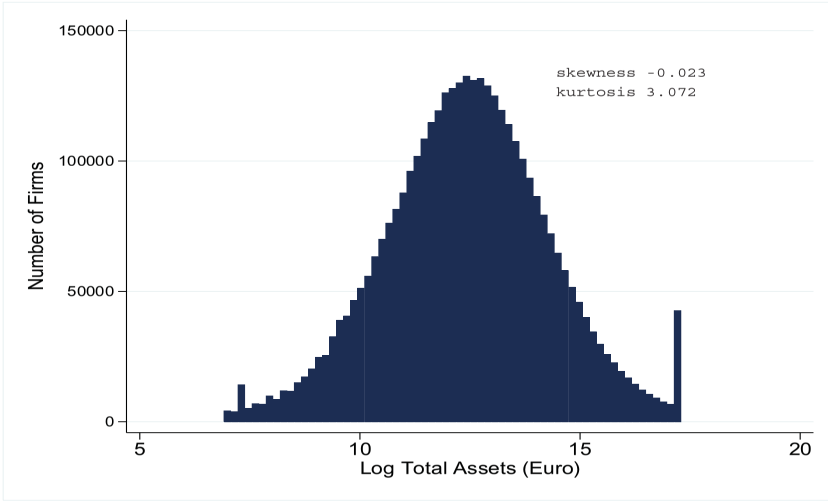


Figure 4: Distribution of Firm Size (Total Assets) and Other Outcomes, 2006

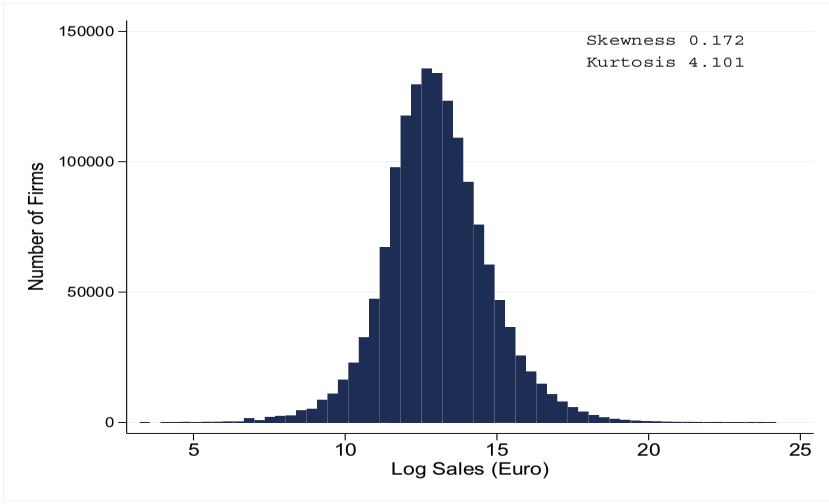
Firm-Level Log Total Assets (euros)



Winsorized Firm-Level Log Total Assets (euros)



Firm-Level Log Sales (euros)



Distribution of the Firm-Level Log Number of Employees (Persons)

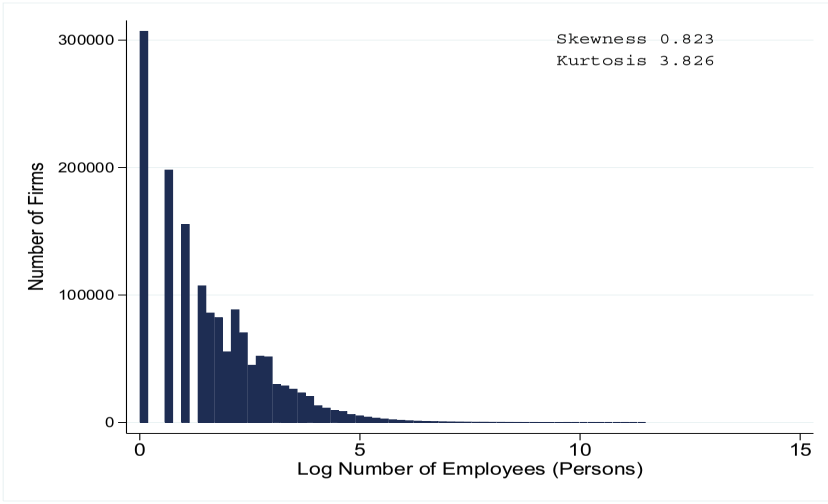
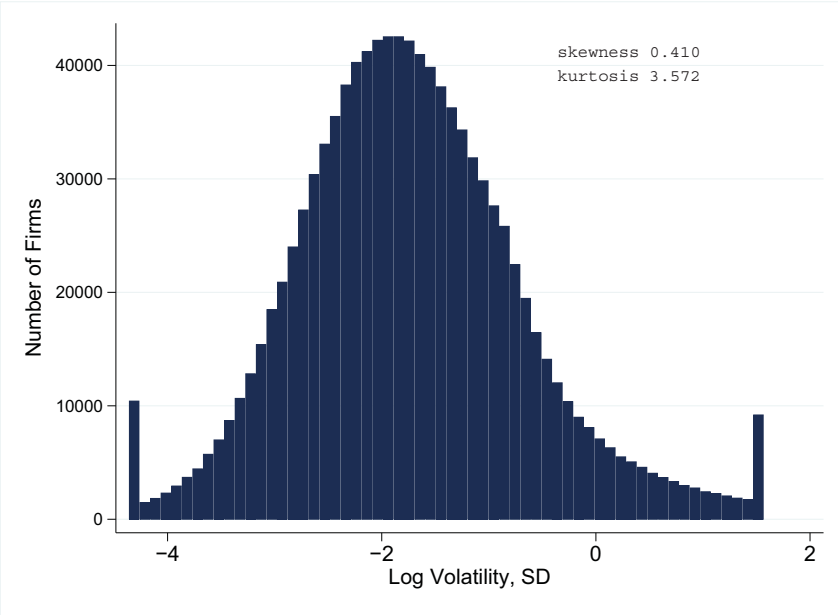
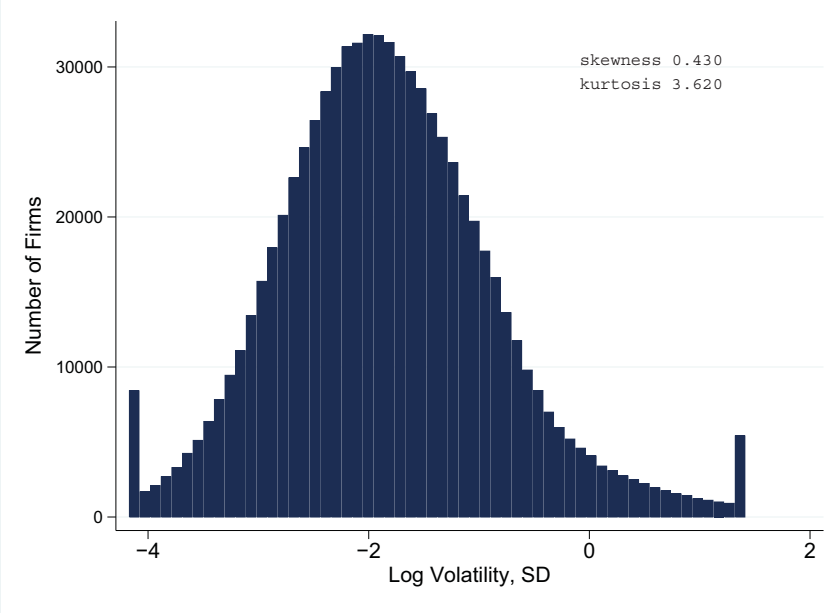


