Owning Up:
Closely Held Firms and Wealth Inequality

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Abstract

This paper studies how frictions in debt and equity markets affect wealth inequality in Eurozone countries. Using micro data on households and firms, I document that in more unequal countries, there are more privately held firms, and ownership of publicly traded firms is more concentrated. I develop a dynamic general equilibrium model in which entrepreneurs have the option to run a private firm and issue debt, or go public and also issue outside equity. Both forms of external finance are subject to country-specific constraints. With more access to debt, entrepreneurs can run larger firms and are wealthier. Similar to debt, outside equity allows entrepreneurs to increase investment in their firm, but it also reduces their risk exposure which lowers savings and wealth holdings. When parameters are chosen to match the facts on firm ownership and financing I documented, the model successfully predicts differences in wealth inequality across countries.

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1 Introduction

Across European countries, the share of wealth held by the richest 10% of households ranges from less than 43% to nearly 60%. What accounts for differences in wealth inequality? This paper studies the importance of frictions in financial markets. A large literature has shown that borrowing constraints facing entrepreneurs affect aggregate capital accumulation and wealth inequality. It has centered around owners of private firms and their access to debt: more debt financing leads to larger firms and higher inequality. I focus on an additional type of entrepreneurial finance: outside equity. Similar to debt, access to outside equity allows entrepreneurs to run larger businesses. Contrary to debt, selling part of the company reduces risk exposure and precautionary savings of entrepreneurs, which tends to reduce inequality.

This papers shows how differences in financial market institutions affect entrepreneurs' financing choices and, as a result, the distribution of wealth in the economy. In Germany, which has a traditionally strong banking system, firms rely more heavily on debt. Also, minority shareholders have fewer legal rights than in other countries, which restricts the availability of outside equity to entrepreneurs. In France, in contrast, firms are less levered and finance more with outside equity. I find that the combination of lower frictions in debt and higher frictions in equity markets explains why Germany has more wealth inequality than France. German entrepreneurs use mostly debt financing, have leveraged positions and are exposed to more risk. In France, more entrepreneurs sell equity in their firm, which allows them to share risk and hence reduces their savings and wealth holdings.

To study the joint determination of firm financing and wealth inequality, I develop a dynamic general equilibrium model in which entrepreneurs choose to run a private firm financed with debt and inside equity, or go public and also issue outside equity. Compared to debt, equity is a state-contingent claim and as such is not only a source of external finance, but also enables risk-sharing. Both debt and equity issuance are subject to frictions, which capture the quality of investor protection across countries. The model shows first how the different frictions affect financing choices of entrepreneurs, and second how these choices impact the economy's wealth distribution. To quantify the model, I combine micro data on households and firms and document a set of novel facts on firm ownership and financing in Europe. These data moments identify the parameters governing financial market frictions across countries. Matched only to moments on firms, the model successfully predicts differences in wealth inequality across European countries.

Combining several micro datasets, I show that in more unequal countries, corporate ownership is more concentrated along two margins. The extensive margin measures the share of firms in every country that is privately held as opposed to publicly traded. The data on private firms come from a micro survey on household wealth that was specifically designed to be comparable across

countries (HFCS). The value of publicly traded firms is measured using Compustat Global. In France, 63% of the aggregate firm value is publicly traded, compared to less than 40% in Germany. The intensive margin measures the ownership concentration of public firms. This is important in the context of Europe, where public firms typically have dominant shareholders. I refer to the fraction held by the top three shareholders as the insider share and use it to measure the split between inside and outside equity. On average across all countries, the share of inside equity in publicly traded firms is 40%. The data on shareholders of public firms comes from Amadeus. Insiders are domestic persons that either own direct equity stakes or were, by a matching procedure, identified as owners of firms who own equity stakes. Data on debt financing also comes from Amadeus, which has extensive coverage of both privately held and public firms.

In a dynamic general equilibrium model, workers supply labor to entrepreneurs, who have access to a production technology and choose how to finance investment. Workers' skill and entrepreneurs' productivity are subject to idiosyncratic shocks. In contrast to the literature, publicly traded firms are also run by risk-averse insiders who choose how much outside equity to issue. Debt is risk-free and must be repaid in all states of the world, whereas outside equity is a state-contingent claim that entitles the buyer to a share of profits every period. There are three financial market frictions that govern the trade-offs facing entrepreneurs. First, going public comes at a one-off fixed cost. Second, there is a proportional cost that scales with the share of outside equity. Since insiders are in full control of the firm, but only receive a fraction of revenues, outside investors need to pay a monitoring cost to ensure that they are not being expropriated. Third, debt is subject to a maximum leverage constraint. Going public and selling outside equity is a trade-off between access to external finance and improved risk-sharing, and the reduction in firm value resulting from the two types of costs.

Both debt and equity market frictions reduce external finance and hence investment in the firm. However, they have opposite effects on the wealth accumulation of entrepreneurs. Higher frictions in debt markets reduce entrepreneurs' ability to lever up and invest in their firm. This lowers revenues from entrepreneurship and wealth holdings. Higher frictions in equity markets affect wealth accumulation mostly through the choice of firm ownership. By selling claims to profits, which are uncertain, an entrepreneur who issues outside equity reduces her risk exposure. She therefore has lower precautionary savings motives. The IPO also allows her to cash out early on expected future profits of the firm and front-load consumption, which further reduces her savings and therefore her wealth holdings.

I quantify the model using France as a baseline country. The three parameters of financial market frictions are identified by data moments I documented: average leverage, the share of privately held firms, and the insider share of publicly traded firms. The productivity distribution of firms

is chosen to match the observed firm size distribution. Conditional on all other parameters, the level of wealth inequality - 52.5% - is matched using the discount factor. For the comparison countries, I keep the discount factor constant and re-estimate the three financial market frictions as well as the firm productivity distribution. Importantly, I do not use any information on the wealth distribution when quantifying the model for countries other than France.

Matched to data on firms only, the model successfully replicates the level of wealth inequality in three comparison countries. The countries were chosen to span the range of inequality across Europe, from 43% in the Netherlands to over 59% in Germany and Austria. The fit across countries could be either because of financial market frictions, or because of differences in the productivity distribution. Shutting down differences in TFP allows me to disentangle the two effects. The striking finding is that essentially all of the differences in wealth inequality are driven by financial market frictions.

What do these financial market frictions map to in practice? Following LaPorta, Lopez-de Silanes, Shleifer, and Vishny (1998), I propose differences in financial market institutions as drivers of the frictions I estimate. First, I micro-found the conflict of interest between insiders and outsiders and show that strong accounting standards could reduce the need to monitor controlling shareholders. Within Europe, accounting standards are better in countries with more dispersed corporate ownership, indicating that they are one possible source of variation in monitoring costs across countries. Second, underwriting fees in German IPOs are on average higher than in the rest of Europe (Abrahamson, Jenkinson, and Jones (2010)). This is one possible explanation for why there are more privately held firms in Germany, and hence why the quantitative model implies a higher fixed cost of IPO in Germany. Third, in countries where firms are more highly levered, creditor rights in case of insolvency tend to be stronger. The stronger are creditor rights, the lower are debt market frictions in the model.

Counterfactuals highlight the role of the new mechanism studied in this paper. In the presence of frictions in financial markets, different policies targeted at increasing the availability of external finance have similar effects on aggregate output, but different effects on the distribution of wealth. Improving the access to debt while keeping entrepreneurs' ability to diversify risk constant increases inequality. Increasing entrepreneur's ability to diversify risk, keeping maximum leverage constant, reduces it. This is best illustrated by comparing Germany and Austria, who both have top wealth shares of nearly 60%. In a counterfactual, equilibrium with French financial market frictions, inequality in both countries would be reduced to nearly France's level of 52.5%. While Austrian GDP would increase by about 4%, aggregate output in Germany would remain roughly constant. Austria and France differ mainly in terms of their monitoring cost, which is much higher in Austria. Lowered to French levels, it would increase outside equity, which

increases output and reduces wealth inequality. Germany has a higher cost of IPO and looser maximum leverage constraints than France. Reducing the cost of going public and tightening borrowing constraints both reduce inequality, but have opposite effects on aggregate output. On net, German GDP would increase by only 0.04% in this counterfactual.

Any changes in financial market frictions have distributional consequences and create winners and losers in the economy. From the point of view of workers, an increase in external finance for entrepreneurs is welfare improving. With more funds available for investment, firms expand and increase their labor demand. In the new equilibrium, wages are higher. For firm owners, higher wages reduce profits. General equilibrium effects of reducing financial market frictions therefore always reduce entrepreneurs' welfare. Whether or not entrepreneurs benefit from a change in financial market institutions depends on how strong the direct effect of better financing opportunities is. The poorer and more productive an entrepreneur is, the more she relies on either type of external finance. This set of entrepreneurs therefore typically enjoys welfare gains from counterfactual reductions in financial market frictions. Less talented and richer entrepreneurs experience welfare losses because of higher wages.

Related Literature. This paper contributes to several strands of literature. It is closely related to the quantitative literature on entrepreneurship and wealth inequality in macroeconomics. Quadrini (2000), Meh (2005) and Cagetti and DeNardi (2006) have shown that returns to private businesses help replicate the skewness of wealth observed in the data by increasing the savings rates of the rich.[1][2] Their models have focused on entrepreneurs running private firms and their access to debt.[3] I add to this literature by considering an additional source of external finance: outside equity. Equity is not only a source of finance, but also reduces risk exposure. As a consequence, debt and equity financing have different effects on wealth inequality.[4] The risk-sharing benefits of equity are also present in Dyrda and Pugsley (2017), who model the choice of legal forms of businesses in the US as a tradeoff between higher risk exposure in pass-through busi-

[1]Increasing savings rates are a necessary addition to standard models of incomplete markets (Aiyagari (1994); Huggett (1996)), which cannot generate realistic top wealth shares.

[2]Other mechanisms put forward to explain the degree of wealth concentration include: heterogeneous returns to investment (Benhabib, Bisin, and Luo (2018); Lusardi et al. (2017); Kacperczyk et al. (2015)), high skewness in labor earnings (Castenada, Diaz-Gimenez, and Rios-Rull (2003), empirical support of this mechanism provided by Arellano, Blundell, and Bonhomme (2017); Guvenen, Karahan, Ozkan, and Song (2016)), bequests and inheritance (DeNardi (2004); DeNardi and Yang (2004) and DeNardi and Yang (2016)), and preference heterogeneity (Krusell and Smith (1998) Hendricks (2004)). DeNardi (2015) provides a comprehensive survey of quantitative models of the wealth distribution.

[3]The empirical literature on entrepreneurial finance has also focused on private firms and studied the effects of increased access to debt on small business finance (Adelino and Schoar (2015)), wealth shock from inheritances on business entry (Hurst and Lusardi (2004)) as well as venture capital and other forms of private equity on firm performance (Kerr, Lerner, and Schoar (2014); Lerner, Schoar, Sokolinski, and Wilson (2018))

[4]The importance of idiosyncratic risk for private business owners is well documented, by, for example, Hurst, Lusardi, Kennickell, and Torralba (2010); and Moskowitz and Vissing-Jorgensen (2002)

nesses against higher taxation in C-corporations. While Dyrda and Pugsley (2017) focus on the effect of tax reforms on *income* inequality, I show that debt and equity financing have opposite effects on *wealth* inequality. In their model, entrepreneurs face a binary choice between financing with inside or outside equity. In this paper, entrepreneurs also choose the intensive margin of equity - that is, how much of their firm to sell -, and remain in charge of business decisions after going public.

There is an equally active empirical literature focused on documenting wealth and income inequality, and its evolution over time. Measuring the distribution of wealth across households is challenging, especially at the tails of the distribution. Various approaches that improve on using household surveys have been proposed: Saez and Zucman (2016) use data on capital income to infer wealth holdings, Fagereng, Guiso, Malacrino, and Pistaferri (2018) focus on Norway which has extensive data availability, and Chetty, Hendren, Kline, and Saez (2014) and Smith, Yagan, Zidar, and Zwick (2017) use administrative tax data in the US. While my paper is not primarily about measurement, it contributes to this literature by providing a cross-country comparison of wealth inequality.

Models of entrepreneurship and financing constraints have been used to study the effect of financial market frictions on aggregate capital accumulation.[5] With few exceptions[6], these papers focus on debt markets only, and assume that entrepreneurs own 100% of the equity in their firm. In Midrigan and Xu (2010), entrepreneurs can raise funds by selling equity claims to an exogenous share of expected firm profits. In this paper, rather than being a constraint, the share of the firm sold to outsiders arises as an equilibrium choice.

The literature on capital structures of firm typically models public corporations as being dispersedly held and maximizing the value of a representative shareholder.[7] In contrast, publicly traded firms in this paper are run by risk-averse insiders who are the ones choosing the split between inside and outside equity. This is an important feature of European public firms, which have high insiders shares. The main trade-off involved with issuing outside equity is between benefits of diversification and costs of separating ownership and control. Some elements of this trade-off are present in the finance literature on IPOs, but to the best of my knowledge, this paper is the first to study the effects of this trade-off on aggregate capital accumulation and the distribution

[5]See, for instance, Evans and Jovanovich (1997) for an early contribution to this literature, Buera, Kaboski, and Shin (2002) and Buera and Shin (2008) in the context of economic development and Bhandari and McGrattan (2018) on private businesses in the US. On the theoretical side, Angeletos (2007); Covas (2006); Meh and Quadrini (2006); Moll (2014) and Buera and Shin (2011) study the effect of uninsurable capital income risk on aggregate savings. Buera, Kaboski, and Shin (2015) and Quadrini (2009) provide comprehensive surveys of macroeconomic models of entrepreneurship.

[6]Hall and Woodward (2010), for instance, document facts on private equity in the US and quantify the value of venture capital to entrepreneurs.

[7]See, for example, Cooley and Quadrini (2001); Frank and Goyal (2007) and Begenau and Salomao (2016)

of wealth.[8][9] Albuquerue and Wang (2008) develop a stochastic general equilibrium model to study the effect of investor protection on firm investment and return volatility. In their model, firms are entirely equity-financed and the split between insiders and outside investors is a fixed parameter. In this paper, the split between debt, inside and outside equity is an endogenous choice that depends on different aspects of investor protection.

Lastly, my paper is related to the literature on law and finance across countries, pioneered by La-Porta, Lopez-de Silanes, Shleifer, and Vishny (1998). The objective is to directly measure specific legal and institutional rules of corporate governance[10], measure the value of corporate control using sales of controlling blocks of equity[11], or evaluate corporate governance across countries based on harmonized case studies[12]. My paper adds to this literature by conducting a quantitative evaluation of investor protection on aggregate outcomes. The approach is complementary to theirs in that I infer how well these rules work based on observable decisions by firm owners.

2 Data And Facts

This section documents a set of stylized facts on the importance of publicly traded vs privately held firms, the ownership structure of publicly traded firms and the role of both margins of corporate ownership concentration in accounting for top wealth inequality. It also compares the importance of debt financing across countries. I start by describing the datasets I use and defining the main variables.

2.1 Datasets and Variable Construction

Eurosystem Household Finance and Consumption Survey (HFCS). Data on the composition and distribution of household wealth comes from the first wave of the HFCS, which was administered by the ECB in 2009/10. The HFCS is a comprehensive survey of household assets and liabilities. It is modeled after the US Survey of Consumer Finances and was specifically

[8] In Pagano and Roell (1998), the trade-off is between external finance and *over-* monitoring by shareholders. In Pastor, Taylor, and Veronesi (2009) and Chen, Miao, and Wang (2010), outside equity offers diversification at the cost of losing private benefits of control or introducing an agency cost. Chemmanur and Fulghieri (1999) focus on *who* to sell to (one large versus many diversified shareholders), Jovanovich and Rousseau (2001) focus on *when* to IPO (the trade-off is between information acquisition that increases firm value and the cost of foregone earnings).

[9] Chemmanur et al. (2009) provide empirical support for models in which going public entails an agency cost by documenting that productivity of US manufacturing firms drops after an IPO.

[10] See, for example, LaPorta, Lopez-de Silanes, Shleifer, and Vishny (1997), and Enriques and Volpin (2007) and Fohlin (2005) with a focus on European countries

[11] Barclay and Holderness (1989) and Dyck and Zingales (2004)

[12] Djankov, La Porta, Lopez-de Silanes, and Shleifer (2005)

designed to be comparable across Eurozone countries. It oversamples rich households and is therefore particularly suited to study top wealth inequality. I use nine out of the 15 countries in the sample, excluding both very small countries such as Luxembourg and Malta, and former socialist economies, such as Slovenia and Slovakia.[13] The nine countries studied in this paper account for over 93% of Eurozone GDP.

