UNIL | Université de Lausanne
Département de finance

ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE

FINANCE RESEARCH SEMINAR SUPPORTED BY UNIGESTION

"What determines investment and operating strategies of public and private firms: Theory and Evidence"

Prof. Evgeny Lyandres

School of Management, Boston University and IDC

Abstract

We examine theoretically and empirically potential determinants of investment and operating strategies of public and private firms that are controlled by imperfectly diversified owners. In particular, we demonstrate theoretically and confirm empirically that due to arguably more severe financial constraints that private firms face, the effects of factors such as the diversification of controlling owners' portfolios and the uncertainty regarding demand for firms' output are dramatically different from the effects on public ones. For example, public firms' controlling shareholders' diversification is positively related to their investment and profitability ratios, while the opposite relations are observed for private firms. Our theoretical and empirical results suggest that the differences between public and private firms' external financing costs are partially responsible for the observed relations between a firm's mode of incorporation and its investment and operating strategies and outcomes.

Friday, January 18, 10.30-12.00

Room 126, 1st floor of the Extranef building at the University of Lausanne

What determines investment and operating strategies of public and private firms: Theory and Evidence*

Evgeny Lyandres†, Maria-Teresa Marchica‡, Roni Michaely§, Roberto Mura¶

January 2013

Abstract

We examine theoretically and empirically potential determinants of investment and operating strategies of public and private firms that are controlled by imperfectly diversified owners. In particular, we demonstrate theoretically and confirm empirically that due to arguably more severe financial constraints that private firms face, the effects of factors such as the diversification of controlling owners' portfolios and the uncertainty regarding demand for firms' output are dramatically different from the effects on public ones. For example, public firms' controlling shareholders' diversification is positively related to their investment and profitability ratios, while the opposite relations are observed for private firms. Our theoretical and empirical results suggest that the differences between public and private firms' external financing costs are partially responsible for the observed relations between a firm's mode of incorporation and its investment and operating strategies and outcomes.

*We thank seminar participants at the Interdisciplinary Center for helpful comments and suggestions.

†School of Management, Boston University and IDC, lyandres@bu.edu.

‡Manchester Business School, University of Manchester, maria.marchica@mbs.ac.uk.

§Cornell University and IDC, rm34@cornell.edu.

¶Manchester Business School, University of Manchester, roberto.mura@mbs.ac.uk.

1 Introduction

Private firms are different from public ones. A small but growing literature examines the differences between public and private firms' financial, investment, and operating strategies. Brav's (2009) and Asker, Farre-Mensa and Ljungqvist (2011b) find that private firms have higher leverage ratios than public firms, while Saunders and Steffen (2011) document that privately-held firms face higher borrowing costs than publicly-traded ones. Asker, Farre-Mensa and Ljungqvist (2011a, b) and Sheen (2009) report that private firms invest more than public ones. Brav (2009) finds that private firms have higher return on assets (ROA) than private ones, while Faccio, Marchica, McConnel and Mura (2011) document that private firms have higher return on equity (ROE) than public firms.[1] Michaely and Roberts (2012) find that public firms tend to use more dividend smoothing than private ones.

One important reason for firm owners to take their firms public is their desire to reduce financial constraints and obtain cheaper access to external funds (e.g., Pagano, Panetta and Zingales (1998), Derrien and Kecskés (2007), Hsu, Reed and Rocholl (2010) and Schenone (2010)). In this paper we examine theoretically and empirically whether the lower costs of obtaining external financing by public firms relative to those of private ones are partially responsible for the differences between public and private firms' investment and operating strategies.

One element that is crucial in an analysis of private and public firms' strategies is imperfect diversification of portfolios of firms' controlling shareholders. Faccio, Marchica and Mura (2011) report that the vast majority of controlling shareholders of private as well as public firms hold portfolios that are underdiversified, a finding that we corroborate in our analysis. Similarly, Moskowitz and Vissing-Jørgensen (2002) find that most owners of private firms' are not well diversified: about three-fourths of all private equity is owned by individuals for whom such investment constitutes at least half of their total net worth. In addition, according to Heaton and Lucas (2004) and Asker, Farre-Mensa and Ljungqvist (2011a, b), private firm owners hold the majority of their firms' equity, suggesting lack of diversification.

The degree of diversification of a firm's controlling owner's portfolio has important implications for the firm's investment and operating strategies (e.g., Rothschild and Stiglitz (1971), Shah and Thakor (1988), and Chod and Lyandres (2011)). The reason is that the less well diversified the controlling owner of a firm is, the more she is concerned with profit (or cash flow) variability. For example, Faccio, Marchica and Mura (2011) find that lower diversification of a firm's controlling owner's portfolio is associated with lower risk taking, as measured by the variability of the firm's ROA. Two natural ways

[1] There is also a large literature documenting a decline in profitability following IPOs (e.g., Jain and Kini (1994), Mikkelson, Partch and Shah (1995), and Loughran and Ritter (1997)).

for a firm to reduce its profit variability is to pursue a less aggressive investment strategy (i.e. curb investment) and a less aggressive operating and pricing strategies (i.e. reduce output and charge higher prices). In other words, firms controlled by owners whose portfolios are relatively well diversified are expected to invest more and/or to produce higher output.

Whether the channel through which a firm controlled by a relatively well diversified owner would have a higher profit variability than a firm whose controlling shareholder is not as well diversified is the former firm's aggressive investment or operating strategy (or the combination of the two) depends on how financially constrained the firm is. Within firms with relatively low costs of accessing external capital markets, a higher diversification of a firm's controlling owner's portfolio would be associated with a higher investment by the firm in physical capital. Within firms with relatively severe financial constraints that limit a firm's ability to finance capital investment using external funds, a higher owner's portfolio diversification would translate into more aggressive operating and pricing strategies.