Figure 5: Distribution of Firm-Level Volatility

Panel A: Operating Revenue



Panel B: Sales



Notes: Volatility is the standard deviation of growth of firm outcome 2002–2006, winsorized at 1 and 99 percent.

Figure 6: Distribution of Firm-Level Foreign Ownership

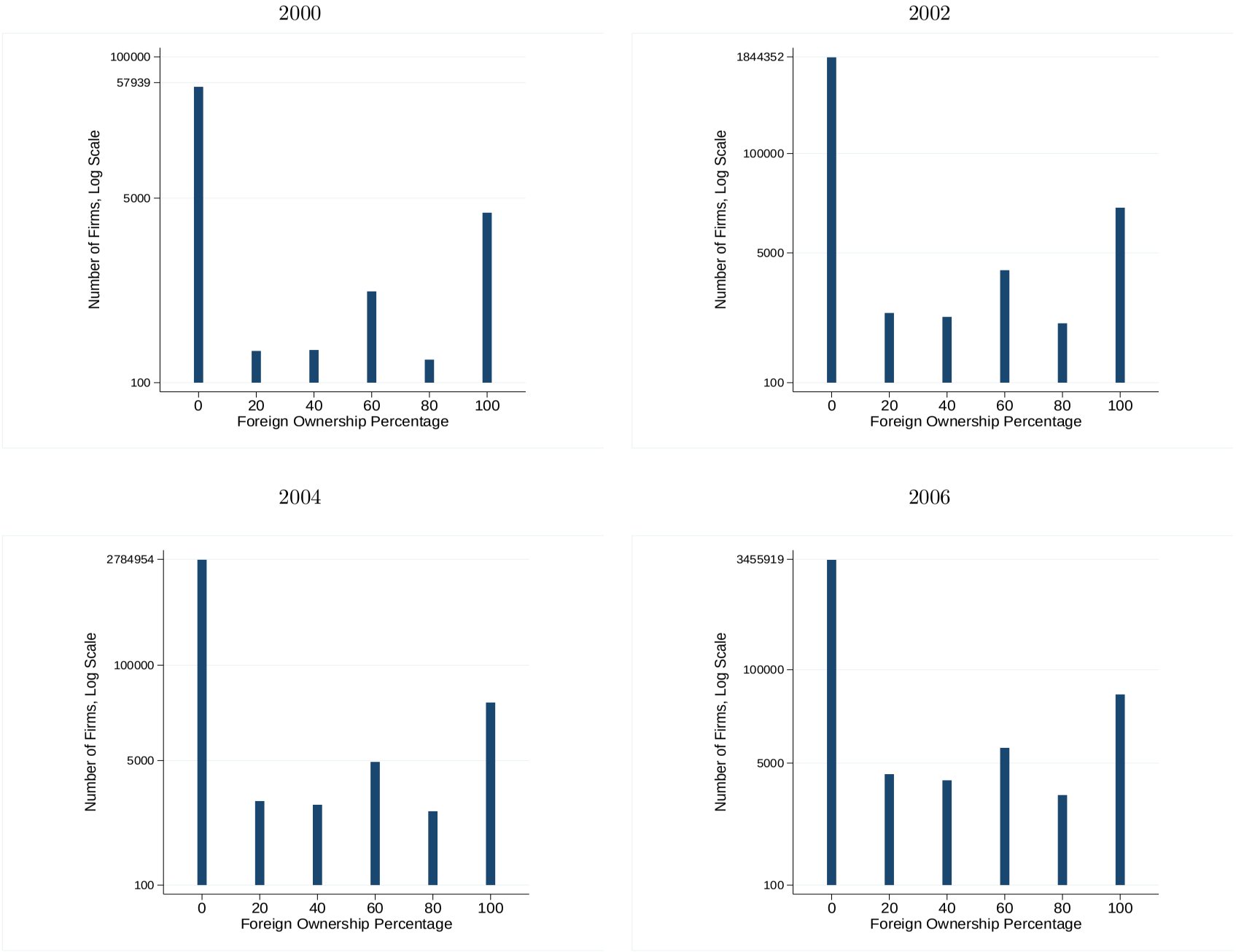
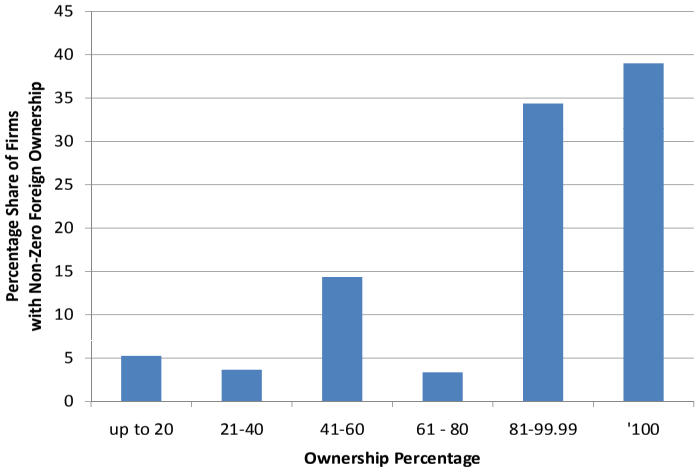
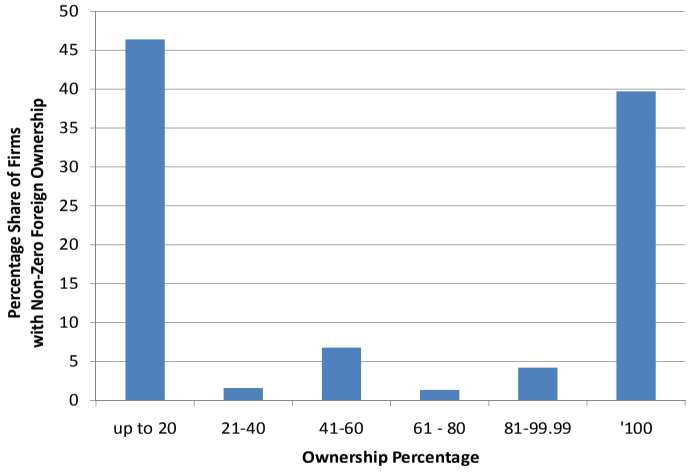