The survey contains two key variables: household wealth and the value of privately held firms. Household wealth is defined as the sum of all financial and real assets held by the household, net of outstanding liabilities. This includes bank accounts, the main residence minus outstanding mortgages if the household is a homeowner, investment in equity, either directly or via mutual funds, and the value of closely held private firms in case the household is an entrepreneur. This measure of wealth also includes private pension savings, but not the value of public pensions.

The value of privately held businesses is an estimate by the owner of the company. Appendix A lists the exact phrasing of the question. This firm-level measure allows me to estimate the aggregate value of private businesses in each of the nine countries, as well as its distribution across households.

Compustat Global. In order to measure the counterpart of privately held firms, I use Compustat Global to estimate the value of publicly traded businesses in each country. Companies are assigned to the country they are headquartered in.[14] Size is measured as their market value in 2009, which corresponds to the year the household survey was administered. I combine the aggregate value of privately held businesses from the household data with the aggregate value of publicly traded firms from Compustat to measure the share of firm value in each economy that is publicly traded.

Amadeus Financials. Data on leverage and the firm size distribution come from Amadeus, a dataset on public and private companies across a wide range of countries collected by the Bureau van Dijk.[15] Importantly for this project, Amadeus has wide coverage, including small and private companies. See Kalemli-Ozcan et al. (2015) for details on the dataset, as well as a discussion of the representativeness of the sample.

Amadeus Ownership. Data on shareholders of publicly traded firms comes from the ownership module of Amadeus. Information in this dataset includes the share of the company owned,

[13]Their transition to market economies started recently enough that they are unlikely to be at their steady state wealth distribution.

[14]Table A.2 shows results of using country of incorporation as an alternative definition.

[15]I use the version on Amadeus available for download through the Wharton Research Data Service (WRDS). See Kalemli-Ozcan et al. (2015) fo a discussion of the differences between the WRDS version and the version provided as historical disks from the Bureau van Dijk

their nationality, whether they are a person, a company, a financial institution or a government body, and their firm ID in case the shareholder is a company itself. Coverage is high: the average (median) share of total firm equity recorded in this dataset is 78% (86%). The average (median) number of shareholders recorded is 7.5 (5).

Ownership structures of public companies are often complex and have multiple layers, with firms being owned by firms who are owned by firms. Because of this, the ownership concentration among ultimate shareholders of firms is easily overestimated. For example, if firm B owns 90% of firm A, a naive approach would conclude that ownership of firm A is very concentrated. If, however, firm B has atomistic shareholders, then firm A and firm B are, in fact, both dispersedly held. It is indeed common for shareholders of public companies to be companies themselves. Looking at direct ownership only, 36% of total (recorded) equity is held by firms, another 27% is held by banks and financial institutions, and 31% is held by individuals.

In order to get one step closer to identifying ultimate shareholders, I do a second round of matching. The firm identifiers provided by Amadeus allow me to find owners of owners of firms. I proceed as follows: shares of public firms owned by private firms are assigned to a person, since private firms are typically owned by one shareholder. If shares of public firms are owned by another public firms, ownership is assigned in proportion to the parent company's shareholders. The following example illustrates. Say 60% of firm A is owned by firm B. If firm B is a public company, I assign ownership of firm A to firm B's shareholders in proportion. For example, say firm B is split 1/3 between three individuals. I would then record firm A as being owned 60%*1/3=20% each by three distinct persons.

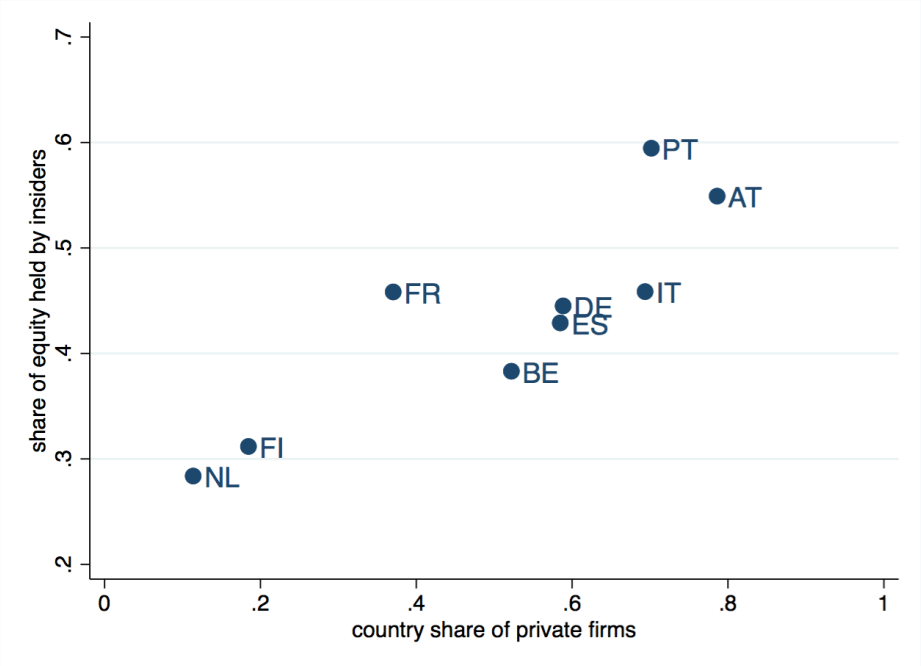
Using my constructed measure of ultimate shareholders, insiders of public companies are defined as the top three shareholders, following LaPorta et al. (1997). I drop any shares held by banks or financial institutions, because no data is available on their ownership structure. 64% of insiders are persons, 23% are firms that could not be matched in the procedure described, and the remaining 13% are 'other', a category that includes government and NGO ownership as well as any unclassified owners. The second round of matching makes a significant difference: At a first level of ownership, nearly 50% of insiders are firms themselves. This share decreases to 23% using the procedure described above. Further, firm owners that could not be identified are more likely to be smaller private companies, as coverage of these firms is less comprehensive. These firms are typically fully owned by one household, which implies that these remaining 23% of firms can be classified as 'insiders'. In terms of ownership concentration, accounting for second-level ownership reduces measured concentration, as expected. The magnitudes are modest, however. On average across all firms and countries, the measured insider share would have been 45.2% using the naive, direct ownership approach. After correcting for firms owning firms, the average

insider share is 43.7%.

2.2 The Ownership of Firms Across Countries

Figure 1 shows, for each of the nine countries, the two margins of firm ownership that are the focus of this paper: the importance of privately held relative to publicly traded firms, and the ownership concentration of public firms. The horizontal axis measures the share of firms in each country that are privately held. The range across countries is large: in the Netherlands, less than 20% of firm value is in privately held businesses, whereas in Austria, public equity is much less important: nearly 80% of aggregate firm value is accounted for by private businesses. The vertical axis plots the average insider share, that is, the average share of public equity held by the largest three shareholders as described above.

Figure 1: Two margins of ownership concentration of firms.



Notes: The x-axis measures the value-weighted share of firms that are privately held. Data are from HFCS and Compustat Global. The y-axis plots the average share of public firms held by the top three shareholders. Data is from Amadeus.

Figure 1 conveys three points: First, the insider share is large. Across firms and countries, insiders hold on average over 40% of publicly traded companies. Second, there is significant variation across countries. In the Netherlands, the average insider share is modest at less than 30%. In Austria, insiders own almost twice that, on average around 55% of the firm. Third, the

two margins of ownership, how many firms are privately held, and what share of public equity is owned by a few large shareholders, co-move across countries.

On the one hand, there are countries like Austria and Portugal, in which ownership and control of firms are tightly linked. Most businesses are privately held, in the hands of just the managing household, and even when firms go public, they remain closely held. On the other hand, there are countries like the Netherlands or Finland, in which ownership and control of firms tend to be more separated: Most firm value is in publicly traded firms, and ownership of these public companies is more dispersed. The fact that the two margins of inside ownership co-move suggests that an underlying force, such as legal institutions, could be responsible for making it easier in some countries to separate ownership and control of firms.

Cross-border holdings of equity. Despite the fact that capital markets in the Eurozone are fully integrated, there is home bias in portfolios. The data show that most Germans own equity in German firms, and German firms are more likely to be held by Germans than would be the case in the absence of such bias. On average across the nine countries in my sample, only 12.7% of equity is held by people who live in a different country than the company is listed in. This share is higher in some, typically smaller, countries, but the maximum is below 21%. When conditioning on insiders, a similar picture emerges. For 16% of publicly traded firms, the largest shareholder is a foreigner. Only 2.2% of firms have all foreign insiders, that is, all of the largest three shareholders do not reside in the country in which the firm is listed. When changing the definition to any of the three largest shareholders being foreign, that number is higher, but still only 27%. This confirms that the typical publicly traded firm is owned by households in that same country, and its insiders are subject to the legal and institutional framework of their country.

Insider shares within and across countries. Figure 1 documents differences in average insider shares across countries. This section compares these differences to the typical variation in insider shares across firms within countries. I consider two dimensions of firm heterogeneity: size and age.

There is a strong negative relationship between the size of a public firm, as measured by the total value of its assets, and its insider share: larger firms are typically more diversely held than smaller firms. This is illustrated in Figure A.1 in Appendix A. Figure A.2 shows that this relationship holds in all nine countries, and that, in terms of economic magnitudes, size and country are similarly important correlates of insider shares. For instance, large German firms have lower insider shares than small German firms, but still higher insider shares than small Dutch firms.

The differences in average insider shares across countries could in principle arise for two reasons: (i) firms of equal sizes have different insider shares, based on whether they are located in Germany or the Netherlands, or (ii) firms in Germany are, on average, smaller than Dutch firms, and hence observed insider shares are higher in Germany. Table A.1 in Appendix A shows that hypothesis (i) is correct: a firm's location correlates with its insider share even conditional on size. Additionally, firm size and location are equally important predictors of its insider share.

Next, I analyze the relationship between a firm's age and its insider share. If there is a systematic and monotonic relationship between firm age and the share held by insiders, this will be observable in the cross-section. Such a relationship would be expected if, over time, owners sell gradually more shares of their firm to raise additional funds for investment. However, Figure A.3 shows that the ownership of older firms is neither more nor less concentrated.

The Ownership of Private Firms. In this paper, I assume that privately held firms are fully owned by one household, who actively manages the firm. This is an accurate model of private firms in continental Europe, where private equity markets are much less important than in the US or UK. This is confirmed by both the HFCS and for Germany, Amadeus. The HFCS asks households to report what share of their business they own. On average, 74% of firms are owned 100% by a single household, and 90% are owned at least 50% by one household. When weighting by firm size, these numbers drop slightly to 61% and 89%. HFCS also asks about shares of private firms in which the household does not have an active management role. On average across all countries, these account for only 6% of the value of private firms.

For Germany, Amadeus records owners of all firms, including privately held ones. Figure A.4 in Appendix A plots the share of the firm owned by the largest shareholder separately for private and public firms. This confirms that a majority of private firms are owned by one person.

2.3 Ownership of Firms and the Wealth Distribution

This section decomposes differences in wealth inequality across countries into the contribution of the two types of inside equity - private firms and the insider share of public firms-, and a residual. Wealth inequality is measured as the share of wealth held by the richest 10% of households in every country.[16]

2.3.1 Estimating Aggregate Wealth

There is one component of household wealth that is not fully captured by the HFCS: inside equity in publicly traded firms. Using the insider shares of public companies described above, I compute

[16]Results are qualitatively robust to using different quantiles of the wealth distribution.

the aggregate value of public equity in a country that is directly held by insiders. This is done by combing the aggregate (asset-weighted) insider share in each country with the value of total public equity from Compustat Global.[17] If the sample of households in the HFCS is representative also of insiders of public firms, this number would be at least smaller than the total value of direct equity holdings captured in the survey.[18] In most countries, this is not the case, which indicates that the HFCS does not sample enough insiders of large public firms. The survey oversamples rich households, but apparently not enough to include sufficiently many wealthy households that are also insiders of public corporations. This interpretation is consistent with the assessment of the ECB: ECB (2013) compares measures of aggregate household wealth obtained from the HFCS with the National Accounts. In general, aggregate wealth as measured by the household survey is smaller than measured by National Accounts. One source of discrepancy mentioned is the failure to include some parts of the (very wealthy) population.

I correct for this by adding the aggregate value of inside equity in each country to the household data. Since insider shares of publicly traded firms are large, their owners are among the top 10% of the wealth distribution. Aggregate inside equity is therefore part of the wealth held by the top decile of households. Appendix A show robustness to the assumptions made.

2.3.2 Decomposing Differences in Wealth Inequality

Figure 2 plots the wealth inequality and its components across countries, taking closely held public corporations into account. The tall bars (dark and light blue combined) plot the share of aggregate household wealth held by the richest 10%. Within Europe, the most unequal countries are Germany and Austria, in which nearly 60% of wealth is held by the richest one tenth of households. The Netherlands, Spain and Belgium are much more egalitarian by this measure; the share of wealth held by the richest 10% is less than 45%. The three colors visually decompose the top 10 wealth share into private firms (the dark blue bars), insider shares of public firms (the medium blue bars) and all other types of wealth (the light blue bars). The dashed line is the average of the top 10% wealth share without both types of inside equity (the light blue bars).

This decomposition shows that both types of inside equity account for a large share of the differences in wealth inequality across countries: when counting only non-business wealth (the light blue bars), wealth inequality is much closer to the Eurozone average everywhere. Quantitatively,

[17] Amadeus does not measure firm value, so I need to combine my measure of the insider share with values from Compustat Global.

[18] I do not expect the total value of public equity to match up with the total value of public firms as measured using Compustat Global. The reason for this is twofold: first, as mentioned in the previous section, cross-country holdings of (small) stakes in public companies are frequent. Second, smaller ownership stakes might frequently be held by intermediaries such as banks or pension funds, and would therefore not show up as direct equity holdings in a survey on household wealth

the cross-sectional standard deviation of wealth inequality is reduced by 47% when removing private businesses, and a total of 56% when also removing insider shares of public firms.

Figure 2: The contribution of closely held firms to differences in wealth inequality.

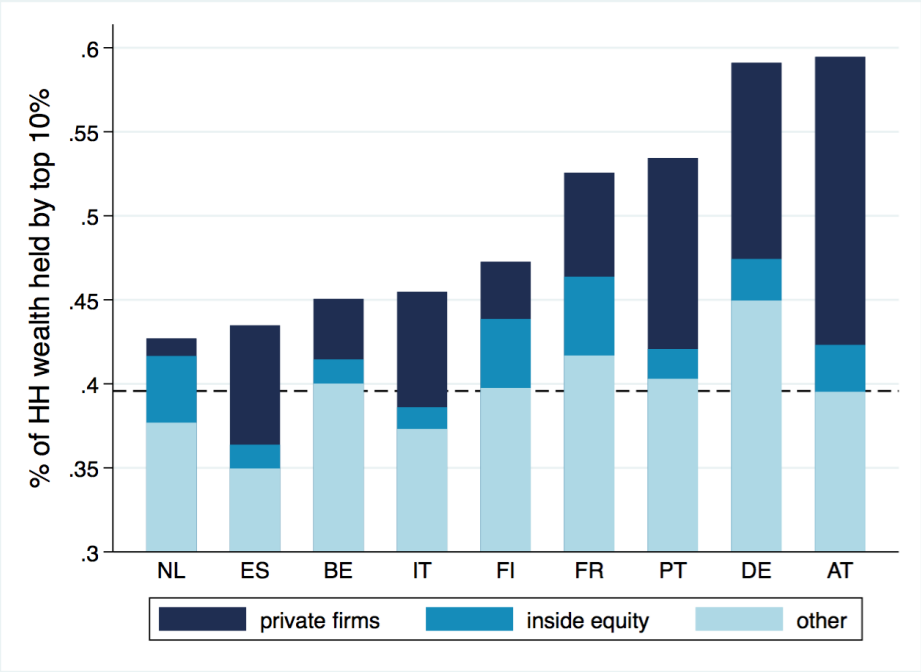


Figure 2 also illustrates that both kinds of insider shares are important for understanding differences in wealth inequality. Take, for example, Finland and France: by measuring only privately held firms, one would have missed about half the difference to the Eurozone average. Comparing the Netherlands and Spain highlights that different aspects of firm ownership are more important in different countries: in Spain, privately held firms seem to contribute mostly to wealth inequality, while insider shares of public firms matter much more in the Netherlands.