In order to examine whether financial constraints are responsible to some degree for the differences in public and private firms' operating and investment strategies, we build a model in which a partially financially constrained firm operates under uncertainty regarding the demand for its output and is controlled by a risk-averse and imperfectly diversified owner. The owner maximizes her utility by making two interrelated choices. The first one is the firm's investment strategy, in particular the amount to be invested in a cost-reducing technology using internal and potentially external financing. The second one is the firm's operating policy, i.e. determination of the firm's output quantity and the resulting equilibrium output price.

The model results in testable empirical implications regarding the effects of controlling owner's diversification and of demand uncertainty on two observable variables driven by firms' investment and operating choices – investment-to-assets ratio and profit margin. Importantly, the effects on the outcomes of firms' investment and operating choices depend crucially on the degree of financial constraints that firms face. In particular, investment rate and profitability of relatively unconstrained firms is shown to be increasing in controlling owner's portfolio diversification and to be decreasing in demand uncertainty surrounding the firm, while these relations are reversed for relatively constrained firms. The intuition is that financial constraints alter the way in which firms can respond to changes in owner's diversification or demand uncertainty. Relatively unconstrained firms controlled by well diversified owners and facing low demand uncertainty choose to invest more in a cost-reducing technology than firms whose owners are not as well diversified, resulting in higher investment-to-asset ratios and profit margins of the former.[2] On the other hand, relatively constrained firms, for which

[2]Relatively unconstrained firms also optimally respond to higher controlling owner's diversification and lower demand

financing additional capital investment using external sources may be too costly, respond to higher owner's portfolio diversification or lower demand uncertainty by increasing output quantities, leading to lower equilibrium output prices and lower profit margins. In addition, increased output quantities lead to higher asset base and potentially lower investment-to-assets ratios.

These differences between the effects of controlling shareholder's portfolio diversification and demand uncertainty on relatively constrained and unconstrained firms' optimal investment and operating choices may be partially responsible for the differences between observed investment and operating strategies and outcomes of public and private firms. The reason is that public firms are likely to face lower information asymmetry than private ones (e.g., Benveniste and Spindt (1989), Dow and Gorton (1997), and Derrien and Kecskés (2007)), which lowers the costs of external financing (e.g., Myers and Majluf (1984) and Fazzari, Hubbard and Petersen (1988) among many others). Thus, examining the relations between controlling owner's diversification and demand uncertainty on one hand and the outcomes of firms' investment and operating strategies on the other hand, and analyzing the differences between these relations for (relatively unconstrained) public firms and (relatively constrained) private firms sheds light on the reasons for the importance of the mode of incorporation for firms' investment and operating choices.

We examine these relations empirically using Bureau Van Dijk's Amadeus Top 250,000 database, which contains comprehensive accounting and ownership data for over half a million firm-year observations from 34 European countries over the period 1999-2010. The advantage of using European data is that most European countries require private companies to disclose their financial information on an annual basis. This allows us to exploit a very rich database that contains a large fraction of the population of European private and public firms. Further, the role played by private companies in the European market is crucial. We estimate that at the end of 2009 privately-held companies were responsible for almost 72% of the total investment in fixed assets of all European non-financial firms, and they generated almost 73% of the total revenues of all European non-financial companies.[3]

uncertainty by choosing higher output, which adversely affects equilibrium profit margins. However, this effect is second-order relative to the effect of higher investment on profit margins.

[3] These figures are the cross-country averages of the fraction of capital expenditures (sales) of private companies to the total capital expenditures (sales) of non-financial corporations in each country at the end of 2009. Capital expenditures of privately held non-financial companies in each country are calculated as the difference between capital expenditures of all non-financial corporations from the European System of National Accounts (ESA 95), Gross Fixed Capital Formation (item P.51), and capital expenditures of all publicly-traded companies in that country from Worldscope. Similarly, sales of privately held non-financial companies in each country are calculated as the difference between the revenues of all non-financial corporations from the European System of National Accounts (ESA 95), Output (item P.1), and the revenues of all publicly-traded companies in that country from Worldscope. We calculate these figures only for those countries

Using these data we are able to construct measures of investment and profitability for public and private firms, identify public and private firms' controlling owners, and compute measures of controlling owners' portfolio diversification and demand uncertainties facing the firms. Our empirical results show that the effects of controlling shareholders' diversification and demand uncertainty on public firms' investment and operating strategies are vastly different from those on the strategies of private firms, in ways generally consistent with the model's predictions. Our findings are robust to controlling for potential measurement errors in our owners' portfolio diversification proxies. Further, we also show that our empirical results are not driven by various potential selection issues, such as the voluntary disclosure of information by private firms in some of the countries in our sample and potential self-selection of firms into private and public modes of incorporation.

To summarize, our theoretical and empirical results demonstrate that one of the important reasons for the observed differences between public and private firms' strategies and outcomes is the imperfect diversification of firm owners' portfolios coupled with the potential access by public firms to cheaper external financing, and the uncertainties surrounding the firms. The remainder of the paper is organized as follows. The next section describes the model of optimal investment and operating choices of firms with varying degrees of financial constraints, and summarizes the empirical predictions following from the model. Section 3 describes the data. In Section 4 we discuss our empirical methods, tests, and results. Section 5 concludes. All proofs are found in the Appendix.

2 Model

2.1 The controlling owner

We consider a situation in which a controlling owner of a firm is imperfectly diversified. In particular, we assume that she owns a proportion η of the firm she controls and in addition, she invests an amount x in an imperfectly diversified portfolio with a normally distributed return R_p, whose mean is $\mathbb{E}R_p$ and whose standard deviation is σ_p.[4] We assume that the controlling owner is risk-averse and that she maximizes the expected utility of her terminal wealth, w. This utility is given by

$$u(w) = a^{-1} - a^{-1}\exp(-aw), \tag{1}$$

with available information in the National Accounts and at least 10 observations in Worldscope.