Figure 7: Distribution of Firm-Level Foreign Ownership for Firms with Non-Zero Foreign Ownership

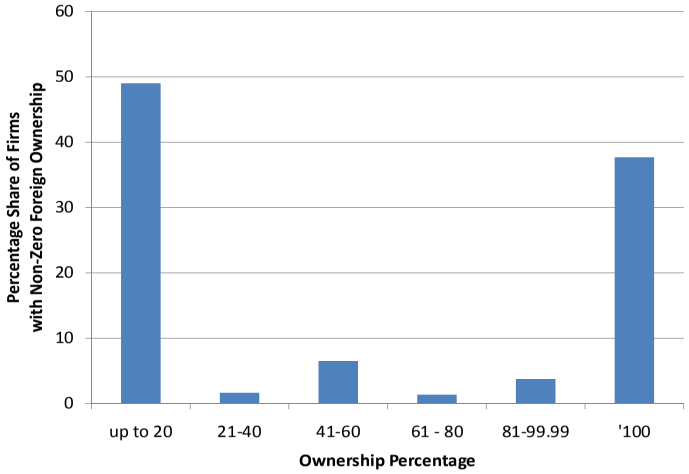
2000



2002



2004



2006

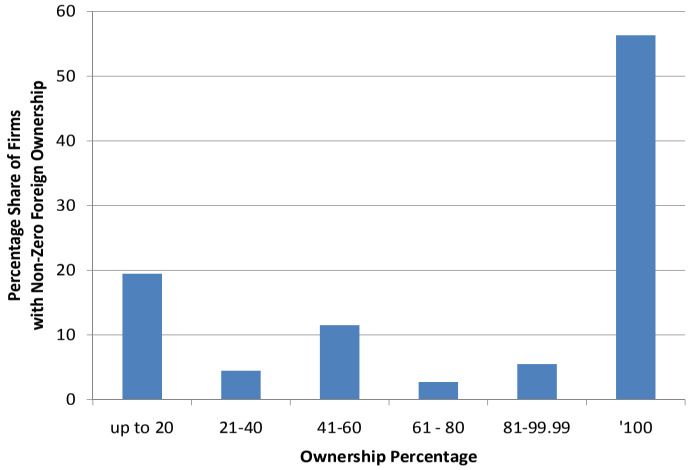


Figure 8: Distribution of Firm-Level Foreign Ownership for Firms with Largest Owner Foreign, 2006