2.4 Debt Financing of Firms Across Countries

In the absence of private equity, there are two ways private firms can finance investment: personal savings - inside equity-, and debt. How much firms rely on debt is important in the context of this paper for two reasons: First, the ability of entrepreneurs to lever up and increase investment in their firm has a first-order impact on wealth accumulation. Second, the decision to issue outside equity likely depends on the availability and cost of debt financing. Figure 3 plots the share of privately held firms against their average leverage. The measure of private firms is the same as in the previous section - the horizontal axes of Figures 1 and 3 are identical. Leverage is defined

as the ratio of all outstanding liabilities to total assets of the firm, netting out cash holdings of the firm from both measures.

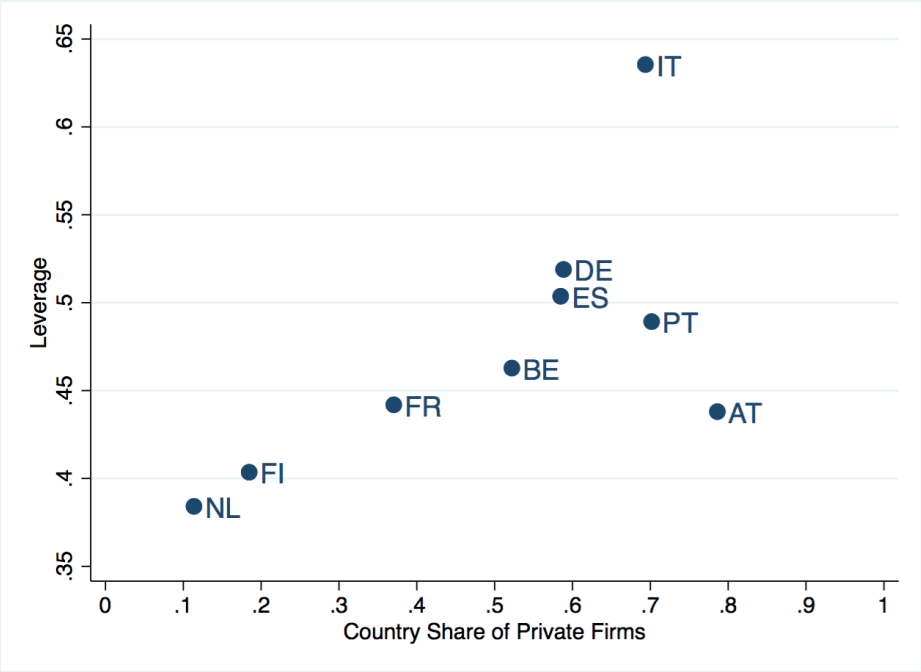


Figure 3: Importance of private firms and their leverage

There is substantial heterogeneity across countries in the average debt to asset ratio of private firms. It ranges from about 38% in the Netherlands to well over 50% in Germany and all the way to 63% for Italian firms. Figure 3 has a second, more suggestive, take-away: there is a negative relationship between the importance of debt and equity financing across countries. Germany for instance has relatively few publicly traded firms and a high average leverage rate for private firms, suggesting that debt and equity financing are substitutes to some extent.

3 Model

The facts documented in the previous section suggest that ownership structures of firms can account for some of differences in wealth inequality across countries. In order to understand how firm ownership is chosen, how ownership is related to wealth inequality, and to conduct counterfactuals, I develop a dynamic general equilibrium model.

The focus of the model is on the choice between between debt, internal and external equity. Entrepreneurs can run a private firm financed with internal equity and debt, which is subject to

a borrowing constraint. Alternatively, they can go public and sell shares of their firm to outside investors. External equity provides additional finance, and allows entrepreneurs to offload some of the investment risk. Separating ownership and control of the firm comes at a cost, however, which gives rise to the main trade-off entrepreneurs face. The model allows me to infer the level of frictions in debt and equity markets from observable firm choices (such as leverage ratios, the share of private firms, and the insider share of public firms). Financial market parameters, through their effect on this trade-off, affect the economy's steady state wealth distribution.

3.1 Layout

Each European country is as small open economy populated by heterogenous workers and entrepreneurs, who choose the ownership structure of their firm. Both workers and entrepreneurs are subject to idiosyncratic, uninsurable risk.

Agents and Demographics. The economy is populated by a measure one of agents with finite, stochastic life time. Agents are born as either of two types: entrepreneurs e, or workers w. Workers are endowed with a skill level $\theta_t \in \Theta$ every period, which they supply to entrepreneurs in exchange for labor income $w\theta_t$. Entrepreneurs differ in their productivity level $\tilde{z} \in \tilde{\mathbb{Z}}$, which is a fixed attribute. They have access to a production technology, which transforms capital (invested at time $t-1$) and labor (hired in a spot market at time t) into output in period t. Every period, an entrepreneur's business might fail, in which case she becomes a worker.

Both types of agents die with probability, π_d. The death shock is i.i.d across agents and over time. An agent who died is replaced by a new one who starts their life with assets equal to a weighted average of the assets of the deceased agent they replace, and average assets in the economy. χ_I is the weight on inheritance, that is, parents' assets. The dependence on average wealth $(1-\chi_I)$ captures all government provided 'starting wealth', such as access to free education, that is equally distributed among the population. Newly born agents draw a type $j' \in \{e, w\}$ and corresponding skill or productivity level $i' \in \{\tilde{\mathbb{Z}}, \Theta\}$. The correlation between parent and child type is governed by an exogenous transition matrix.

Firms have two stages in life: young and mature. All entrepreneurs are born running a young firm; every period thereafter, their firm matures with a constant probability. Young firms differ from mature ones only in that they cannot issue outside equity, that is, only mature firms are allowed to go public. This is a reduced form way of modeling the fact that it takes time for firms to establish a reputation and signal their type, which is necessary for outside investors to be willing to invest.

Preferences. All agents in the economy have standard preferences over a single consumption good given by:

$$\mathbb{E}_0 \left[\sum_{t=0}^{\infty} \left[\beta(1-\pi_d)\right]^t \; u_i(c_t) \right].$$

Implicit in this formulation is that agents derive utility only when alive, and do not care about their offspring. The expectation is taken with respect to the agent's idiosyncratic shocks.

The felicity function $u_i(.)$ depends on the agent's type. In particular, $u_e(c) = u_w(c + \bar{c})$, where $\bar{c}$ captures non-pecuniary benefits of entrepreneurship, in the spirit of Hurst and Pugsley (2015).

Technology. Each entrepreneur has access to a production technology, which I refer to as their firm. Entrepreneurs invest capital k_t at time $t-1$ and hire labor l_t in period t, which generates revenues at t according to:

$$\tilde{y}_t = \tilde{z}_t^{\,1-\psi} \left(k_t^{\alpha} \, l_t^{1-\alpha}\right)^{\psi}$$

The entrepreneur's productivity level $\tilde{z}_t$ represents the quality of the business idea. In a frictionless world, it would uniquely determine the firm's size. Business investment is risky: $\tilde{z}_t$ follows a Markov chain with an absorbing state at $\tilde{z}_t = 0$. The absorbing state, which captures firm failure, is i.i.d. across firms and over time. If the firm fails, the business idea loses its value forever, installed capital is resold frictionlessly, and the entrepreneur starts the next period as a worker, with a draw from the unconditional distribution of worker ability. If the firm does not fail, entrepreneurial productivity remains constant. This shock structure captures the most important uncertainty for entrepreneurs: business failure.

Labor is hired in a spot market after the entrepreneur observes the realization of $\tilde{z}_t$. The entrepreneur's investment decisions depend on expected revenues net of labor costs, which are given by:

$$\tilde{y}_t = z_t k_t^{\nu}$$

where $z_t = \tilde{z}_t^{\frac{1-\psi}{1-(1-\alpha)\psi}} \left(\frac{(1-\alpha)\psi}{w}\right)^{\frac{(1-\alpha)\psi}{1-(1-\alpha)\psi}} (1-\psi(1-\alpha))$ and $\nu = \frac{\alpha\psi}{1-(1-\alpha)\psi}$.
To simplify notation, I use net revenues for the remainder of the description of the model.

3.2 Assets

There are three assets agents can hold, a risk-free one-period bond, capital in their firm, and the value of the 'blueprint' itself. Given that the production technology has decreasing returns to scale, firms make positive profits in equilibrium. The right to operate a firm therefore has positive value, which I refer to as the blueprint. Since these are small open economies, there is a perfectly elastic supply of bonds at gross interest rate R. Both types of agents, entrepreneurs and workers, can save in the risk-free asset, but not borrow.

Firm financing. Entrepreneurs can finance investment in their firm with debt or equity. Debt b_{t+1} comes in the form of a non-defaultable one-period bond, and is constrained by a limited enforcement problem. Lenders can only issue risk-free debt, and hence the amount a firm can borrow is limited by how much lenders can recover in the worst state of the world: firm exit. Assets are worth $(1-\delta)k$ in case the firm exits. I denote by λ the share of remaining firm assets lenders can seize in case the exit shock hits. These assumptions imply that the maximum a firm with capital stock k_{t+1} can borrow is given by

$$\bar{b}_{t+1} = \lambda \frac{(1-\delta)}{R} k_{t+1} \tag{1}$$

λ is the first of three financial markets parameters that vary across countries. It captures the strength of creditor rights, and as such determines how much they are willing to lend to entrepreneurs. Since debt is risk-free, it is priced at the risk-free gross interest rate R.

The firm can also adjust equity to finance itself. Issuing new equity is costless, regardless of who owns the firm. An equity injection is therefore analogous to negative dividends. Dividends, which can be positive or negative, are pinned down by the firm's investment and borrowing policies: $D_t = zk_t^{\nu} + (1-\delta)k_t - Rb_t - k_{t+1} + b_{t+1}$. Firms use internal funds, $zk_t^{\nu} + (1-\delta)k_t - Rb_t$, to finance new investment net of new debt, $k_{t+1} - b_{t+1}$. What is left over after this is paid out to or paid in by shareholders. Dividends of the firm are split according to ownership shares every period. An entrepreneur who sold, say, $\varphi = .6$ of her firm to outside investors will receive (or pay) 40% of dividends, while the investor receives the remaining 60%. For young firms, φ is restricted to be zero, as they are excluded from public equity markets.

Outside Equity. Outside equity is bought by an investment fund, who holds a fully diversified portfolio of firm shares. Since there is no aggregate risk in the economy, the shares bought by the investment fund are valued using the risk-neutral interest rate R. Importantly, even after selling off an arbitrary share $\varphi < 1$ of the firm, the entrepreneur is solely in charge of making investment and financing choices for the firm. At the time the investment fund purchases the

shares, it observes firm productivity z and the current level of wealth of the entrepreneur. Both of these state variables are used to forecast dividends. There is a competitive market for firm shares, such that the price paid by the investment fund is equal to their valuation.[19] I denote by $V_{OI}(X, z, \varphi)$ the price paid by outside investors for a share φ of a firm with productivity z, run by an entrepreneur with cash on hand X.

Going public and selling off part of the company to outside investors entails a separation of ownership and control of the firm. The entrepreneur now only receives a fraction $(1 - \varphi)$ of dividends, while remaining in full control of the firm's investment and borrowing decisions. As a result, the entrepreneur might be tempted to misuse company funds in a very broad sense of the term. This includes things such as investing in pet projects, hiring less qualified friends and relatives, or literally diverting company funds by using them for personal purposes. Since decisions of the firm are at her discretion, the entrepreneur would reap the fullI benefits of such a diversion, but she would only bear a share $(1 - \varphi)$ of the resulting reduction in firm profits. In order to prevent the insider from engaging in such behavior, the outside investor needs to monitor her. Monitoring comes at a cost, which has the following functional form:

$$M(\varphi, z, k) = c_M \, \varphi \, z k^{\nu} \tag{2}$$

This monitoring cost has important features embedded. First, it is increasing in the share sold to outsiders, φ. This captures the idea that the higher is φ, the lower the share of dividends that accrues to the insider, and hence the higher their incentive to misuse company funds. Outsiders therefore need to spend more resources on monitoring the insider. Second, the monitoring cost scales with firm revenues, zk^{ν}.[20] This reflects that it is easier to hide any given amount of fund diversion in a larger firm, so again, outside investors need to spend more resources monitoring the insider. Section 6 micro-foundats this formulation of the monitoring cost.

After taking monitoring expenses into account, returns for outsiders are given by:

$$\varphi D_t - c_M \, \varphi \, z k_t^{\nu} = \varphi \left[(1 - c_M) z k_t^{\nu} - k_{t+1} - R b_t + b_{t+1} \right]$$

From the point of view of the outside investor, c_M acts like a reduction in firm productivity. c_M is the second parameter that varies across countries. It captures a range of institutional features across countries, such as (minority) shareholder rights in the spirit of LaPorta et al. (1998), or the quality of accounting standards, which can substitute for monitoring by investors.

[19] This also implies that the investment fund makes zero economic profits, and hence its ownership is irrelevant.

[20] Alternatively, one could assume that the monitoring cost is proportional to sales gross of labor payments: $M(\varphi, z, k) = \tilde{c}_M \, \varphi \, (k_t^{\alpha} l_t^{1-\alpha})^{\psi}$. The two are equivalent for $\tilde{c}_M = c_M(1 - (1 - \alpha)\psi)$

The IPO decision, as well as the share of the firm sold to outsiders φ are irreversible choices. It comes at a one-off fixed cost of going public, c_{IPO} that captures fees as well as legal and administrative expenses associated with listing on the stock market. Note that, while the ownership split of the firm, φ and (1-φ), can not be changed after the IPO, firms can still raise money from outside investors by diluting equity, or setting dividends negative. For example, if an entrepreneur wants to raise an extra \$100 of equity, outside investors will contribute $\$100 * \varphi$, while she needs to put up the remaining cash.

The Value of Firms. The value of firms in this model has two components: the value of capital installed in the firm, net of outstanding debt, and the value of the blueprint. This is the expected value of future firm profits. I refer to the combination of the two as the value of the firm, and use the term blueprint for the value of the right to operate a production technology. These blueprints are non-tradable, because the entrepreneur who owns the firm is essential for the firm's success. Consequently, private firms cannot be bought or sold. By going public, entrepreneurs transform part of their firm into a traded assets. The shares sold to outsiders are perfectly tradable and hence have a market price. Given the assumptions I made on the investment fund, the price of these firm shares is equal to the present discounted value of all future expected profits of the firm, conditional on current assets of the insider, and firm productivity.

3.3 Choice Problems

Worker's Problem. The problem of a worker is a standard consumption-savings problem with incomplete markets as in Aiyagari (1994). Define a worker's beginning-of-period cash on hand as $X = \theta + R\,a$. Their state variables are (X, θ) and they choose how much to consume and save every period

$$
\begin{aligned}
V_w(X;\theta) = \max_{c,a',X'} \; & u_w(c) + \beta(1-\pi_d)\mathbb{E}_{\theta'}[V_w(X',\theta')] \\
\text{s.t.} \quad & c + a' = X \\
& X' = w\theta' + Ra' \\
& a' \geq 0
\end{aligned}
$$

Young Entrepreneur's Problem. A private entrepreneurs who has not been hit by the exit shock enters each period with cash on hand $X = Ra + zk^{\nu} + (1-\delta)k - Rb$. Since firm debt and personal savings of the entrepreneur command the same return, R, and neither are state-contingent, I can define $\tilde{a} \equiv a - b$, the entrepreneur's net savings. Young entrepreneurs cannot

go public, so they choose consumption as well as investment k' and net savings $\tilde{a}'$ to maximize:

$$\begin{aligned} V_Y(X;z) = \max_{\{c,\tilde{a}',k',b',X',X'_f\}} & \; u_e(c) + \beta(1-\pi_d)\{(1-p_\eta)\left(p_{yo}\, V_O(X',z) + (1-p_{yo})V_Y(X',z)\right) \\ & \qquad + p_\eta\, \mathbb{E}_\theta[V_W(X'_f;\theta)]\,\} \\ \text{s.t.} \;\; & c + \tilde{a}' + k' = X \\ & X' = R\tilde{a}' + zk'^{\nu} + (1-\delta)k' \\ & X'_f = R\tilde{a}' + (1-\delta)k' \\ & \tilde{a}' \geq -\lambda\frac{(1-\delta)}{R}k' \end{aligned}$$

With probability p_η, the firm fails and the entrepreneur becomes a worker with starting assets given by the capital invested in her firm, plus any net savings. With probability (1-p_η), the firm survives, in which case it either matures, which happens with constant probability p_{yo}, or the entrepreneur remains an owner of a young firm.