[4] σ_p is clearly decreasing in the number of stocks in the investor's portfolio, n_p, and in the correlation among their returns, ρ_p. Because of these monotonic relations, we consider σ_p a deep parameter of the model, while our proxies for σ_p in the empirical tests are based on n_p and ρ_p.

where $a = u''/u'$ is the investor's Arrow-Pratt coefficient of absolute risk aversion. Assuming that, similar to the returns of the owner's portfolio, her wealth that is due to ownership of the firm (to be discussed below) is normally distributed as well, investor's expected utility maximization simplifies into the mean-variance criterion:

$$\mathbb{E}u(w) = \mathbb{E}w - \frac{a}{2}\sigma^2(w). \tag{2}$$

2.2 The firm

The inverse demand for a firm's product is given by

$$p(q) = \alpha - \beta q, \tag{3}$$

where $p(q)$ is the product's price and q is the quantity of the product supplied. The intercept of the demand function, α, is stochastic. We assume that it is normally distributed with mean μ and standard deviation s. β determines the elasticity of the demand for the firm's product: low β corresponds to a price-taking firm, while high β corresponds to an oligopolistic competition environment.

The firm's marginal cost of production is assumed constant. The total cost of producing q units of output, $C(q)$, equals

$$C(q) = \left(c - \delta\sqrt{K}\right) q, \tag{4}$$

where c is the "benchmark" marginal cost, which can be reduced by investing capital, K, whose unit cost is assumed one without loss of generality, into a cost-reducing technology. The efficiency of the cost-reducing technology is determined by the "investment efficiency" parameter, δ.

The firm is endowed with initial capital, W. In addition, the firm can raise external funds to be used for expanding capital. The deadweight cost of raising one dollar of external capital, F, equals

$$F = (1 - d)f, \tag{5}$$

where $f \geq 0$ is firm-specific financing cost, and $0 < d < 1$ is the "financial development parameter." $f = 0$ corresponds to a completely unconstrained firm, while $f \to \infty$ corresponds to a completely constrained firm. The firm's overall capital, K, equals, thus, the sum of its endowment, W, and capital financed by externally raised funds, $I \geq 0$. Combining (3), (4), and (5), the firm's profit is given by

$$\pi = (\alpha - \beta q)\, q - \left(c - \delta\sqrt{W + I}\right) q - (W + I) - I(1 - d)f. \tag{6}$$

Assuming that the firm's investment and production decisions (i.e. the choices of I and q) are made before the realization of the demand shock, the firm's profit is normally distributed with mean,

$\mathbb{E}\pi$, and standard deviation, $\sigma(\pi)$, given by

$$\mathbb{E}\pi = (\mu - \beta q)\, q - \left(c - \delta\sqrt{W + I}\right) q - (W + I) - I(1 - d)f, \tag{7}$$

$$\sigma(\pi) = sq. \tag{8}$$

2.3 Controlling owner's problem

The objective of the firm's controlling owner is to maximize her expected utility by choosing the level of its investment in the cost-reducing technology, I, and output, q:

$$\max_{I\geq 0, q\geq 0} \mathbb{E}u(w) = \max_{I\geq 0, q\geq 0} \left[x\mathbb{E}\left(1 + R_p\right) + \eta\mathbb{E}\pi - \frac{a}{2}\left(x^2\sigma_p^2 + \eta^2\sigma^2(\pi) + 2x\eta\rho\sigma_p\sigma_\pi\right)\right], \tag{9}$$

To solve the owner's optimization problem in (9) we need to impose the following constraints on the model's parameters:

$$\mu - c - a\rho s\sigma_p x > 0, \tag{10}$$

$$\delta < \sqrt{\left(1 + (1 - d)f\right)\left(4\beta + 2a\eta s^2\right)}, \tag{11}$$

$$W \leq \frac{\delta(\mu - c - a\rho s\sigma_p x)^2}{\left(\left(1 + (1 - d)f\right)\left(4\beta + 2a\eta s^2\right) - \delta^2\right)^2}. \tag{12}$$

Equation (10) ensures positive output in equilibrium, equation (11) ensures finite output, and equation (12) specifies that the optimal investment of a completely unconstrained firm (whose external financing cost, $F = (1 - d)f$, equals zero) is larger than the amount of available internal capital.

Maximizing the owner's expected utility in (9) leads to the following equilibrium capital investment and output quantity:

Lemma 1 *1) If the financing cost, $F = (1 - d)f$, is lower than*

$$\overline{F} = \frac{\delta(\mu - c - a\rho s\sigma_p x) - \sqrt{W}(4\beta + 2a\eta s^2 - \delta^2)}{\sqrt{W}(4\beta + 2a\eta s^2)}, \tag{13}$$

(partially constrained scenario henceforth), equilibrium investment and output are given by

$$K^* = \left(\frac{\delta(\mu - c - a\rho s\sigma_p x)}{\left(1 + (1 - d)f\right)\left(4\beta + 2a\eta s^2\right) - \delta^2}\right)^2, \tag{14}$$

$$q^* = \frac{2(1 + (1 - d)f)(\mu - c - a\rho s\sigma_p x)}{\left(1 + (1 - d)f\right)\left(4\beta + 2a\eta s^2\right) - \delta^2}, \tag{15}$$

respectively;

2) If the financing cost is equal or higher than $\overline{F}$ in (13) (fully constrained scenario hereafter), equi-

librium investment and output are given by

$$K^* = W,$$
$$q^* = \frac{\mu - c - a\rho s\sigma_p x + \delta\sqrt{W}}{2\beta + a\eta s^2}, \tag{16}$$

respectively.

Note that the threshold financing cost in (13), above which the firm is fully constrained (i.e. the financing cost above which the firm does not raise money in the capital markets in order to invest in cost-reducing technology) is increasing in the expected demand intercept, μ and is decreasing in the baseline marginal cost of production, c. The reason is that the higher the demand and the lower the cost, the larger the optimal investment and the higher the financing cost that makes raising external capital prohibitively costly. Note also that the threshold financing cost is increasing in the efficiency of the cost-reducing technology, δ, for the same reason. Finally, the threshold financing cost is decreasing in the amount of available internal funds: the higher the internal capital available to the firm the less it is willing to resort to costly external financing.