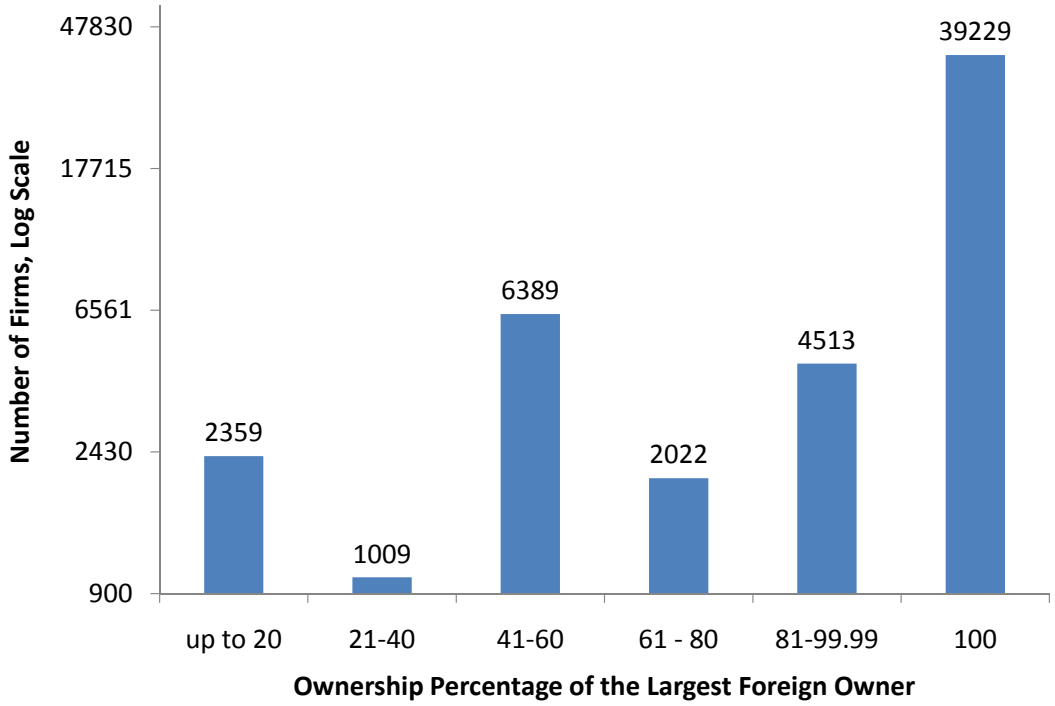
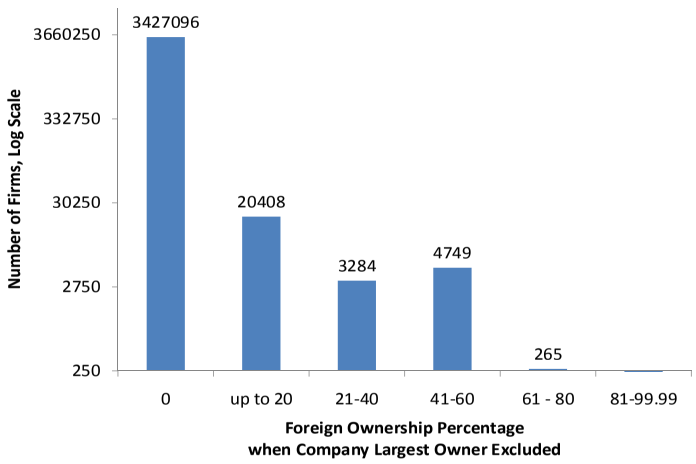


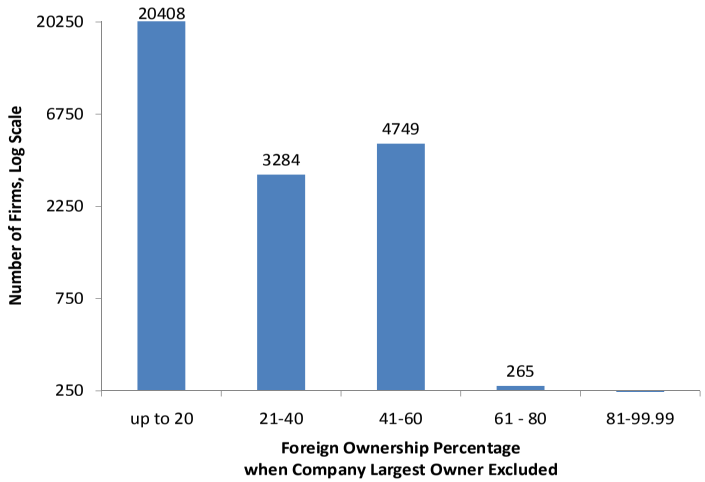
Figure 9: Distribution of Firm-Level Minority Ownership, 2006

Distribution of Firm-Level Foreign Minority Ownership (FMO)

Number of Firms

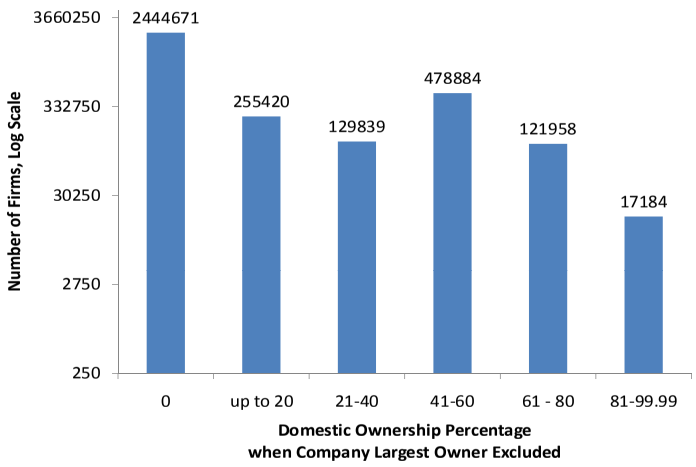


Number of Firms



Distribution of Firm-Level Domestic Minority Ownership (DMO)