Old Entrepreneur's Problem. If their firm is mature, entrepreneurs have an additional choice: going public and selling a fraction of their firm. If they remain private, their continuation value includes the option to go public in the future. If they go public, their cash on hand includes the proceeds from the sale of part of their firm, minus the one-time cost of going public.

$$V_O(X,z) = \max\left\{V_{PRIV}(X,z), \max_{\varphi}\{V_{PUB}(X + V_{OI}(X,z,\varphi) - c_{IPO}, z, \varphi)\}\right\}$$

$$\begin{aligned} V_{PRIV}(X;z) = \max_{\{c,\tilde{a}',k',b',X',X'_f\}} & \; u(c) + \beta(1-\pi_d)\{(1-p_\eta)\, V_O(X',z) + p_\eta\, \mathbb{E}_\theta[V_W(X'_f;\theta)]\,\} \\ \text{s.t.} \;\; & c + \tilde{a}' + k' = X \\ & X' = R\tilde{a}' + zk'^{\nu} + (1-\delta)k' \\ & X'_f = R\tilde{a}' + (1-\delta)k' \\ & \tilde{a}' \geq -\lambda\frac{(1-\delta)}{R}k' \end{aligned}$$

Public Entrepreneur's Problem. Public entrepreneurs, that is, entrepreneurs who previously sold a share $\varphi > 0$ of their firm, enter each period with cash on hand $X = Ra + (1-\varphi)\,[zk^{\nu} + (1-\delta)k - Rb]$. Again, I can define their net savings $\tilde{a} \equiv a - (1-\varphi)b$, which include *their* share of firm debt. Using this, the public entrepreneur's problem is similar to the private

entrepreneur's:

$$V_{PUB}(X;z,\varphi) = \max_{\{c,\tilde{a}',k',X',X'_f\}} u(c) + \beta\{(1-p_\eta)\, V_{PUB}(X';z,\varphi) \; + p_\eta\, \mathbb{E}_{\theta'}[V_W(X'_f,\theta')]\}$$

$$\begin{aligned} \text{s.t.} \quad & c + \tilde{a}' + (1-\varphi)k' = X \\ & X' = (1-\varphi)\left[z'k'^{\nu} + (1-\delta)k'\right] + R\tilde{a}' \\ & X'_f = (1-\varphi)(1-\delta)k' + R\tilde{a}' + \theta' \\ & \tilde{a}' \geq -(1-\varphi)\lambda\frac{(1-\delta)}{R}k' \end{aligned}$$

The Investment Fund. The investment fund holds a fully diversified portfolio of firm shares and has unlimited access to funds. Thus, the value of firm shares to the investment fund, V_{OI}, is the present discounted value of expected future profits, discounted at the risk-free rate. Since the entrepreneur's choice of capital depends on her cash-on hand, the share sold, and firm productivity, the value of the firm to outside investors is a function of *post-IPO* wealth of the entrepreneur, the share sold, and productivity. V_{OI} solves the following recursive relationship

$$V_{OI}(\tilde{X},z,\varphi) = k(\tilde{X},z,\varphi)(-1+\frac{1-\delta}{R}) + \frac{(1-p_\eta)}{R}\left(zk(\tilde{X},z,\varphi)^{\nu} + V_{OI}(X'(\tilde{X}),z,\varphi)\right)] \quad (3)$$

where $\tilde{X}$ denotes the post-IPO cash on hand of the entrepreneur, so $\tilde{X} = X + V_{OI}(\tilde{X},z,\varphi) - c_{IPO}$.

3.4 Equilibrium

I denote by $\sigma = \{X, j, \tau\}$ the collection of individual state variables of agents in the economy, where $j \in \{W, Y, PRIV, PUB\}$ and $\tau \in \{\Theta, \tilde{\mathbb{Z}}\}$. $\mu(\sigma)$ is the distribution of people over these states. Individual decision rules derived from agents' problems, in combination with the three exogenous processes for death and birth, firm maturing and failure, and worker productivity imply a transition rule $\mu'(\sigma|\mu)$. I assume that economies are open, so capital can flow across borders, but the labor market clears domestically. The labor market clearing condition is given by Equation 4, which states that total labor supply, which is simply the share of workers S_w given normalizations chosen, needs to equal the total demand for workers by young, private and public firms.

$$S_w = \int_i l_Y(i;w)di + \int_i l_{PRIV}(i;w)di + \int_i l_{PUB}(i;w)di \quad (4)$$

Note that I am assuming that even large public companies hire in the domestic pool of workers,

while their sales can be abroad. In practice, many of these companies not only sell abroad, but also have some production activity abroad. What labor market clearing in this model requires is that all FDI activity nets out in the stationary distribution, so that total labor demand of, say, French firms, equals total labor supply by French workers, irrespective of the distribution of labor over employers of different national identities.[21] Since these are small open economy, the goods market does not need to clear domestically, and there will, in general, be current account imbalances.

I focus on stationary equilibria, that is equilibria in which the joint distribution of assets and types in the economy μ is constant. Given an interest rate $\{R\}$, a stationary equilibrium is a set of value functions $\{V_W, V_Y, V_O, V_{PRIV}, V_{PUB}\}$, allocations for workers $\{c_W, a'_W\}$, allocations for young entrepreneurs $\{c_Y, \tilde{a}'_Y, k_Y, l_Y\}$, allocations for mature private entrepreneurs $\{c_{PRIV}, \tilde{a}'_{PRIV}, k_{PRIV}, l_{PRIV}\}$, allocations for public entrepreneurs $\{c_{PUB}, \tilde{a}'_{PUB}, k_{PUB}, l_{PUB}\}$, prices $\{w, V_{OI}\}$, and a constant distribution over types $\{\mu^*\}$ such that

1. Given prices, allocations and value functions solve agents' problems.
2. V_{OI} is given by equation 3.
3. The labor market clearing condition 4 holds.
4. $\mu'(\sigma|\mu^*) = \mu^*(\sigma)$.

4 Parametrization and Model Fit

Preferences. Agents have CRRA utility with risk aversion σ. Entrepreneurs derive non-pecuniary benefits from running their own firm, which enter as a consumption flow in their utility.

$$u_w(c) = \frac{c^{1-\sigma}}{1-\sigma}$$
$$u_e(c) = \frac{(c+\bar{c})^{1-\sigma}}{1-\sigma}$$

Entrepreneurial Productivity. Entrepreneurs draw their productivity $\tilde{z}$ at birth, and it is fixed thereafter. I approximate the distribution of firm productivities using three values. The lowest type $\tilde{z}_1$, which is the majority of firms, represents mom & pop stores with just a few

[21] This abstracts of course from international differences in labor productivity/

employees. 80% of entrepreneurs belong to this category. In most countries, these firms never go public, as the fixed cost of doing so is too high relative to the value of their business. The larger two types of firms differ not only in terms of their productivity ($\tilde{z}_3 > \tilde{z}_2 > \tilde{z}_1$) but also in that the firm has value independently of its owner. For the lowest type of firms, I assume that death of the owner triggers firm failure.[22] The larger firms have sufficient brand value such that they can be taken over by another agent in case the owner dies. Most of these larger firms have productivity $\tilde{z} = 2$ (18% overall), and the remaining 2% of firms are of the largest type. I normalize $\tilde{z} = \{\tilde{z}_1, \tilde{z}_2, \tilde{z}_3\}$ such that the average level of productivity in the economy is 1. This leaves two parameters, $\frac{\tilde{z}_2}{\tilde{z}_1}$ and $\frac{\tilde{z}_3}{\tilde{z}_1}$ to be chosen. I confirm that the 80% - 12% - 2% split is a good approximation by showing that the distribution of firm sizes fits well overall. All firms exit with probability p_η, in which case their owner joins the pool of workers.

Worker Productivity. Worker productivity θ_t follows an AR(1) in logs. $log(\theta_t) = \rho_\theta log(\theta_{t-1}) + (1-\rho_\theta)\mu_\theta + \sqrt{(1-\rho_\theta^2)}\sigma_\theta\epsilon_t$, where $\epsilon_t \sim \mathcal{N}(0,1)$. I approximate this using a five-state Markov process. I normalize the mean of the process such that average endowment of effective units of labor equals 1. I assume a high persistence of labor income, and choose σ_θ such that model-implied dispersion in log earnings matches the cross-sectional variance of log disposable income in Germany, as estimated by Fuchs-Schuendeln et al. (2010).

Inheritance of Assets. For every household that dies, a new household is born who starts life with wealth equal to χ_I * assets of the deceased + $(1-\chi_I)$ * average assets of all deceased this period. χ_I is chosen as follows: in the HFCS, respondents are asked to report the value of all inheritances and gifts they have received over their life time. In order to identify χ_I, I compute the total value of such transfers as a fraction of total wealth held by young households in the economy. I consider three definitions of young households: less than 25, 30 and 35 years of age. Depending on the age cut-off, this fraction ranges from 44%-54%.[23] I therefore choose $\chi_I = .5$ as the baseline value, meaning that starting wealth of agents is made up of half their parents' wealth and half the average wealth.

Inheritance of Talent and Population Shares. I assume that all children of entrepreneurs are born with entrepreneurial talent. Moreover, heirs of owners of type 2 or type 3 firms inherit their parents' firm, and hence are type 2 or 3 entrepreneurs themselves. The distribution of entrepreneurial talent of descendants of the lowest type of firm is chosen such that, in steady

[22] Smith et al. (2017) document that, for pass-through businesses in the US, unexpected death of the owner leads to drastic reductions in profits and spikes in exit rates.

[23] These numbers are computed conditional on reporting a positive value. There is a large share of people that report zero gifts or inheritances. Without conditioning on positive transfers, the aggregate share of wealth that is inherited or gifted is 16%-20%

state, there are 80% small firms and 2% of the largest firms. If descendants of workers are born as entrepreneurs, they face the same initial distribution as heirs of low z types. If they are born as workers, they draw an initial productivity θ from the unconditional distribution. The probability that a worker's offspring has entrepreneurial talent is chosen such that, in steady state, the share of entrepreneurs in the population is 10%. This is the average share of entrepreneurs across Europe, as measured by the HFCS.

4.1 Quantification

The quantification strategy has two parts. First, there is a set of parameters that have either been estimated by many previous studies (e.g. the depreciation rate of capital), or can be directly estimated from the data without using the structure of the model (e.g. firm exit rates). These parameters are listed in Table 1. Second, I choose entrepreneurial productivity levels, the discount factor β and the three financial market frictions to match a set of moments for the French economy, listed in Table 2. I choose France as the baseline country since its level of inequality is average within the Eurozone, and Amadeus has especially good coverage in France.[24] The next section describes this procedure in detail.

4.2 Choice of Moments

Table 2 lists the French moments and model parameters. I assign each parameter one moment, based on which parameter that moment is most sensitive to. Of course, all moments are jointly determined by all parameters. I choose the dispersion of firm productivity, $\frac{\tilde{z}_2}{\tilde{z}_1}$ and $\frac{\tilde{z}_3}{\tilde{z}_1}$, to match the share of France's total wage bill that is accounted for by the top 25% and top 1% of firms. λ, the maximum share of the capital stock that can be financed through debt, is pinned down by the average leverage of private firms in the economy. The last two parameters both relate to equity markets: the fixed cost of going public, and the proportional monitoring cost paid by outside investors. The fixed cost governs mostly the extensive margin of public equity, i.e. how many firms choose to IPO. It is pinned down by the share of total firm value in private firms. The monitoring cost on the other hand mostly determines how much of their firm entrepreneurs sell, conditional on going public. It is therefore identified by the aggregate share of public firms that is in the hands of insiders. Conditional on all features of production and financial markets in the economy, the share of wealth held by the richest 10% of households is sensitive to β, agents' discount factor. The higher is the discount factor, the higher the desire to save of all agents. Workers' savings behavior is more sensitive to the discount factor though, so a higher β

[24] See Kalemli-Ozcan et al. (2015)

Table 1: Externally Set Parameters

	Value	Description	Comment
R	1.02	risk-free rate	
P_{death}	.02	death probability	average working life of 50 years
δ	.06	depreciation	Stokey & Rebelo (1995)
p_η	.0514	exit probability	average firm age 14 years
p_{yo}	.1	probability firm matures	age at IPO
ν	.9	returns to scale	
α	1/3	exponent on capital	capital share
ρ_θ	.9	persistence of worker prod	
σ_θ	.65	st.dev. of worker prod	Fuchs-Schuendeln et al (2010)
S_w	.9	share of workers	Share of worker in HFCS
χ_I	.5	parent wealth in starting assets	share of wealth inherited (HFCS)
$\bar{c}$	$2w\theta_1$	non-pecuniary benefits	

narrows the gap in savings rates between the two types of agents, translating into a lower top wealth share. Figure B.1 in Appendix B shows how the moments are affected by each parameter, starting from their baseline values.

In the model, wealth has two components: savings in the risk-free asset, and the value of firms. I measure the value of firms in the model in a similar way as in the data. In the data, the value of public firms is measured using the market value of equity, which includes both the book value of capital net of debt, and the value of the blueprint. Private firms are measured using self-reported values of entrepreneurs in the HFCS. Respondents are asked to report the value of all assets net of outstanding debt. I assume that this includes an estimate of the value of the blueprint. In the model, I measure the value of firms as follows: the value of capital is simply $k - b$. For public firms, the value of the blueprint is measured using the market value of outside equity. Private firms are not traded in the model, so determining the value of the blueprint is

less straightforward. I define the value of blueprints for private firms as the present discounted value of expected profits, discounted using the risk-neutral interest rate R. This assigns private firms the value they would have to a risk-neutral outside investor, assuming the entrepreneur still makes investment decisions. This measure of firm value is used both to compute the share of private firms in the economy, and the wealth of entrepreneurial households.

Table 2: Matched Parameters - France

Parameter	Value	Moment	Value
z_2/z_1	14.9	share of employment in top 25%	81.1%
z_3/z_1	57.0	share of employment in top 1%	18.3%
λ	.49	average leverage	44.2%
c_{IPO}	.16	share of private firms (value)	37%
c_M	.14	aggregate insider share	33.2%
β	.985	top 10% wealth share	52.5%

Notes: The fixed cost of IPO is reported as a fraction of the value of type 2 firm. The first three moments are calculated using the Amadeus Financial Module. Employment is measured as the wage bill. I winsorize at 1% both at the top and bottom. Leverage is defined as total outstanding liabilities, net of cash, as a share of total firm assets. The share of private firms, the insider share and the share of household wealth held by the richest 10% are based on my calculations using the HFCS, Compustat Global and the Amadeus Ownership Module. See section 2 for details.

4.3 Identification: the role of c_M and c_{IPO}

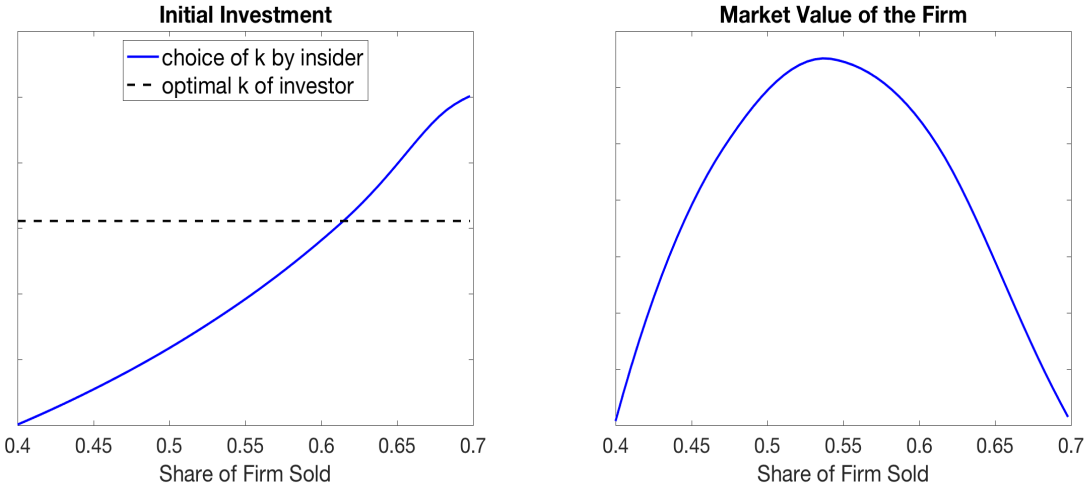
In this section, I show how the two equity market frictions, the fixed and monitoring cost, are separately identified by the two moments, the insider share and the share of private firms. To do so, I first show how investment policies depend on the entrepreneur's wealth and the share sold to outsiders. This then allows me to explain how the value of the firm is determined, as a function of the share sold. Using this, I analyze entrepreneurs' choice of how much of their firm to sell and how this choice depends on the financial frictions agents face. All graphs in the

following section are computed using the parameters matched to the French economy.