When the firm is not fully constrained, both investment in cost-reducing technology and output are increasing in the efficiency of that technology and in the expected demand net of marginal production cost, and is decreasing in the cost of external financing. When the firm is fully constrained, equilibrium output is increasing in the available capital (all of which is invested), as well as in the expected demand net of marginal production cost.

2.4 Comparative statics

The firm's decision variables are the size of the investment in cost-reducing technology and the output quantity. In this section we examine the effects of the model's parameters on the firm's optimal choices. Importantly, in order to test the model's predictions empirically, we examine the comparative statics of the outcomes of the firm's choices: investment-to-assets ratio and profit margin. In our setup, the firm's book assets are composed of investment in cost-reducing technology, K and the cost of other inputs required for production, $\left(c - \delta\sqrt{K}\right) q$.[5] Thus, our measure of the firm's equilibrium investment-to-assets ratio, $\mathbb{I}^*$, is given by

$$\mathbb{I}^* = \frac{K^*}{K^* + \left(c - \delta\sqrt{K^*}\right) q^*}. \tag{17}$$

[5] We implicitly assume that lumpy investment has to be financed using the combination of internal and external funds, while the costs of other inputs required for production, such as inventories, can be financed from future revenues (i.e. these costs are balanced by accounts payable in the balance sheet).

We can define two measures of profit margin. The first one is operating profit margin, which does not take into account the investment in cost-reducing technology:

$$\Pi^*_{op} = 1 - \frac{c - \delta\sqrt{K^*}}{\mu - \beta q^*}. \tag{18}$$

The second one is net profit margin, which incorporates the investment in cost-reducing technology:

$$\Pi^* = 1 - \frac{\left(c - \delta\sqrt{K^*}\right) q^* + K^*}{\left(\mu - \beta q^*\right) q^*}. \tag{19}$$

The measure available in the dataset that we use to test the model's predictions is net profit margin, thus we emphasize the comparative statics for Π^* in (19). Notably, all of the comparative statics derived for Π^* hold for Π^*_{op} in (18).

In what follows we examine comparative statics of $\mathbb{I}^*$ and Π^* with respect to the diversification of controlling owner's portfolio, demand uncertainty, and the degree of financial development.

2.4.1 Portfolio diversification

Two natural (inverse) proxies for controlling owner's diversification are the volatility of the return on her holdings outside of the firm, σ_p, and the correlation of her portfolio return with the demand shock, ρ. Differentiating $\mathbb{I}^*$ and Π^* with respect to measures of portfolio diversification, σ_p and ρ, leads to the following results:

Proposition 1 *1) An unconstrained or a partially constrained firm's investment-to-assets ratio is increasing in owner's portfolio diversification:* $\frac{\partial \mathbb{I}^*}{\partial \sigma_p} < 0$ *and* $\frac{\partial \mathbb{I}^*}{\partial \rho} < 0$*;*
2) A fully constrained firm's investment-to-assets ratio is decreasing in owner's portfolio diversification: $\frac{\partial \mathbb{I}^*}{\partial \sigma_p} > 0$ *and* $\frac{\partial \mathbb{I}^*}{\partial \rho} > 0$.

This result is illustrated in Figure 1 that plots the relation between investment-to-assets ratio as defined in (17), and the standard deviation of controlling owner's portfolio, σ_p, for various levels of financing constraints.[6] The inputs are as follows: $a = 0.5$, $\mu = 30$, $s = 10$, $\beta = 5$, $c = 5$, $\delta = 2$, $d = 0$, $\mathbb{E}R_p = 0.1$, $\rho = 0.5$, $\eta = 0.5$, $x = 5$, $W = 0.2$. We vary the financing cost, f, between 0 and 3 and we

[6] The results are similar when we examine the relation between equilibrium investment and the correlation between controlling owner's portfolio return and demand shock, ρ.

vary the standard deviation of investor's portfolio, σ_p, between 0 and 0.5.[7]

Figure 1: Investment-to-assets and portfolio diversification

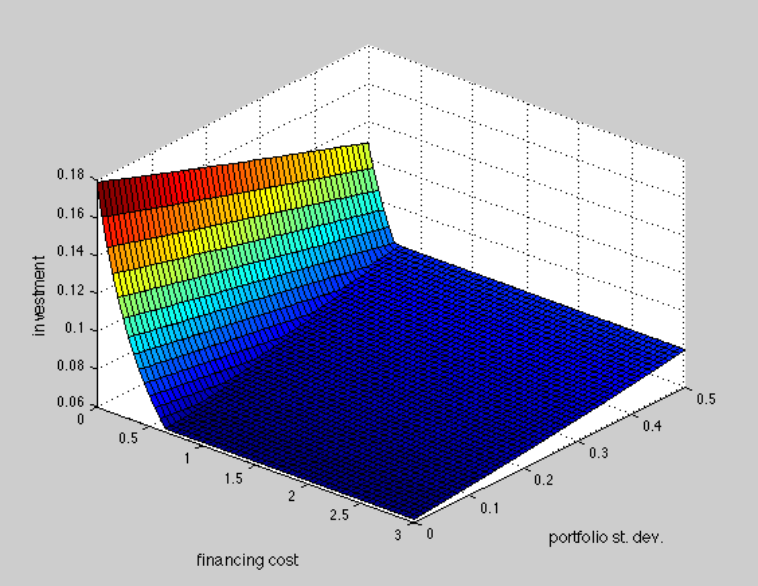


Figure 1 illustrates that for relatively unconstrained firms (f lower than approximately 0.5), investment-to-assets ratio is decreasing in the standard deviation of controlling owner's portfolio outside the firm, i.e. investment-to-assets ratio is increasing in portfolio diversification. For relatively constrained firms, on the contrary, investment-to-assets ratio is decreasing in portfolio diversification.