Number of Firms



Percent of All Firms

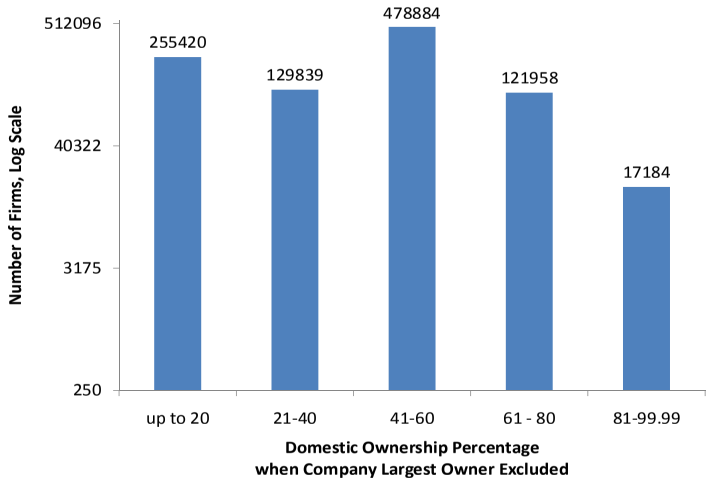
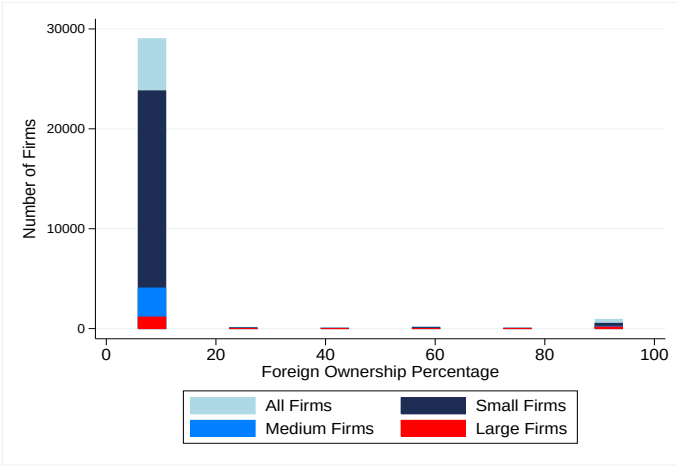


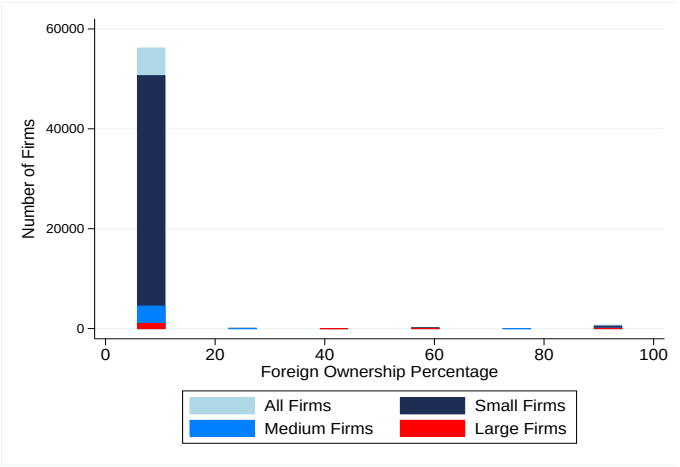
Figure 10: Distribution of Ownership in 2006 for Two Regions