4.3.1 Investment Policies and the Value of the Firm

Investment in the firm is increasing in the share φ sold to outsiders. First, the more of the firm an entrepreneur sold, the less of any given amount of investment she needs to finance herself. She is therefore less likely to hit her borrowing constraint. Second, the less of the firm the entrepreneur owns, the less risk she is exposed to. This increases her willingness to invest in capital. Third, entrepreneurs who sol more of their firm have more liquid cash - the proceeds of the IPO - which they can use to finance investment. The left panel of Figure 4 illustrates this: it shows the initial investment of the entrepreneur, that is, the investment she makes in the period in which her firm goes public.

Figure 4: Investment and firm value as a function of the share sold to outsiders



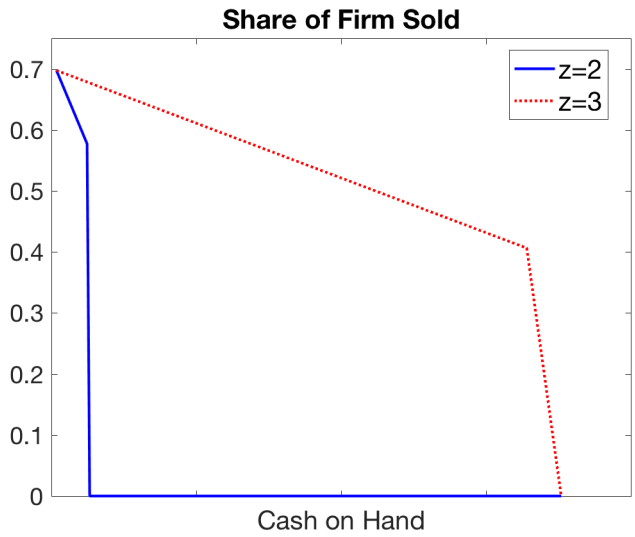
The market value of the firm, that is, the value of the firm to outside investors is a non-monotonic function of the share sold. This is a direct consequence of the insider's investment policy, in combination with the monitoring cost. From the point of view of outsiders, the monitoring cost acts like a reduction in firm TFP. Therefore, the optimal investment in the firm is lower for outsiders. This optimal investment level is depicted as the dashed line in the left panel of Figure 4. For low values of φ, the initial investment of the entrepreneur is below the optimal level from the point of view of outsiders, and hence the market value of the firm is increasing in the share sold. Eventually however, insiders invest more in the firm than the outsider would, at which point the value of firm starts declining in the share sold.[25]

[25]The exact point at which the market value peaks is not where initial investment crosses optimal investor k, since the value of the firm is forward-looking and hence takes into account future (rising) investment levels.

4.3.2 The optimal choice of φ

There are three main benefits of selling part of the firm to outside investors: access to additional outside finance, diversification, and 'cashing out' early and front-loading consumption. Entrepreneurs face a trade-off between these benefits and the reduction in firm value. The wealthier an entrepreneur is, the lower the benefits of diversification and access to finance, relative to the reduction in firm value. This implies that the share of the firm sold to outsiders is decreasing in entrepreneurial wealth, as Figure 5 shows. Further, the higher the firm productivity z, the larger the optimal scale of the firm, and the larger the benefits of external finance and risk-sharing. This explains why, conditional on the same level of wealth, owners of more productive firms sell off more of their company. This is precisely the mechanism in the model that generates a negative relationship between firm size and the insider share, which is one of the robust facts on public firm ownership I documented in Section 2.

Figure 5: Entrepreneurial wealth, productivity and the optimal insider share



The fact that the share sold to outsiders jumps down to zero at a certain level of wealth is due to the fixed cost of IPO. Entrepreneurs compare the value of selling the optimal share to outsiders to the value of remaining private, and choose to go public whenever the difference in values is large enough to justify paying the fixed cost. Where that threshold lies exactly, and hence what share of firms are publicly traded depends on all three parameters.

4.3.3 Dependence on c_M, c_{IPO} and λ

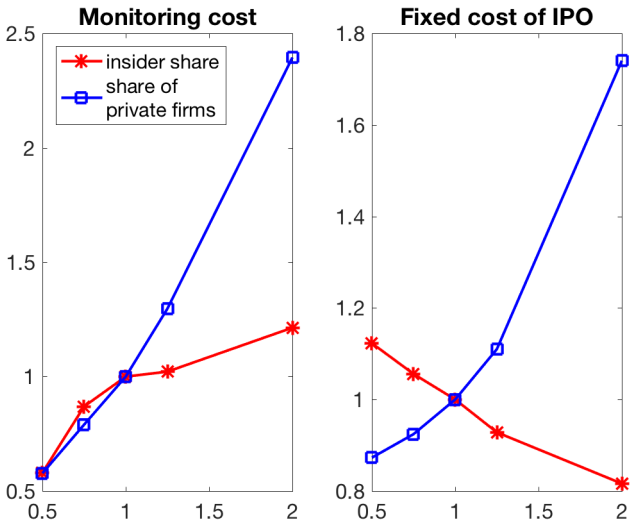
If both the fixed cost of IPO and the monitoring cost were zero, all mature type 2 and type 3 firms would go public immediately, and sell 100% of their company to outsiders. This is true irrespective of the tightness of borrowing constraints, so even if $\lambda = 1$. In the absence of any frictions, selling the company is simply selling a risky asset for its expected value.[26] If the fixed cost were zero, but $c_M > 0$, all mature firms would go public and sell some - potentially very small - share $\varphi < 1$. In such an economy, the share of private firms would be very low, and the average insider share would be moderate. If the monitoring cost were zero, but $c_{IPO} > 0$, all of the differences between firms would be along the extensive margin: below a certain wealth threshold, entrepreneurs would sell 100% of their firm, and sell none of it above this threshold. Such an economy would be characterized by a very low insider share, and a moderate share of private firms. Conditional on both equity costs, the tightness of borrowing constraints determines the value of running a private firm, and hence impacts how much fixed and variable costs entrepreneurs are willing to pay to access outside finance in the form of equity.

The previous exposition using extreme value of parameters also helps explain how c_M and c_{IPO} are separately identified in the model. Figure 6 plots the effect of the two parameters on the two moments related to equity: the share of private firms in the economy, and the insider share of public firms. The plot shows the effect of increasing or decreasing each of the two parameters one at a time, starting from the French baseline. The tightness of borrowing constraints λ is held constant, this parameter is mostly identified by average leverage in the economy.

As the left panel of Figure 6 shows, the monitoring cost c_M moves both the share of private firms and the insider share in the same direction. In an economy with higher c_M, entrepreneurs sell less of their firm if they do go public, and they are also less likely to go public. An increase in the fixed cost mainly changes the threshold level of wealth above which entrepreneurs decide to remain private. This increases the share of private firms in a similar way than the monitoring cost. Both increasing the fixed cost decreases the insider share due to a selection effect: only the firms that were planning to sell a large share still go public when c_{IPO} is higher, so conditional on going public, the average insider share is lower. λ, the tightness of borrowing constraints also affects the IPO choice, but it has a much larger effect on average leverage of firms. Taken together, the insider share, the share of private firms and leverage separately identify the three frictions in financial markets, conditional on any productivity distribution of firms. Figure B.1 in Appendix B plots the response of all moments to all parameters starting from the French

[26] This is not necessarily true for entrepreneurs with $z = 1$. For these types of firms, the entrepreneur's death triggers firm failure, which is priced in by outsiders.

Figure 6: The optimal insider share as a function of financial markets



Note: This figure plots the resulting moments when moving one parameter at a time, starting from the French baseline. Parameters and moments are normalized to the French benchmark value; the axes measure deviations from the benchmark values.

baseline.

4.4 Model Fit

Table 3 compares the model to non-targeted moments in the French data. The first set of moments show how well the model fits the overall distribution of wealth. The share of households who have no wealth is low in France, at 3.9%. The model comes close to matching this, which confirms that a zero borrowing limit is a good assumption. The model also matches the overall distribution of firm size well, as the second part of Table 3 shows. The model also generates a negative relationship between firm size and the insider share, which was one of the robust facts on I documented in Section 2.

5 Results

This section presents the main results of the paper. They are split into three parts: First, I estimate the TFP process and financial markets parameters for a set of other Eurozone coun-

Table 3: Model Fit - France

Moment	Data	Model
Top 25% wealth share	75.3%	71.4%
Top 5% wealth share	39.9%	43.0%
Top 1% wealth share	15.4%	23.6%
Share of Hh with wealth ≤ 0	3.9%	1.8%
Top 10% labor share	62.7%	64.2%
Top 5% labor share	48.8%	42.3%
Slope of insider share wrt size	-.024	-.005
Wealth Entrepreneurs / Workers	3.8	5.4
Share of Wealth held by Entrep	27.3%	43%

Notes: Inequality moments are based on HFCS. Firm moments are from Amadeus. The slope of the insider share with respect to size comes for a regression of the insider share on log(assets) in model and data.

tries, and assess how well the model fits inequality in each of these countries. Second, I use the quantified model to conduct counterfactuals. In particular, I show what my model would predict for household wealth inequality if other countries were to have France's financial market institutions, that is, its values of the frictions λ, c_M and c_{IPO}. Last, I decompose these counterfactuals into the contribution of frictions in debt and equity markets. This sheds light on the main mechanisms at play in the model, and also illustrates how debt and equity markets differentially affect aggregate output and inequality.

5.1 Matching Germany, Austria and the Netherlands

The quantification for other countries proceeds as follows: I keep all externally set parameters constant at their values listed in Table 1, keep the discount factor constant at the level estimated in the previous section, and choose the TFP process as well as the three financial market parameters to match the same set of five moments as I did for France.

5.1.1 Germany

As listed in Table 4, there are significant differences between Germany and France when it comes to ownership and financing structures of firms. German firms have an average leverage of 51.9%, compared to 44.2% in France, which explains why λ^{DE} is much higher than λ^{FR}. Through the lens of the model, German creditors have stronger rights in the case of firm failure, increasing their willingness to lend. This implies that German firms can finance more extensively with debt. The second significant difference between Germany and France is the relative importance of private and public firms: While in France, only 33% of firm value is accounted for by privately held firms, this number is almost double in Germany, at 59%. Therefore, I estimate a higher fixed cost in Germany. Last, Germany has a lower insider share than France. Although fewer firms go public in Germany, those that do sell a higher fraction of the company to outsiders. The model rationalizes this through a combination of the higher fixed cost - which reduces the insider share cet.par. -, and a slightly lower monitoring cost.

Table 4: Parameters & Moments: Germany

Parameter	Value	Moment	Value
z_2/z_1	22.8	share of employment in top 25%	82.6%
z_3/z_1	65.6	share of employment in top 1%	16.1%
λ	0.60	average leverage	51.9%
c_{IPO}	0.28 $V_F(z_2)$	share of private firms (value)	58.9%
c_M	0.13	aggregate insider share	28.0%

Tables B.1 - B.3 in Appendix B assesses the fit of the model for Germany, Austria and the Netherlands on non-targeted moments.

5.1.2 Austria

The main difference between France and Austria is the insider share. In Austria, nearly 60% of public equity is in the hands of insiders, which is the highest share among Eurozone countries. As a result, I estimate a large monitoring cost, more than twice as large as in France. Since the

monitoring cost is so high, the fixed cost of going public in Austria has to be low, in order for any firms to be willing to jump over that hurdle. Consequently, I estimate a very low fixed cost of IPO for Austria. The average leverage of firms is very similar in the two countries, and so is the estimated debt constraint, λ. All moments and parameters are collected in Table 5.

Table 5: Parameters & Moments: Austria

Parameter	Value	Moment	Value
z_2/z_1	12.7	share of employment in top 25%	74.0%
z_3/z_1	35.1	share of employment in top 1%	13.1%
λ	0.49	average leverage	43.8%
c_{IPO}	.002 $V_F(z_2)$	share of private firms (value)	78.6%
c_M	0.34	aggregate insider share	57.4%

Note that I estimate a higher value of the borrowing limit λ in Austria, although average leverage is actually slightly lower than in France. The reason for this is that there are more (mature) private firms in Austria, some of which have saved out of being constrained, and hence have low leverage. Therefore, the model needs a higher value of λ to produce same level of leverage as in the French economy.

5.1.3 The Netherlands

The Netherlands are a unique country in the Eurozone in that outside equity plays a very important role. At the same time, average leverage of firms is low. According to my calculations, merely 11.4% of the value of firms is privately held, and the insider share is very low at 16.2%. Further, their firm size distribution is less concentrated than in other countries, with the top 25% of firms accounting for only 67.1% of the country's wage bill, compared to 81.1% in France. My model cannot fully match the low share of private firms, even if the fixed cost is zero, since there is always a mass of young firms, who have not yet matured and hence are not allowed to go public. Therefore, I set both the fixed and monitoring cost to zero and choose λ as well as the TFP process to match the other three moments. The results are displayed in Table 6. The

model comes very close to matching the share of private firms and the aggregate insider share. The reason the insider share is positive despite a monitoring cost of zero is twofold: First, I set the minimum insider share to 5% in the model.[27] All firms with $z = 2$ or $z = 3$ choose this minimum value for the insider share, given that the monitoring cost is zero. Second, the lowest type of firm, those with $z = 3$, choose an insider share higher than the minimum, even when the monitoring cost is zero. This is because entrepreneurs have zero utility in case they die, and therefore put zero weight on firm profits in that state of the world. For the low productivity firms, the entrepreneur's death triggers firm failure, which effectively makes the investment less profitable from the point of view of the investor. This has similar effects to the monitoring cost: from the point of view of outsiders, optimal investment is lower, which induces a hump-shaped relationship between firm value and share sold, implying an interior solution for the choice of insider share.

Since leverage is relatively low in the Netherlands, I estimate a value of λ that is lower than in France.

Table 6: Parameters & Moments: Netherlands

Parameter	Value	Moment	Data	Model
z_2/z_1	5.4	share of employment in top 25%	67.1%	67.5%
z_3/z_1	19.3	share of employment in top 1%	12.7%	12.8%
λ	.417	average leverage	38.4%	38.4%
c_{IPO}	.0 $V_F(z_2)$	share of private firms (value)	11.4%	12.2%
c_M	.0	aggregate insider share	16.1%	15.2%

[27] This assumption has no effect on other countries, since their monitoring cost prevents any entrepreneur from selling such a high fraction of their firm.

5.2 Wealth Inequality across Eurozone Countries

The first test of the model is how well it does in predicting inequality across countries. For France, the discount factor β was selected to match the share of wealth held by the richest 10%, so the model hits that moment by construction. For all other countries, I re-estimated only parameters related to firms: the TFP distribution, and three financial market frictions. Table 7 shows the main results. The first column lists the data moments for each country: the share of household wealth held by the richest 10%. The range across countries is large, going from less than 43% in the Netherlands, to around 53% in France all the way to over 59% in Germany and Austria. As shown in Table 7, the model does very well at predicting these levels of inequality. It replicates the fact that the Netherlands has much lower wealth inequality, while Austria and Germany are more unequal than France; and also correctly predicts the magnitudes of these differences.

Having estimated primitives and financial market parameters for different countries, and confirmed that the model does well at matching wealth inequality, I can now use it to run counterfactuals. The main purpose of this is twofold: First, I will show that most of the differences in wealth inequality across countries is driven by financial market frictions, as opposed to the TFP process. I show that by running two counterfactuals: Other countries adopting French financial market institutions, but keeping their own distribution of firm productivity, and vice-versa. Second, I will decompose the differences between countries into the components coming from each of the three aspects of financial markets. This allows me to explain the channels in more detail, and highlight the effect of each of the three parameters on inequality and aggregate output. All of the counterfactuals are steady state to steady state comparisons.