Proposition 2 *1) An unconstrained or a partially constrained firm's net profit margin is increasing in owner's portfolio diversification,* $\frac{\partial \Pi^*}{\partial \sigma_p} < 0$, $\frac{\partial \Pi^*}{\partial \rho} < 0$, *if the efficiency of the cost-reducing technology,* δ, *is higher than*

$$\overline{\delta} = \sqrt{\frac{4\beta c(1+(1-d)f)^2}{\mu(1+2(1-d)f)}}, \tag{20}$$

and it is decreasing in owner's portfolio diversification, $\frac{\partial \Pi^*}{\partial \sigma_p} > 0$, $\frac{\partial \Pi^*}{\partial \rho} > 0$, *if the efficiency of the cost-reducing technology is lower than* $\overline{\delta}$ *in (20);*

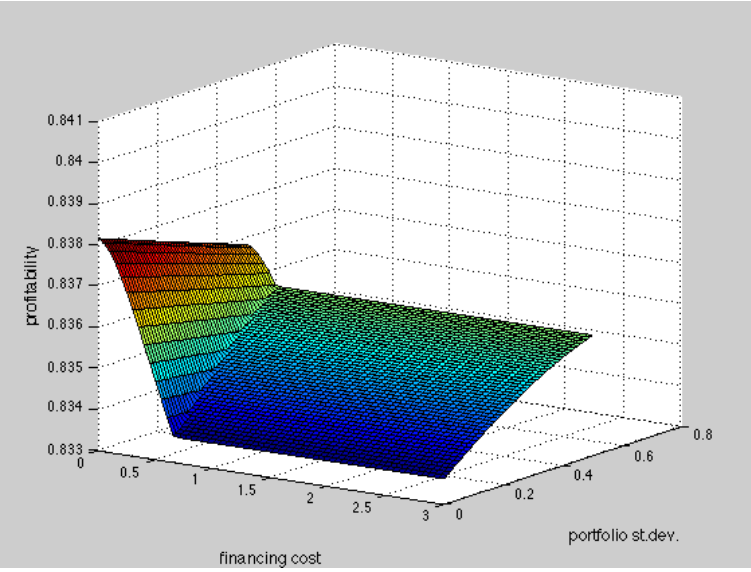
2) A fully constrained firm's net profit margin is decreasing in owner's diversification: $\frac{\partial \Pi^*}{\partial \sigma_p} > 0$, $\frac{\partial \Pi^*}{\partial \rho} > 0$.

Figure 2, which is based on the same parameter values as Figure 1, illustrates the result in Proposition 2. For relatively unconstrained firms ($f < 0.69$ for the chosen parameter values), $\delta > \overline{\delta}$ and the relation between owner's portfolio diversification and profit margin is positive (part 1 of Proposition

[7]Here and below the qualitative results hold for various parameter values, as long as the constraints in equations (10)-(12) are satisfied.

2). For relatively constrained firms, on the other hand, the relation between portfolio diversification and profit margin is negative (part 2 of Proposition 2).

Figure 2: Profit margin and portfolio diversification



The intuition for the results in Propositions 1-2 and Figures 1-2 is as follows. If the firm is not fully constrained (i.e. it finances part of the investment in cost-reducing technology externally), an increase in its owner's degree of diversification (i.e. a reduction in σ_p or ρ) lowers the importance of profit variance in the investor's expected utility and leads to higher investment level, as follows from (5). There are two forces determining the effect of owner's portfolio diversification on equilibrium profit margin. First, keeping investment (and marginal cost of production) constant, an increase in diversification raises equilibrium output and reduces profit margin. On the other hand, higher diversification raises optimal investment, which, in turn, reduces the marginal cost of production and increases profit margin. When investment efficiency is low, the indirect effect through the impact of increased investment on the marginal cost and on the resulting profit margin is small, and the negative direct effect of diversification on profit margin prevails. However, when investment efficiency is high enough, the positive effect of increased investment in cost-reducing technology on profit margin is sufficiently large to outweigh the direct negative effect on profit margin of increased output, leading to an overall positive relation between owner's diversification and profit margin.

If the firm is fully constrained (i.e. it only invests internal funds into cost-reducing technology), the higher the lever of diversification of the owner' portfolio outside the firm (i.e. the lower σ_p or ρ), the smaller the effect of volatility of firm's profit on investor's expected utility. The reason is that the interaction term between the standard deviation of firm's profit and measures of diversification in (9) affects investor's expected utility negatively. Since the firm's profit variability is increasing in output,

as follows from (8), equilibrium output in (16) is decreasing in σ_p and ρ. In other words, equilibrium output is increasing in owner's portfolio diversification. Larger output leads to lower equilibrium output price and higher cost-price ratio, and to lower profit margin. In addition, since larger output requires larger production inputs other than capital investment, equilibrium investment-to-assets ratio is decreasing in output and is, therefore, decreasing in owner's diversification.

2.4.2 Demand uncertainty

The effects of diversification on a firm's optimal investment and production decisions are due to the interaction between demand uncertainty and uncertainty regarding the return on owner's portfolio outside the firm. Differentiating investment-to-assets ratio and profit margin with respect to demand uncertainty leads to the following results:

Proposition 3 *1) An unconstrained or a partially constrained firm's investment-to-assets ratio is decreasing in demand uncertainty:* $\frac{\partial \mathbb{I}^*}{\partial s} < 0$*;*
2) A fully constrained firm's investment-to-assets ratio is increasing in demand uncertainty: $\frac{\partial \mathbb{I}^*}{\partial s} > 0$.

Proposition 4 *1) An unconstrained or a partially constrained firm's profit margin is decreasing in demand uncertainty,* $\frac{\partial \Pi^*}{\partial s} < 0$*, if the efficiency of the cost reducing technology,* δ*, is higher than* $\overline{\delta}$ *in (20), and it is increasing in demand uncertainty,*$\frac{\partial \Pi^*}{\partial s} > 0$ *, if the efficiency of the cost-reducing technology is lower than* $\overline{\delta}$*;*
2) A fully constrained firm's profit margin is increasing in demand uncertainty: $\frac{\partial \Pi^*}{\partial s} > 0$.