Foreign Ownership

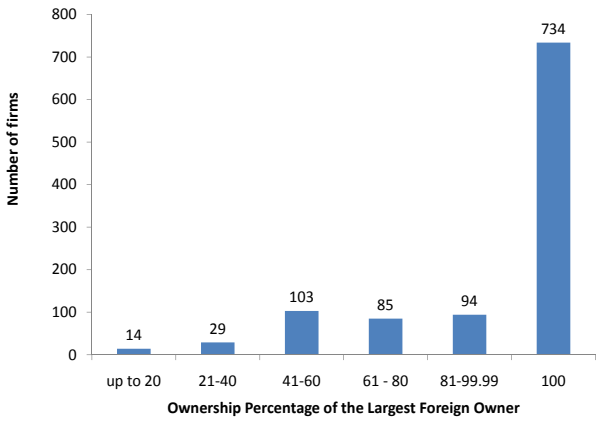
Bavaria 2006



Scotland 2006

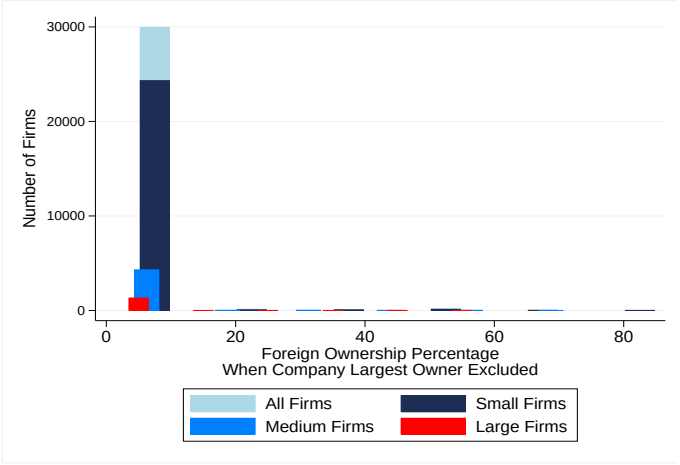


Majority Ownership, Firms with Largest Owner Foreign, Bavaria 2006



Minority Ownership, Bavaria 2006

Foreign Minority Ownership



Domestic Minority Ownership

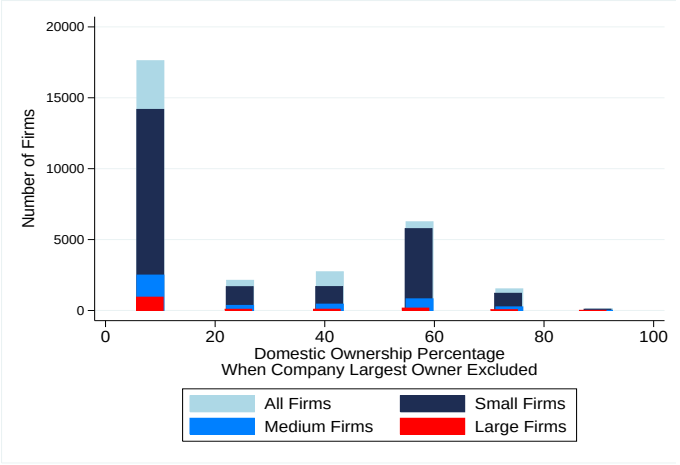
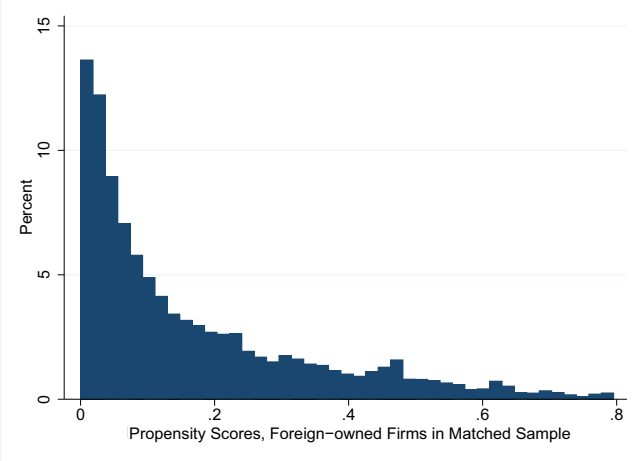


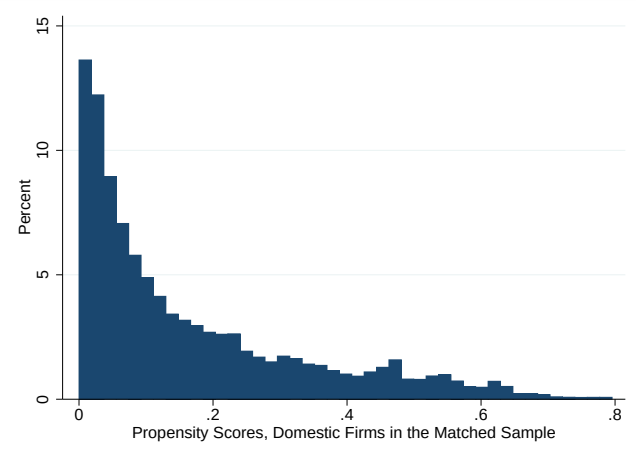
Figure 11: Distribution of the Propensity Scores for Matched and Unmatched Firms