Table 8 summarizes the results of these two counterfactuals. The first part of the table shows the effect on inequality and aggregate output of each country adopting all three French financial market parameters. This moves all three countries down to 52.1% - 52.9%, very close to the French level of 52.6%. This already indicates that there is little room for differences in wealth inequality across countries coming from differences in the firm productivity distribution only. This is confirmed in the second part of the table.

Table 8 also shows the change in aggregate output that would result from each country adopting the French level of financial market frictions. Aggregate output is measured as the total value of all domestic production, including the resources that are used to monitor insiders. Defining it this way avoids mechanically increasing or decreasing output as the monitoring cost changes.

Table 7: Wealth Inequality across Countries: Model and Data

	top 10% wealth share	
	Data	Model
France	52.5%	52.5%
Germany	59.1%	60.1%
Austria	59.4%	60.6%
Netherlands	42.6%	43.9%

Note: The top 10% wealth share in the data is computed using the HFCS, and Compustat Global and Amadeus Ownership to infer the value of insider shares of public firms. See Section 2 for details. The right column shows the model predicted share of wealth held by the top 10% of households in the stationary distribution. Wealth includes holdings of the risk-free bond, capital net of debt in the firm, as well as the market value of firm shares owned by households.

Comparing the counterfactual change in output between Germany and Austria is a first hint that the exact channel through which the change happens is important for determining the change in output. Austria and Germany have similar levels of inequality, both in the baseline and counterfactual equilibrium. But while in Austria, aggregate output would increase by 3.8% as a result of the change in financial market institutions, German GDP would remain essentially unchanged. This happens because most of the difference between France and Austria lies in equity markets. For Germany, switching to French financial markets is a combination of decreasing leverage, which decreases both inequality and output, and increasing access to outside equity, which decreases inequality and increases output. Taken together, these two almost offset each other, and output would remain virtually unchanged. The Netherlands are similar to Austria, but in reverse, since its equity markets are more developed than the French ones. The next two sections provide more detail on the link between financial markets and inequality, and decompose the counterfactuals into the contribution of each of the three parameters.

Table 8: Counterfactuals: Introducing France's financial markets

	FR	DE	AT	NL
Baseline	52.6%	60.1 %	60.6%	43.9%
French financial markets				
Top 10% wealth share		52.8%	51.9%	52.4%
Change in output		+.04%	+3.8%	-3.4%
French TFP process				
Top 10% wealth share		60.3 %	61.0%	43.9%

5.3 Access to Debt and Equity, and the Effect on Wealth of Entrepreneurs

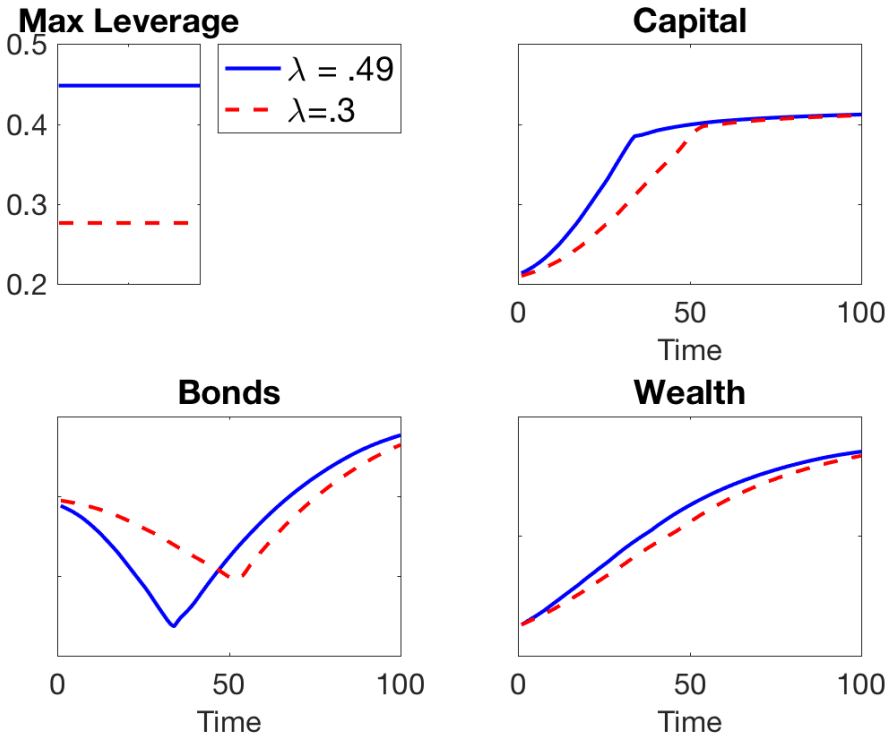
Table 8 shows that, for some countries, the counterfactual of adopting French financial market institutions moves inequality and output in the same direction, while they move in opposite directions for other countries. The effect of any financial market friction on aggregate output is straightforward. Both higher leverage and more outside equity, either through a lower fixed cost of IPO, or a lower monitoring cost, allows poor, but talented entrepreneurs to increase investment in their firm. This unambiguously increases aggregate output. The relationship between financial frictions and inequality is more subtle, and could in theory go either way. The main mechanism driving this relationship in the model works through the wealth accumulation of entrepreneurs. Since the savings behavior of workers is largely unaffected by these parameters, anything that increases wealth holdings of entrepreneurs in the steady state increases wealth inequality in the economy.[28]

Leverage and Wealth Accumulation The effect of λ on the savings behavior of entrepreneurs in my model is similar to what other quantitative papers on entrepreneurship have found. Like in, for example, Cagetti and DeNardi (2006), loosening borrowing constraints would increase

[28]Workers are affected by entrepreneurial savings only inasmuch as these determine the starting distribution of assets for former, failed, entrepreneurs.

steady state inequality. Although the details of the model are different, the most important channel is the same: the higher the debt constraint, the more capital entrepreneurs can invest in their firm, the more profits they make, and the more they save. Figure 7 illustrates this: It plots the evolution of capital, savings in the risk-free asset, and household wealth over time for two entrepreneurs: one who faces the French debt constraint $\lambda^{FR} = .49$, and one who faces a tighter borrowing constraint. Both entrepreneurs start out with the same level of wealth, and their time path is simulated assuming that they and their firm survive for 100 periods.

Figure 7: Capital, Savings and Wealth for two Values of λ



Evolution of capital, bond holdings and wealth for two entrepreneurs who face $\lambda = .59$ and $\lambda = .3$ respectively. The start out with the same level of cash on hand, and their time path is simulated assuming that they never die and are never hit by the exit shock.

The top left panel shows the maximum share of capital that can be financed by debt, $\frac{b}{k} = \frac{(1-\delta)\lambda}{R}$. The bottom left panel plots the evolution of holdings of the risk-free asset both for the French entrepreneur (the blue solid line), and the entrepreneur who faces a tighter borrowing constraint (the dashed red line). Tighter borrowing constraints imply that the entrepreneur can borrow less, and hence invests less in their firm (top right panel). Over time, she saves out of the constraint and her level of investment in the firm slowly catches up with the investment by the French

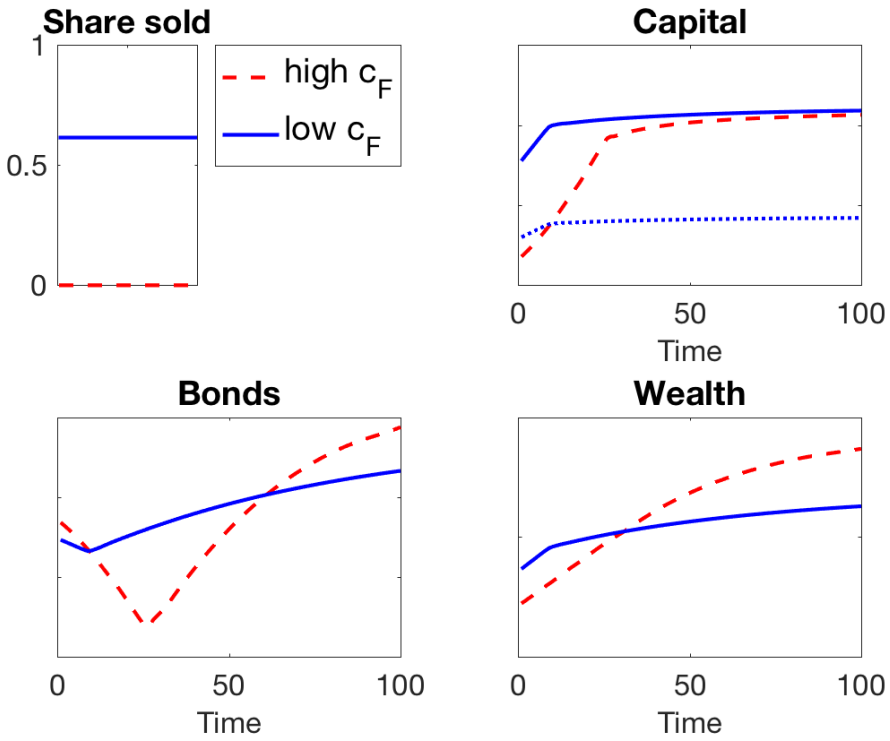
entrepreneur. The bottom right panel plots the evolution of wealth for both entrepreneurs. With tighter borrowing constraints, wealth accumulates more slowly.

Leverage increases wealth inequality through one additional channel in my model: the higher is λ, the fewer firms go public, all else equal. The next section illustrates why less outside equity increases inequality in the model.

Outside Equity and Wealth Accumulation Figure 8 shows a similar exercise as for λ, but compares an entrepreneur who is private with one who went public. The difference between the two entrepreneurs lies in the fixed cost of IPO they face: The solid blue line again shows an entrepreneur in France, whose initial wealth is such that she chooses to go public and sell about 60% of her company to outsiders. The dashed line corresponds to the time path of an entrepreneur who lives in an economy with a fixed cost that is high enough to deter her from going public. All other parameters are left at the French baseline values. The main mechanism would also be at play when comparing two public entrepreneurs with different insider shares, so an economy with low and high monitoring costs.

At $t = 0$, the French entrepreneur sells 60% of her company. As depicted in the top right panel of Figure 8, the IPO allows the French entrepreneur (solid blue line), to rapidly increase investment in her firm. She can do that for two reasons: First, only 40% of any given amount of investment (net of borrowing) needs to be financed by her, which is depicted as the dotted blue line in the same panel. Second, the proceeds of the IPO give her additional cash, which is the reason why *her* share of capital - the dotted blue line - is higher than the capital invested by the entrepreneur who remained private - the dashed red line. The private entrepreneur slowly accumulates wealth, expands her firm and saves out of the borrowing constraint. As illustrated by the bottom left panel, she borrows heavily for a longer period of time than the public entrepreneur, but eventually also starts saving, and does so at a higher rate. Finally, the bottom right panel shows the evolution of wealth that results from these mechanisms. Initially, then French entrepreneur is wealthier than she would have been in an economy with a higher fixed cost. This is mainly because the availability of financing through outside equity increases the value of her firm substantially. Eventually though, the wealth level of the private entrepreneur surpasses the French entrepreneur's, a feature that is mostly driven by precautionary savings. After 50 model periods, the private entrepreneur still runs a smaller firm than the public one. At this point, she is no longer at her borrowing constraint and is wealthier than the public entrepreneur. Why then does she choose lower investment in her firm? The reason is that her portfolio is much riskier. She owns 100% of her firm, which means that she would have to absorb 100% of the losses in case her firm exits, as opposed to 40% in the case of the French entrepreneur.

Figure 8: Capital, Savings and Wealth for two Values of c_{IPO}



Evolution of capital, bond holdings and wealth for two entrepreneurs, one who faces French financial markets, and one who faces a high enough fixed cost that deters him from going public. The start out with the same level of cash on hand, and their time path is simulated assuming that they never die and are never hit by the exit shock. The dotted line in the top right depicts capital help by the public entrepreneur directly, i.e. $(1-\varphi)k$.

This leads her to save, accumulate wealth, and run a smaller firm. Since there are enough older entrepreneurs in steady state, the second part of the wealth accumulation process outweighs the first, and inequality is decreasing in the availability of public equity.

5.4 Decomposition: the contribution of λ, c_{IPO} and c_M

Table 9 shows the quantitative effect of each of the three financial market parameters, starting from the German values, which is listed in column (1). Column (5) shows the result of the counterfactual involving all three financial market parameters, as described in Table 8. In addition to moving very close to the French level of inequality of 52.5%, the share of private firms, the insider share, and average leverage are all similar to the French level. Columns (2)-(5) move one of the three financial market parameters at a time. Compared to France, Germany has less tight debt constraints, $\lambda^{DE} = .6$ compared to $\lambda^{FR} = .49$, a higher fixed cost of IPO, $c_{IPO}^{DE} = .28$ compared

to $c_{IPO}^{FR} = .17$, and a slightly slower monitoring cost, $c_M^{DE} = .13$ compared to $c_M^{FR} = .14$.

Table 9: Decomposition: French financial markets in Germany

	(1)	(2)	(3)	(4)	(5)
	Baseline	λ	c_M	c_{IPO}	all
Top 10% NW	60.1%	56.5%	61.8%	54.6%	52.8%
Output		-0.67%	-0.36%	+1.17%	+.04%
Share priv firms	58.9%	46.4%	65.4%	38.6%	34.3%
Leverage	51.9%	43.9%	51.4%	52.3%	44.1%
Insider share	27.5%	26.4%	28.0%	34.0%	33.1%

Note: All columns display steady state equilibrium moments, using the German productivity distribution. Column 1 shows the baseline number for Germany, the next three columns move one financial market parameter at a time to the French level. The last column does all three financial market parameters at once.

Only changing the borrowing constraint to French levels would reduce inequality to 56.4%, and reduce aggregate output by almost 1%. In this counterfactual economy, average leverage would be much lower, which is the main driver of both the change in output and inequality. As a result of tighter borrowing constraints, there would be more public firms. All else equal, running a private firm is now less profitable, so more entrepreneurs find it worthwhile to pay the fixed cost of going public. This mitigates some of the effect on both inequality and aggregate output, but the direct effect of λ outweighs the indirect effect through more IPOs.

If Germany had the same cost of IPO as France, there would be significantly fewer private firms in the economy: Their share of firm value would decrease from about 58% to 39%. At the same time, the average insider share in the economy would increase, since the firms who were previously deterred from going public are exactly the ones who were planning to sell a smaller share of their firm. Since this is mostly a shift from private firms to public firms (albeit with a higher insider share), inequality decreases and output increases. The mechanism for this is exactly as described in the previous section. If only the monitoring cost were increased to the

French level, there would be more private firms, a higher insider share, less output and more inequality. Since the difference in the monitoring cost is relatively small, moving both financial market parameters to the German level would be quite similar to moving the fixed cost only.

Taken together, both debt and equity market frictions push for lower levels of inequality when moving from the German equilibrium to one with French financial markets. Only in combination can these two sets of frictions account for the difference in wealth inequality between the two countries. When it comes to aggregate output however, frictions to debt and equity markets have opposite effects. The negative effect of tighter borrowing constraints outweighs the positive effect of cheaper access to outside equity. On net, German GDP would decrease slightly if they were to adopt French financial markets.

6 Discussion

Comparing the results of a counterfactual introduction of French financial markets in Germany and Austria highlights that frictions to debt and equity markets have differential effects on steady-state equality and efficiency. Both of these are useful summary statistics, but are not sufficient to evaluate welfare consequences of counterfactual changes in financial market institutions. In the first part of this section, I briefly discuss the distributional effects of changing financial market parameters and analyze, for the case of Austria and Germany, who would benefit and who would lose in the counterfactual.

6.1 Welfare

I analyze the welfare effects of any changes in financial market institutions by groups of agents. I split agents by their labor market status - worker and entrepreneur - and where relevant, I also group people by their current level of wealth. The thought experiment I am considering is: does a worker with EUR1000 in assets / the owner of a private firm of type $z = 2$ with a level of cash on hand of EUR1000 prefer to live in Germany with German or French financial markets?