Propositions 3 and 4 are illustrated in the following two figures, in which we use the same parameter values as in Figures 1 and 2, with the only difference that the standard deviation of investor's portfolio,

σ_p, is set to 0.3 and demand uncertainty, s, varies between 8 and 12.

Figure 3: Investment-to-assets and demand uncertainty

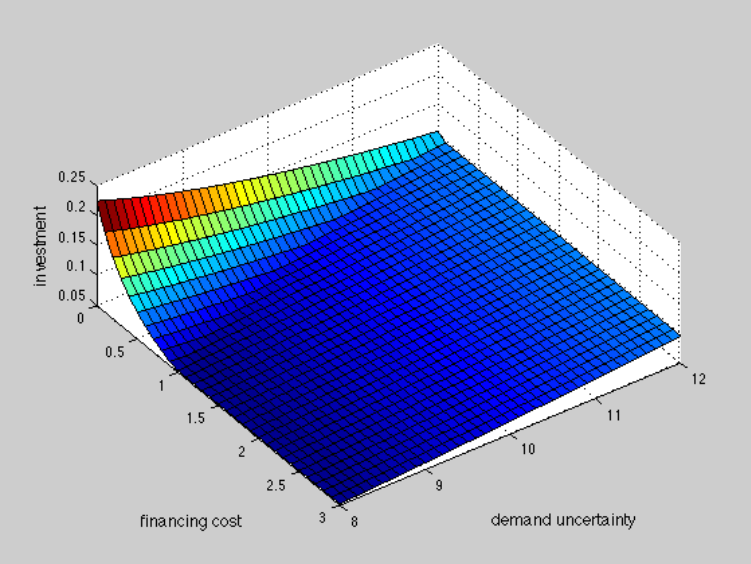
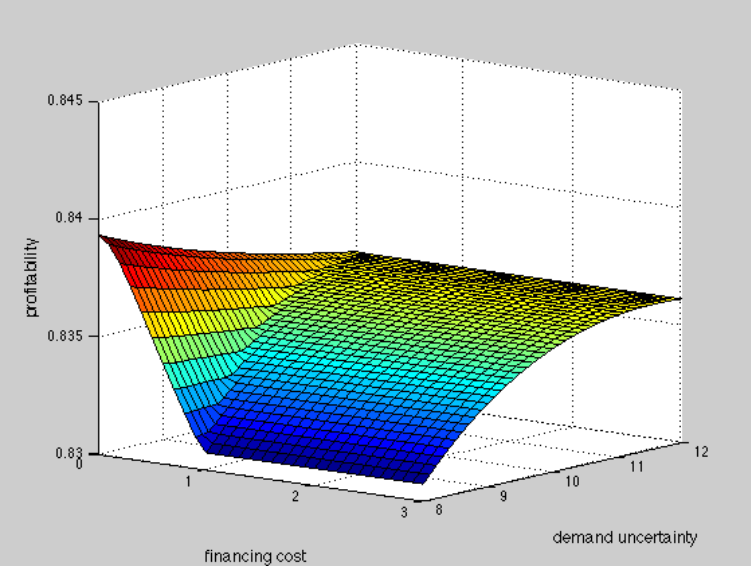


Figure 4: Profit margin and demand uncertainty



The intuition for the relations in Propositions and Figures 3-4 is as follows. Increased demand uncertainty lowers optimal output because of the positive effect that a firm's output has on its profit variance. For a fully constrained (high-f) firm, whose capital expenditure does not respond to changes in demand uncertainty, this reduction in output leads to higher output price and profit margin, and to lower amount of required non-investment inputs, resulting in higher investment-to-assets ratio. For a partially constrained or completely unconstrained (low-f) firm there is an additional effect: lower optimal output due to higher demand uncertainty reduces optimal investment, leading to a negative

relation between demand uncertainty and investment-to-assets ratio. The effect of demand uncertainty on equilibrium profit margin is twofold. First, holding investment constant, higher demand uncertainty reduces optimal output and raises equilibrium profit margin. Second, higher demand uncertainty reduces optimal investment leading to lower equilibrium profit margin. If the efficiency of investment in cost-reducing technology is sufficiently high, the indirect effect through investment dominates the direct effect, and the relation between demand uncertainty and profit margin is negative. If, on the other hand, investment efficiency is low, the direct effect dominates, leading to a positive relation between demand uncertainty and profit margin.

2.4.3 Financial development

Financial development reduces the cost of obtaining external financing. Since the cost of external financing influences firms' strategies and outcomes as shown above, we examine how changing financial development, d, affects firms' investment-to-assets ratios and profit margins. These relations are summarized in the following propositions:

Proposition 5 *1) A partially constrained firm's investment-to-assets ratio is increasing in financial development:* $\frac{\partial \mathbb{I}^*}{\partial d} > 0$*;*
2) A fully unconstrained or a fully constrained firm's investment-to-assets ratio is unrelated to financial development: $\frac{\partial \mathbb{I}^*}{\partial d} = 0$*;*

Proposition 6 *1) A partially constrained firm's profit margin is increasing in financial development:* $\frac{\partial \Pi^*}{\partial d} > 0$*;*
2) A fully unconstrained or a fully constrained firm's profit margin is unrelated to financial development: $\frac{\partial \Pi^*}{\partial d} = 0$*.*

Propositions 5 and 6 are illustrated in Figures 5 and 6, in which we use the same parameter values as in Figures 1 and 2, while setting σ_p to be equal to 0.3, and varying the financial development

parameter between 0 and 0.5 and the financing cost parameter between 0 and 5.