A: Firms in the Matched Sample

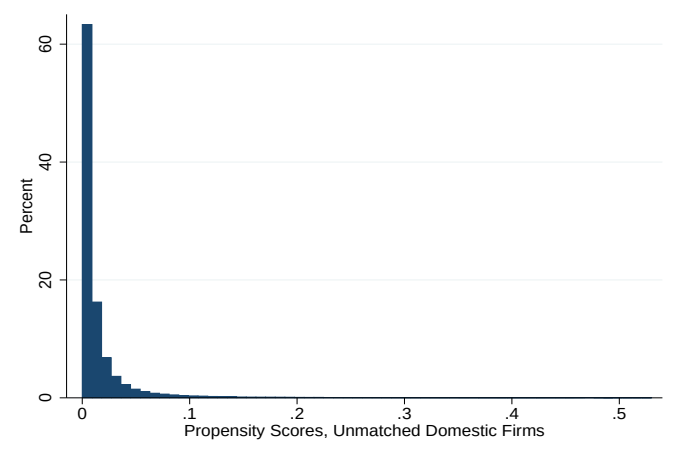
Firms with Non-Zero Foreign Ownership



Firms with Zero Foreign Ownership

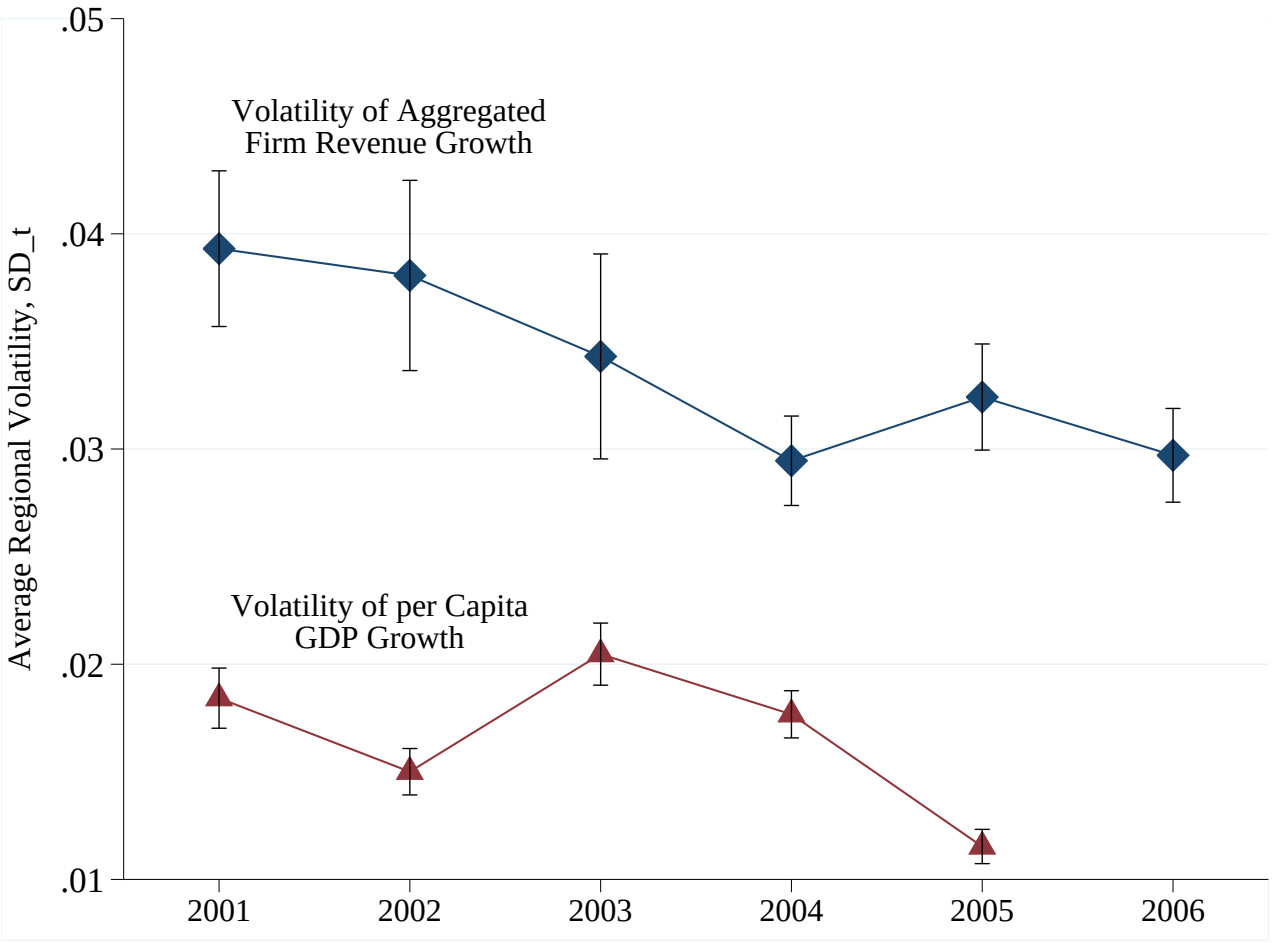


B: Unmatched Firms



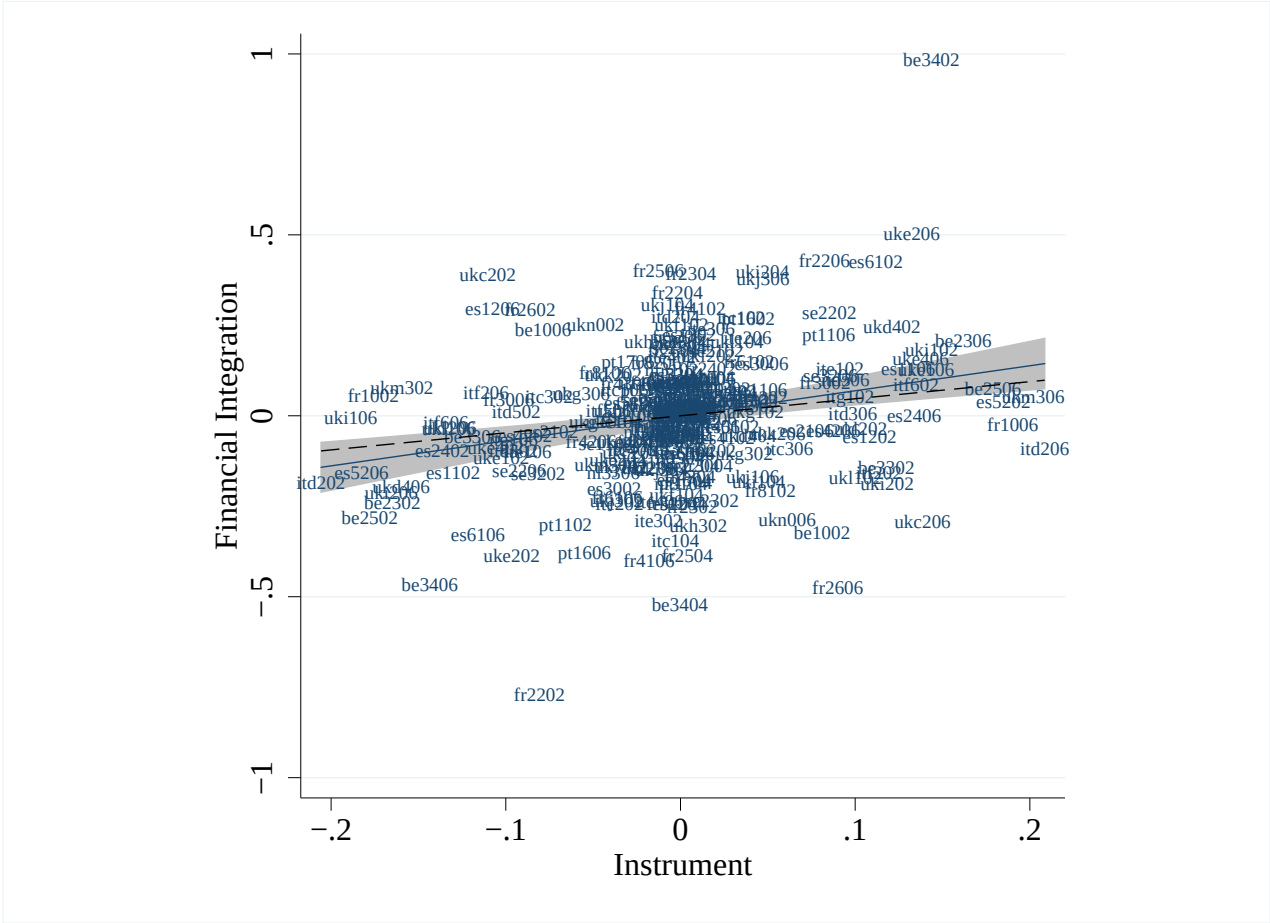
Notes: In Panel A the distribution of the propensity scores is for 24,697 firms with non-zero foreign ownership (left graph) and 24,697 firms with zero foreign ownership (right graph) making up the matched sample. In Panel B, the distribution of the propensity scores is for 998,069 unmatched domestic firms. Matching is performed on firm age, total assets, country- and industry-dummies at the 2-digit NACE level. The propensity scores are the estimated (logistic) probabilities of being foreign-owned conditional on these variables. See Appendix B for detailed explanations.

Figure 12: Dynamics of Aggregate Volatility