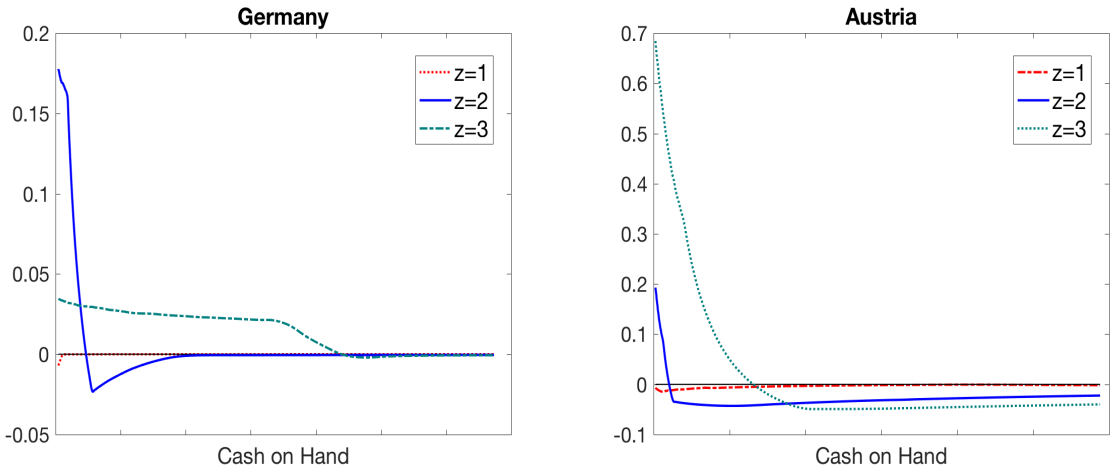
The effect of any counterfactual on the welfare of workers is straightforward: welfare increases if and only if the economy's wage rate is higher in the counterfactual. Any reduction in financial market frictions will increase the economy's wage rate. Lower frictions imply that entrepreneurs have more access to outside finance, increase investment and labor demand, which increases wages.

The general equilibrium effect through the wage rate affects entrepreneurs in the exact opposite way: a higher wage rate increases labor costs and reduces their profits. Since exit rates are

relatively low at 5.2%, the fact that they might become workers in the future is small compared to the immediate effect on firm profits. Only entrepreneurs are directly affected by changes in financial market institutions. While the direction oft he direct effect is always the same for all entrepreneurs, how strongly they are affected depends on both their type and asset level. A higher λ, which corresponds to a loosening of borrowing constraints has non-negative welfare effects on all entrepreneurs. The wealthier an entrepreneur, the less she relies on debt, and the lower the direct welfare effect of λ. A similar argument holds for the two equity parameters, c_M and c_{IPO}: the wealthier an entrepreneur, the less she relies on public equity, and the less she is affected by changes in the associated costs. In addition, the lowest TFP firms never go public in most countries and counterfactuals, so they are affected only through the change in the wage.

Figure 9 plots the consumption-equivalent welfare gains for German and Austrian entrepreneurs from moving to a counterfactual equilibrium with French levels of financial market frictions. In both countries, the counterfactual wage is higher, by 3.7% in Austria and 0.3% in Germany.

Figure 9: Consumption-Equivalent Welfare Gains for Private Entrepreneurs



In Germany and Austria, entrepreneurs with the lowest productivity $z = 1$ are worse off with French financial markets, since wages increase and borrowing constraints tighten. The wealthier the entrepreneur, the smaller the effect, which is largely due to the fact that richer entrepreneurs rely less on debt financing. The welfare effect on the two larger entrepreneurs is also qualitatively similar on both countries. Poor entrepreneurs enjoy welfare gains, since for them, the positive effect of lower frictions in equity markets (c_M in the case of Austria, c_{IPO} in the case of Germany) outweighs the negative effect of higher wages and tighter borrowing constraints. Wealthier entrepreneurs lose in this counterfactual: even with french financial markets, they do not go public or sell very little of their firm. For them, the downward pressure on profits through higher wages

and the tighter borrowing constraints reduce welfare.

The main difference between the two countries is due to the differential effect of the monitoring and fixed cost. In Germany, the counterfactual mainly changes the fixed cost of IPO. This has a large effect on poor owners of medium productivity firms. The lower fixed cost allows them to go public, which positively affects their welfare: not only is their firm more valuable now that they list it on the stock market, their expected consumption path is less volatile, since they cashed in on a share of uncertain profits at IPO. In Austria, most of the difference to France lies in the monitoring cost. Since this is a proportional cost, it has larger effects on the most productive firms, so the poorest and most talented entrepreneurs, those with $z = 3$, are the ones that benefit most from the introduction of French financial markets.

6.2 What are financial market frictions?

Why do German firms have access to more debt, and find it harder to go public than French or Dutch firm? And what does it mean for Germany to adopt France's financial market institutions? This section discusses observable features of corporate governance or other institutions that differ across countries and could be responsible for the financial frictions backed out using the quantitative model. A large literature, pioneered by LaPorta et al. (1998) and LaPorta et al. (1997), has argued that laws and institutions, in particular the protection of creditor and shareholder rights, have economically significant impacts on the availability of external finance across countries. The following section, which is speculative in nature, follows this tradition of trying to identify specific laws and institutions that might be responsible for better investor protection in come countries.

6.2.1 Monitoring Cost

In the quantitative model, shareholders of public firms need to pay a monitoring cost to prevent the insider from misusing company funds. The cost is increasing in company size and the share held by outside investors, and it has a country-specific component, c_M. The following simple two-period model micro-founds this functional form. The model is then used to discuss how institutional features such as a country's accounting standards or the right of shareholders to sue directors map into c_M.

Consider an entrepreneur who has an idea for a business project. Capital k needs to be invested at $t = 0$ and generates revenues $y = \begin{cases} zk^\nu & \text{if } \eta = 0 \\ 0 & \text{if } \eta = 1 \end{cases}$ in period $t = 1$. In period 0, the entrepreneur can sell a fraction $\varphi \in [0, 1)$ of period 1 profits to an outside investor. In period 1, η is realized, but it is only observable to the entrepreneur. In case the project succeeds, she can either report

truthfully, in which case she receives $(1-\varphi)\, z\, k^{\nu}$, or she can lie and keep the entire output. In the corporate governance literature, such shareholder expropriation is referred to as self-dealing or tunneling and can take the form of excessive compensation, nepotism in executive hiring, transfer pricing, or outright theft of company assets (see, for instance Djankov et al. (2005)).

With probability p, insiders are caught, at which point they receive none of the output and pay a fine C. In this simple set-up, entrepreneurs will truthfully report the realization of η iff $(1-\varphi) \geq (1-p)zk^{\nu} - pC$. The higher is p, the detection probability, and C, the punishment in case they get caught, the less appealing is expropriation.

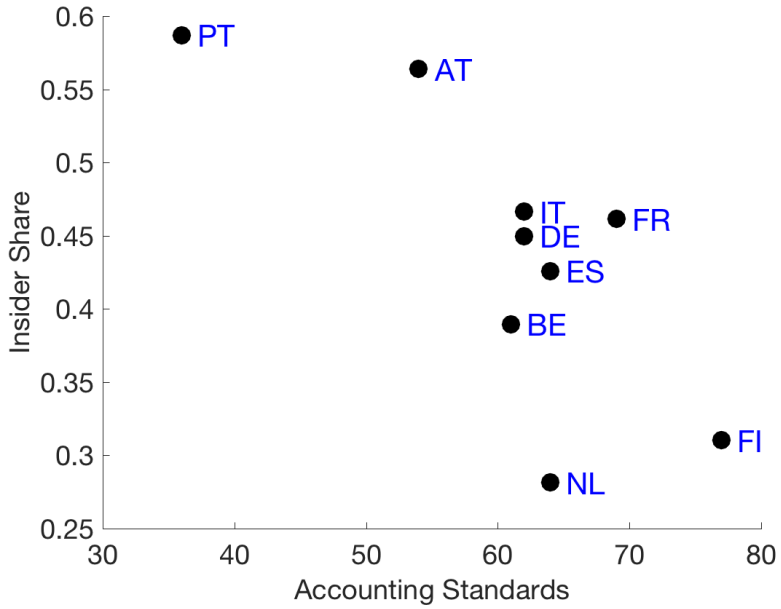
Ex-ante Monitoring Setting the punishment $C = 0$, the minimum level of p such that insiders are incentivized to report truthfully is simply φ, the share of the project financed by outside equity. The larger is φ, the less skin in the game insiders have, and the more they need to be monitored. Suppose that outside investors can spend resources to monitor the insider, that is, to increase the probability that she will be caught in case she lies about η. To achieve a level of detection probability p, the outsider needs to spend resources $e(p) = c_M\, p\, zk^{\nu}$. This cost is increasing in zk^{ν} since it involves for instance keeping a close eye on the firms' books, which is more costly the larger is the firm.

This formulation exactly maps into the monitoring cost used in the quantitative model. It also points to a possible driver of c_M across countries: accounting standards. The better are accounting standards in a country, the harder it is for insiders to hide any fund diversion, and the less effort $e(p)$ is required by individual investors. This variable has been proposed by LaPorta et al. (1998) as a determinant of the enforcement of investor rights. The authors also provide a measure of accounting standards across countries, based on examination of company reports across countries.

Figure 10 plots the measure of accounting standards developed by LaPorta et al. (1998) against the average insider share in each of the nine countries. The relationship between the two measures indicates that in countries with better accounting standards, more widespread corporate ownership is facilitated. This correlation is merely suggestive however, it could be the case that countries with more dispersed ownership of public equity have developed better accounting standards.

Ex-Post Punishment Fixing the probability of detection, the minimal level of punishment required to deter insiders from misreporting is $C = \frac{1-p}{p} zk^{\nu}\varphi$. Again, this is increasing in output and the share of the company financed with inside equity. LaPorta et al. (1998) argue that legal mechanisms which can be used by minority shareholders against perceived oppression by directors

Figure 10: Accounting Standards and the Insider Share across Countries.



Notes: Measure of accounting standards is based on LaPorta et al. (1998). Insider share is the average share of public firms in each country held by the top three shareholders, based on Amadeus.

are a key component of corporate governance. In the US, derivative suits give shareholders such legal recourse. In Europe, this is much less common, which might be one explanation for why corporate ownership is more concentrated in general. According to the World Bank's International Finance Corporation IFC (2015), Germany and Austria are the only two of the nine countries covered in this paper where shareholders cannot enforce directors' duties in their own name. In Italy and Spain, it is in principle possible, but under more stringent conditions than in other countries. These four countries have relatively low shares of publicly traded firms.

6.2.2 Cost of IPO

Underwriting fees are arguably the single largest expense associated with an initial public offering. Abrahamson et al. (2010) collect data on gross spreads for IPOs across countries between 1998 and 2007. Although their focus is on the comparison between the US and Europe, two interesting facts within Europe emerge. First, spreads are decreasing in proceeds, which justifies the assumption of a fixed cost component of going public. Second, Germany has larger spreads than any other other European country considered. In particular, spreads on German IPOs of all sizes are significantly larger than in France. This is one promising explanation for what is driving the difference in IPO cost I estimate between France and Germany.

6.2.3 Collateral Constraint

The formulation of debt market frictions in my quantitative model is standard in the entrepreneurship literature (used, among many others, by Buera and Shin (2011) and Moll (2014)). A collateral constraint such as $b \leq \lambda \frac{1-\delta}{R} k$ can arise as a result of a limited enforcement problem. Suppose an entrepreneur with investment has access to the same technology as in Section 6.2.1. In period 0, she can issue risk-free debt b. In period 1, after finding out whether her project succeeded or failed, she chooses to either repay her debt or walk away from her obligations. If she does not repay her debt, she keeps a fraction $(1 - \lambda)$ of the capital, and none of the output. Since not repaying is more appealing in case the project fails, the following condition ensures that creditors are always repaid: $\frac{1-\delta}{k} - Rb \geq (1 - \lambda)\frac{1-\delta}{k}$. This implies the collateral constraint used in the quantitative model.

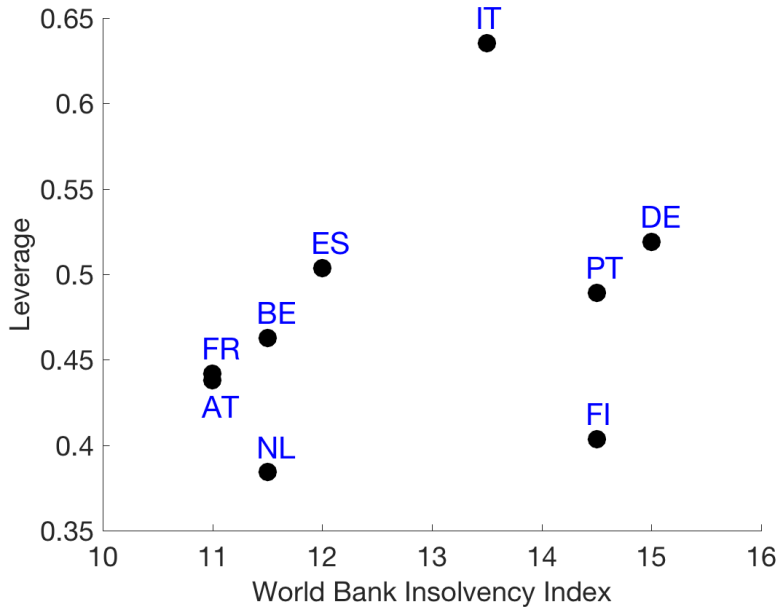
The World Bank developed an index capturing the strength of creditor rights. It includes both measured of time, cost and outcome of insolvency proceedings, as well as the strength of the insolvency framework. The strength of the insolvency procedure depends, for instance, on whether creditors can initiate liquidation and reorganization proceedings. Countries with a higher index have stronger protection of creditors, allowing them to recover more of their investment. Through the lens of the simple model, this increases λ. Figure 11 illustrates that leverage is indeed higher in countries with stronger creditor rights.

7 Conclusion

Why is wealth inequality high in some countries, and lower in others? This paper argues that ownership and financing structures of firm are an important determinant of differences in inequality across Eurozone countries. As such, it fits into an active literature on entrepreneurial savings and investment, and how these depend on financial markets. It adds a new dimension, public equity, to the existing literature, which has focused on entrepreneurs running private companies and their access to debt. The quantitative results of the paper indicate that the combination of debt and equity market frictions can account for differences in wealth inequality across countries.

Combining micro data on households and firms in nine Eurozone countries, I show that more unequal countries have more closely held firms. This has two components: First, there are more privately held as opposed to publicly traded firms. Second, insiders - the top three shareholders - own larger fractions of public companies. An accounting decomposition illustrates that these two types of closely held firms account for 54% of the differences in wealth inequality across

Figure 11: Creditor Protection and Average Leverage



Notes: Insolvency Index is from the World Bank's Doing Business Database. Leverage is average leverage of private firms in each country, calculated from Amadeus.

countries.

To explain how firm ownership is chosen and how this affects wealth inequality, this paper develops a dynamic general equilibrium model of workers and entrepreneurs. Entrepreneurs face a choice of firm ownership: they can either stay private, and finance with debt and internal, or go public and issue outside equity. Motivated by the facts on corporate ownership in Europe, public firms are run by a risk-averse insider, who chooses the split between inside and outside equity. Both debt and equity issuance are subject to country-specific frictions that capture the strength of creditor and shareholder protection.

Quantified to match moments of the firm distribution, including leverage ratios and the split between inside and outside equity, the model successfully replicates the level of inequality in four comparison countries. I find that Germany has a higher top wealth share than France because it has higher equity and lower debt market frictions. These are identified by the fact that German firms are less likely to be public, and the private firms have higher leverage. Counterfactuals show that introducing French financial markets in German would reduce wealth inequality to the French level and leave GDP essentially unchanged. This is due to the fact that tightening debt constraints both reduces output and inequality, while reducing equity market frictions simultaneously reduced inequality and increases output.

This paper has assumed that one entrepreneur can only be the insider of one firm. There is suggestive evidence that in many European countries, entrepreneurial families control several of the largest companies. This is a promising avenue for future work. Amadeus is in principle suited for an analysis of ownership concentration *across* firms. If confirmed by the data, families controlling multiple firms not only has effects on the wealth distribution, but also on competition between large companies.