Figure 5: Investment-to-assets and financial development

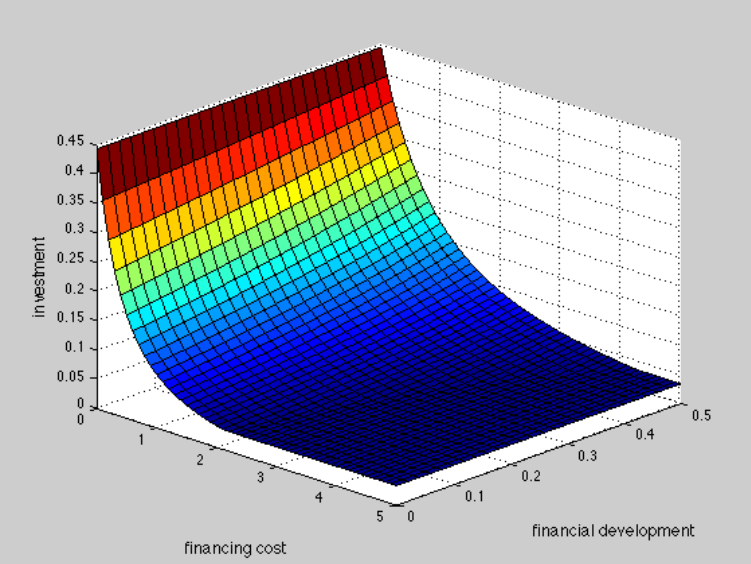
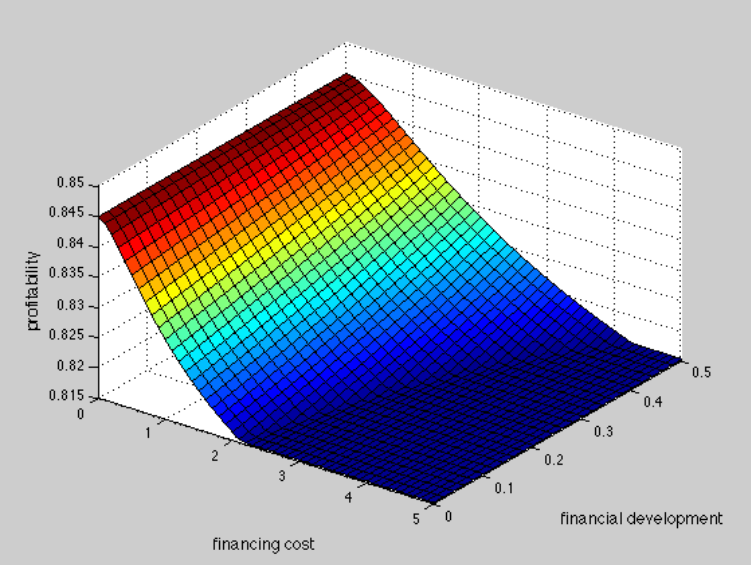


Figure 6: Profit margin and financial development



When a firm is fully constrained, a marginal change in financial development does not make it partially unconstrained, therefore when firm-specific financing cost, f, is high, financial development does not affect the firm's optimal investment and output, therefore investment-to-assets ratio and profit margin are insensitive to financial development. When a firm is partially unconstrained, higher financial development reduces its financing cost, raising investment in the cost-reducing technology and profit margin. When the firm is completely unconstrained (i.e. its external financing cost approaches zero), financial development does not significantly affect the firm's investment and profitability, leading,

again, to a flat relation between investment-to-assets ratio and profit margin on one hand and financial development on the other hand.

2.5 Empirical predictions

The literature on the implications of a firm's public/private status on the costs of obtaining external financing (e.g., Pagano, Panetta and Zingales (1998), Derrien and Kecskés (2007), and Hsu, Reed and Rocholl (2010)) suggests that private firms are likely to face costlier access to external capital, ceteris paribus. As a result, Propositions 1-6 lead to the following empirical predictions.

1a) Investment-to-assets ratio of public (private) firms is increasing (decreasing) in controlling owner's portfolio diversification;

1b) Profit margin of public (private) firms may be increasing (is decreasing) in controlling owner's portfolio diversification;

2a) Investment-to-assets ratio of public (private) firms is decreasing (increasing) in demand uncertainty;

2b) Profit margin of public (private) firms may be decreasing (is increasing) in demand uncertainty;

3a) Investment-to-assets ratio of partially financially constrained public firms is increasing in financial development. Investment-to-assets ratio of the least financially constrained public firms and that of private firms is independent of financial development;

3b) Profit margin of partially financially constrained public firms is increasing in financial development. Profit margin of the least financially constrained public firms and that of private firms is independent of financial development.

In the next section we describe the data that we use to test the empirical predictions listed above. In Section 4 we report the results of these empirical tests.

3 Data

3.1 Sample

The data used in the paper are assembled from Amadeus Top 250,000. Amadeus is maintained by Bureau Van Dijk Publishing and covers European public and private companies. From this database we gather ownership and accounting information for every European privately-held and publicly-traded company that satisfies a minimum size threshold.[8] Disclosure requirements in Europe require

[8] For France, Germany, Italy, Spain, and the United Kingdom, the database includes all companies that meet at least one of the following criteria: (1) revenues of at least €15m, (2) total assets of at least €30m, (3) at least 200 employees. For the other countries, the database includes all companies that meet at least one of the following criteria: (1) revenues

private companies to publish annual information. Consequently, we are able to gather accounting and ownership information for a very large set of firms.[9]

We collect the data from the Amadeus Top 250,000 DVDs using the April issue of each year during the period 1999-2010. Information is typically incomplete for the year that just ended. Further, Amadeus removes firms from the database five years after they stop reporting financial data.[10] In order to avoid biases related to both survivorship and incomplete information, we skip the most recent reporting year and collect accounting data retroactively starting with the 2012 DVD and progressively moving backward in time. By doing so, no firms are dropped from the sample. We gather accounting data for all firms having data available for the variables included in the empirical tests of our model's predictions for at least one year during the period 1999-2010. Past studies found these accounting data to be reliable (e.g., Faccio, Marchica and Mura (2011)).