Notes: Cross-sectional average of the time-varying volatility measure, see Equation (1), calculated for aggregated operating revenue from AMADUES (upper line) or regional per capita GDP from Eurostat. The vertical lines show +/− one standard deviation.

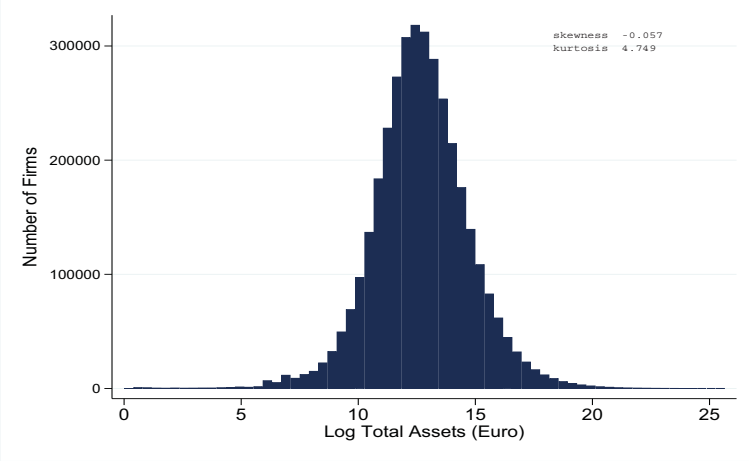
Figure 13: Conditional Correlation Plot of First-Stage Regression



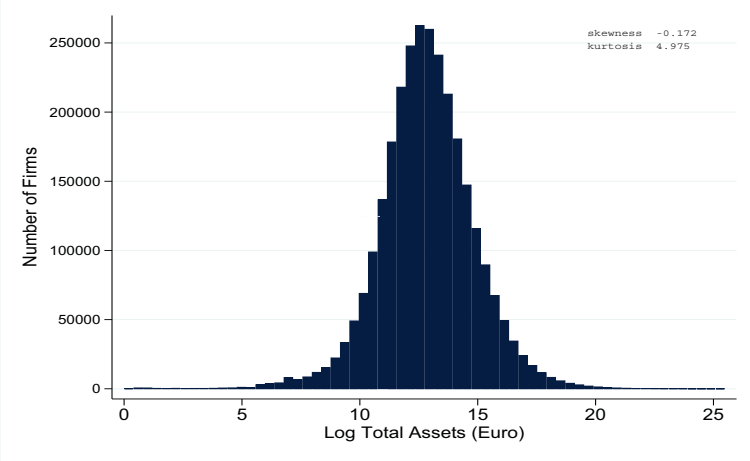
Notes: Plot of conditional correlation of Financial Integration and the instrument (Trust × Financial Harmonization Laws) form the first-stage regression in column (1) of Table 10. The regression line (solid) has a coefficient of 0.69 (significant at the 1% level) while the shaded area represents the 95% confidence interval. The dashed regression line drops the outliers Luxembourg/Belgium (BE34) and Picardie (FR22) and has a coefficient of 0.43 (significant at the 2% level).

Figure 14: Distribution of Firm Assets in AMADEUS by Availability of Ownership Data, 2006

Panel A: All Firms



Panel B: Reporting Firms



Panel C: Non-Reporting Firms