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A Data

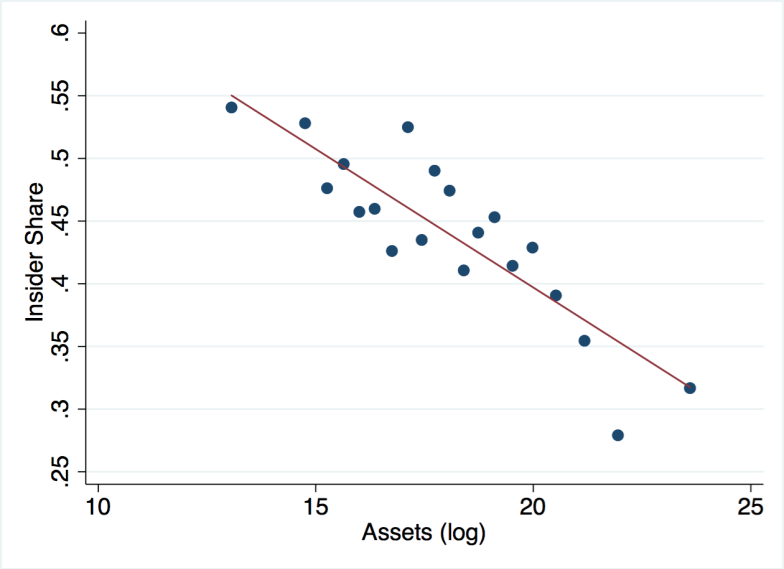
A.1 Insider Share

Table A.1: Insider share, country and firm size

	(1)	(2)	(3)
VARIABLES	insider_share	insider_share	insider_share
AT	28.25***		27.24***
	(4.727)		(5.176)
BE	10.80***		10.37**
	(3.634)		(4.208)
DE	16.83***		12.89***
	(2.825)		(3.488)
ES	14.44***		8.283**
	(2.959)		(3.671)
FI	2.871		2.960
	(3.709)		(4.320)
FR	17.98***		15.39***
	(2.805)		(3.467)
IT	18.50***		16.43***
	(3.166)		(3.806)
PT	30.56***		30.59***
	(4.908)		(5.784)
log_assets		-2.209***	-2.305***
		(0.251)	(0.255)
Constant	28.15***	83.87***	72.80***
	(2.570)	(4.587)	(5.885)
Observations	2,679	2,208	2,208
R-squared	0.034	0.034	0.064

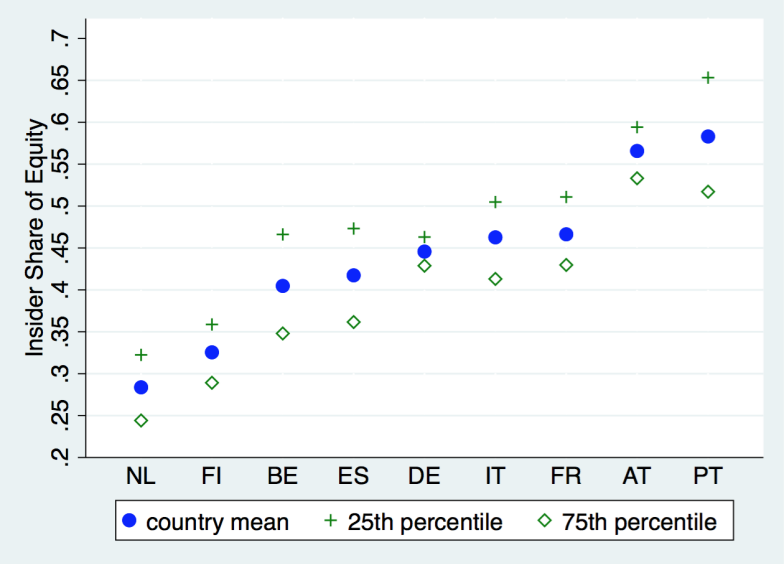
An observation is a firm. The omitted category is the Netherlands, which has the lowest insider share of all countries.

Figure A.1: Insider share and size pooling across all countries



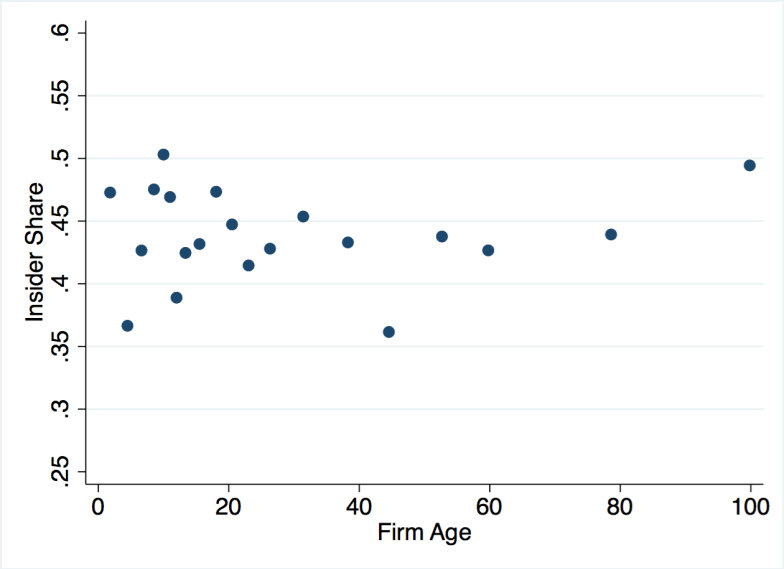
Notes: Binscatter of insider share again log of firm assets, pooling all countries. Insider share is share of equity held by top three shareholders, calculated as described in Section 2

Figure A.2: Insider share and size country by country



Notes: Dots are (unweighted) average insider share of all publicly traded firms in each country. Diamonds and pluses are predicted insider shares for a firm at 25th and 75th percentile of the size distribution. Prediction based on a linear regression of insider share on log assets, separately for each country.

Figure A.3: Insider share and age pooling across all countries



Notes: Binscatter of the insider share by age groups, pooling all publicly traded firms across countries. Insider share is share of equity held by top three shareholders, calculated as described in Section 2. Firm age is years since incorporation. Age winsorsized at 100.

A.2 Private Firms

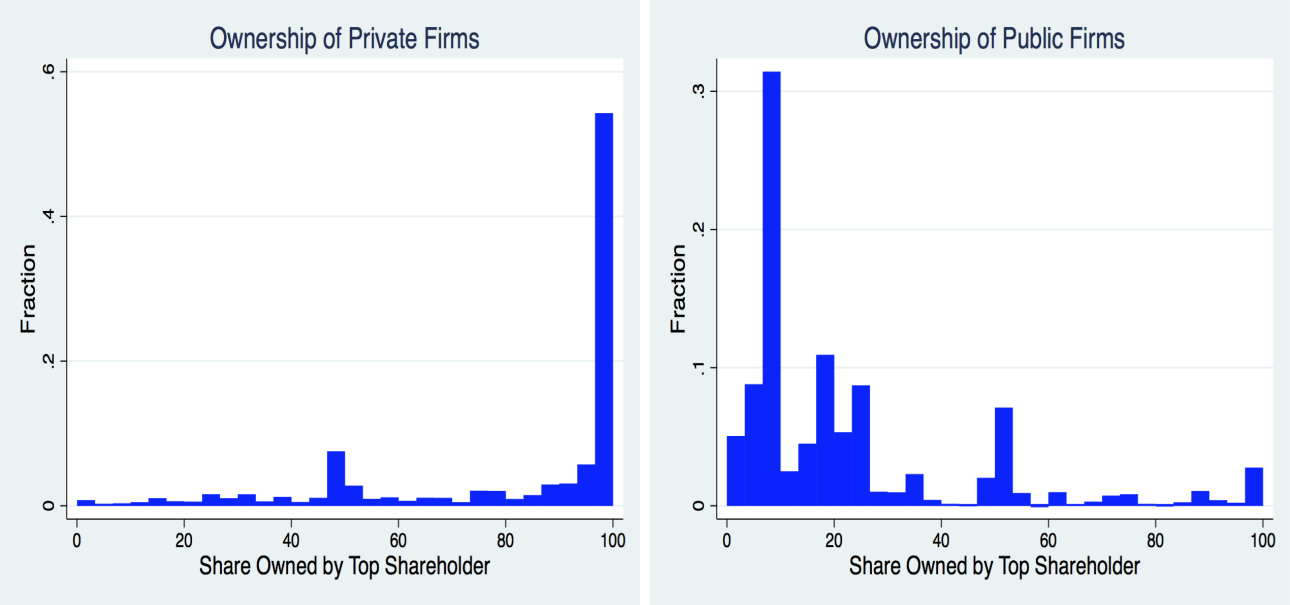
HFCS In the HFCS, surveyed households are asked to report the value of any private businesses they own. The exact wording of the question is:

> Aside from any assets and debts connected with this business that I may have already recorded: What is the net value of (your /your household's) share of the business? That is, what could you sell it for, taking into account all (remaining) assets associated with the business and deducting the (remaining) liabilities?

A.3 Public Firms

Table A.2 compares two ways of assigning publicly traded firms to countries. The first one is the baseline version used in the paper: Firms are assigned to the country in which they are headquartered. Column two counts firms as belonging to the country they are incorporated in. In all but two countries, the difference between the two is negligible. In the Netherlands, the value of firms with headquarters in the country is 25% larger than the value of firms incorporated. In Belgium, there are 11% more incorporated firms than firms with their headquarters in Belgium.

Figure A.4: The Ownership of Private and Public German Firms



Notes: Scatterplot of the share of each firm held by the largest shareholder. For public firms, I use the second-level ownership measure as described in Section 2. Observations are weighted by total assets of the firm.

A.4 Estimating Aggregate Wealth.

In the baseline version, I assume that the HFCS does not survey any insiders of public firms. Alternatively, I can classify equity holdings in the household data into small ones, and ones that are large enough to potentially be inside equity. I do not observe the distribution of equity holdings across different types of stock, so this procedure gives an upper bound on the insiders of public firms in the survey data. I proceed as follows: I classify any value of stock holdings by individual households as inside equity if they are larger than 1% of the value of the lowest quartile of public firms in that country. In all countries but Belgium, this estimate of households' inside equity is much lower than the aggregate value of inside equity as computer using the firm data. I add the difference between the two measures to the HFCS, and count it as part of wealth held by the top 10%. This procedure is the most conservative one, in that I assume all household with large holdings of public equity are 'insider'. Table A.3 compares these two procedures and confirms that the two polar ways of dealing with inside equity have very similar results.

Table A.2: The Value of Public Firms

	Headquartered	Incorporated	Difference
AT	40	40.05	.001
BE	71.06	78.9	.11
DE	686.79	685.97	-.001
ES	322.89	326.15	.01
FI	72.77	72.77	0
FR	920.84	916.95	-.004
IT	262.25	262.25	0
NL	322.87	239.41	-.259
PT	32.21	32.21	0

Notes: Value are in bn EUR. Column 1 is the total value of public firms headquartered in each country. Column 2 is the total value of public firms incorporatred in each country. Column 3 is the value of incorporated relative to headquartered firms.

Table A.3: Aggregate Wealth, Inside Equity and Wealth Inequality

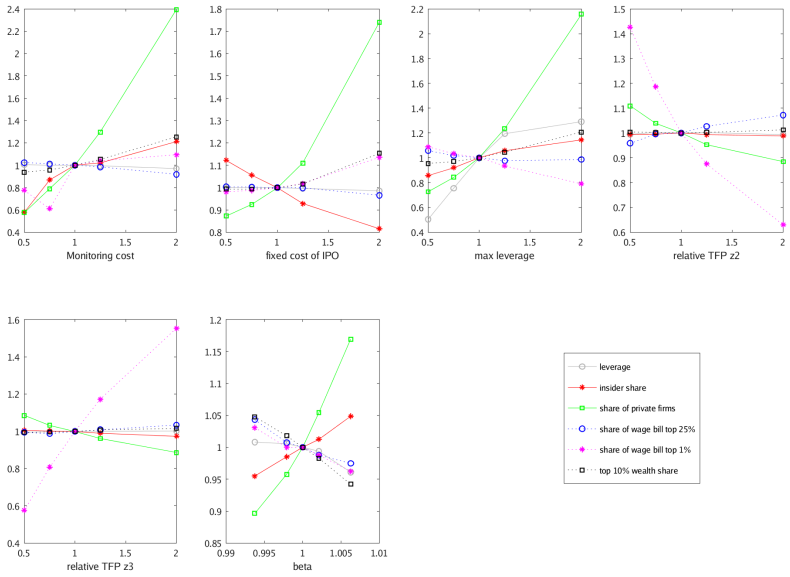
	Wealth	Wealth top 10%		Stocks/Wealth		Inside Equity/Stocks	
	(2)/(1)	(1)	(2)	(1)	(2)	(1)	(2)
AT	.997	.595	.594	.032	.034	.812	.878
BE	.986	.451	.443	.032	.046	.311	.711
DE	.992	.591	.588	.033	.04	.611	.764
ES	.999	.435	.434	.024	.025	.569	.603
FI	.974	.473	.458	.062	.087	.472	.677
FR	.984	.526	.518	.056	.071	.663	.854
IT	.999	.455	.454	.016	.018	.734	.787
NL	.995	.427	.424	.048	.053	.753	.833
PT	.997	.534	.533	.024	.027	.658	.745

Notes: (1) refers to the baseline assumptions on coverage of insiders. (2) refers to the version where all large equity holdings in the households data are counted as insiders. Column one aggregate wealth of version 2 relative to the baseline version. Columns 2-7 compare aggregate statistics for the baseline version and alternative version: the share of wealth held by the richest 10%, the share of total wealth that is accounted for by public equity, and the share of all equity holdings in the augmented HFCS that are classified as inside equity.

B Model

B.1 Identification

Figure B.1: Effect of each parameter on all moments.



Notes: Each panel shows changes in one target moment as a function of changing one parameter at a time. Starting point is the French baseline calibration, figure shows effect of reducing and increasing parameters by factors of 1.5 and 2.

B.2 Model Fit

B.3 Decomposition of counterfactuals

Table B.1: Model Fit: Germany

Moment	Data	Model
Top 25% wealth share	82.1%	75.8%
Top 10% wealth share	59.1%	60.1%
Top 5% wealth share	45.7%	53.2%
Top 1% wealth share	26.2%	30.1%
Share of Hh with wealth ≤ 0	8.7%	1.9%
Top 10% labor share	62.2%	65.6%
Top 5% labor share	47%	41.5%
Slope of insider share wrt size	-.01	-.01
Wealth Entrepreneurs / Workers	5.3	7.3
Share of Wealth held by Entrep	34.1%	45%

Table B.2: Model Fit: Austria

Moment	Data	Model
Top 25% wealth share	90.9%	76.6%
Top 10% wealth share	59.4%	60.6%
Top 5% wealth share	47.0%	50.9%
Top 1% wealth share	26.4%	28.9%
Share of Hh with wealth ≤ 0	5.8%	1.6%
Top 10% labor share	52.2%	58.3%
Top 5% labor share	37.8%	38.9%
Slope of insider share wrt size	-.02	-.01
Wealth Entrepreneurs / Workers	6.7	8.14
Share of Wealth held by Entrep	33.2%	47%

Table B.3: Model Fit: Netherlands

Moment	Data	Model
Top 25% wealth share	70.7%	66.2%
Top 10% wealth share	42.6%	43.7%
Top 5% wealth share	28.7%	31.5%
Top 1% wealth share	12.0%	15.0 %
Share of Hh with wealth ≤ 0	11.9%	1.7%
Top 10% labor share	46.1%	48.1 %
Top 5% labor share	34.4%	29.6%
Slope of insider share wrt size		-.16
Wealth Entrepreneurs / Workers	1.8	5.5
Share of Wealth held by Entrep	11.9%	37.8%

Table B.4: Decomposition: Austria

	Baseline	λ	c_M	c_F	all
Top 10% NW share	60.6 %	60.5%	51.9%	67.5%	51.9%
Output		-0.13%	+4.37%	-0.67%	+3.88%
Share of priv firms	78.5 %	77.9%	33.2%	99.3%	40.1%
Leverage	43.7%	43.3%	44.6%	43.2%	44.2%
Insider share	57.5%	57.3%	42.0%	29.3%	33.5%

Table B.5: Decomposition: Netherlands

	Baseline	λ	c_M	c_F	all
Top 10% NW share	43.9 %	43.8%	49.1%	48.9%	52.4%
Output		-.12%	-3.2%	-1.8%	-3.43
Share of priv firms	12.2 %	13.1%	24.3%	29.0%	53.2%
Leverage	38.4%	44.7%	38.2%	38.1%	43.9%
Insider share	15.2%	15.3%	48.0%	5.0%	34.7%