In addition to the accounting data, for all firm-years in our sample we collect direct ownership data. In doing so, we follow Faccio, Marchica and Mura (2011). In particular, since each DVD contains many years of accounting data, the information on ownership is only given as of the current year. Therefore, we collect these data one year at a time for each DVD. After cleaning the ownership information from those shareholders that are only generally defined in Amadeus, we identify the ultimate shareholder for each firm in the sample and reconstruct her equity portfolio (more details below). After combining accounting and ownership information, we end up with the final sample of 528,110 firm-year observations for 162,688 unique firms. Further, we use Datastream to gather information on weekly stock returns for all publicly-traded European firms over the 1998-2010 period to construct one of the portfolio diversification measures and a proxy for demand uncertainty. Finally, we collect data from World Bank-World Development Indicators and Global Development Finance to compute a measure of financial development.

In the calculation of ownership of firms by a shareholder we include both majority and minority equity stakes in privately-held and publicly-traded firms both in investor's country and abroad. For each company that has available ownership data, we identify all ultimate shareholders. That is, in cases in which the direct shareholder of a firm is another firm, we identify its owners, the owners of its owners, and henceforth, i.e. we trace ownership pyramids of any length. Following Claessens, Djankov, and Lang (2000), Faccio and Lang (2002) and Faccio, Marchica and Mura (2011), our measure of

of at least €10m, (2) total assets of at least €20m, (3) at least 150 employees.

[9] In Germany, Portugal, Bosnia, Macedonia, Serbia and Montenegro, and Switzerland not all companies comply with the filing requirements, while in Austria the disclosure of financial information covers fewer items than elsewhere.

[10] These drawbacks are also discussed in Popov and Roosenboom (2009), Faccio, Marchica, McConnell and Mura (2011), and Klapper, Leaven and Rajan (2012).

ultimate ownership is the weakest link along the ownership chain. After tracing each ownership stake to its ultimate shareholders, we call the shareholder controlling the largest fraction of voting rights in each firm the firm's largest ultimate shareholder. In what follows we frequently refer to the largest ultimate shareholder as firm owner. The empirical analysis below focuses on firm owners because control of voting rights indicates power in making investment and operating decisions. However, for each shareholder, we also compute her cash flow rights in the firm's earnings. A shareholder's cash flow rights are a product of ownership stakes along the ownership chain. We exclude all firms in which a government is a shareholder, as these firms may have different incentives than other companies in the economy.

3.2 Variables

In what follows we describe the variables used in the analysis. We first describe the construction of the two main dependent variables: investment-to-assets ratio and profit margin. Then we discuss the measures of owners' portfolio diversification, demand uncertainty, and financial development. Finally, we describe the control variables in the investment-to-assets and profit margin regressions.

Dependent variables

Investments-to-assets ratio is defined as the year-to-year change in gross fixed assets divided by lagged total assets. Total assets are computed as the sum of fixed and current assets.

Profit margin is defined as the return on sales (ROS), i.e. the ratio of earnings before interest and taxes (EBIT) to sales.

To reduce the impact of outliers, across all analyses, most accounting variables, including ratios, such as investment-to-assets and profit margin are winsorized at the top and bottom 1% of the distribution.[11]

Measures of owner's portfolio diversification

Ln(Number of firms) is the natural logarithm of the total number of firms in which the company's largest ultimate shareholder (e.g., the ultimate shareholder controlling the largest fraction of voting rights in the firm) holds shares, directly or indirectly, in a given year, across all countries in our sample. The motivation for this measure, which is used commonly as a proxy for portfolio diversification (e.g., Barber and Odean (2000) and Goetzman and Kumar (2008)) is that the potential for diversification

[11] Some variables are winsorized differently, as discussed below.

is increasing in the number of stocks in investor's portfolio. While this measure of portfolio diversification is admittedly crude, it has an important advantage of not requiring any information regarding the distribution of stock returns, which is particularly important in our sample consisting mostly of privately held firms.

Herfindahl index of firm owner's portfolio holdings is the sum of squared weights that each investment carries in the owner's portfolio. To compute the Herfindahl index of holdings, used commonly as a measure of portfolio diversification (e.g., Bodnaruk, Kandel, Massa and Simonov (2008), and Goetzman and Kumar (2008)), we first calculate the dollar value of a shareholder's investment in each firm in her portfolio as the book value of the company's equity, multiplied by the shareholder's ultimate ownership stake in the firm.[12] We then compute the weight of each stock in the owner's portfolio. The Herfindahl index of portfolio holdings is the sum of these squared weights. The advantage of a value-weighted measure, such as the Herfindahl index, over an equally-weighted measure based on the number of portfolio firms is that the bias due to exclusion of small firms is less significant in the value-weighted measure.

– *Correlation* is the correlation of the mean stock return of public firms in the firm's industry with the shareholder's overall portfolio returns, multiplied by -1, as in Bodnaruk, Kandel, Massa and Simonov (2008) and Faccio, Marchica and Mura (2011). We multiply the correlation by -1 so that the measures index increases with portfolio diversification. This measure of diversification is higher for firm owners whose portfolio returns are less correlated with the returns in the industry in which their firm operates.[13] We use the mean industry return as a proxy for the stock return of a given firm, which is unavailable for private firms. The industry (weekly) return is defined as the weekly average return across all publicly traded European firms within a given 3-digit SIC industry classification. We include only firms that have stock price data available in Datastream. For each investor, the portfolio returns are computed as the weighted average of returns on the individual stocks in her portfolio (or industry return in cases in which individual stock returns are not available). In this calculation, we use the weights of each firm in the investor's equity portfolio at the beginning of each year.

It is important to note that despite the wide coverage of firms in Amadeus, our portfolio diversification measures are subject to some limitations. First, small equity positions as well as positions in

[12] We use book equity instead of market equity because our sample consists predominantly of private firms. In the calculation of the Herfindahl index of holdings we only include firms with available data on the book value of equity.

[13] The drawback of this measure of portfolio diversification is that it is likely to understate diversification, as the returns of two stocks within the same industry are assumed perfectly correlated by construction.

companies below the size threshold are not covered in Amadeus and so not included in the portfolios. The exclusion of the smallest companies, though, is unlikely to have a major impact on value-weighted portfolio diversification measures discussed above. Second, we do not capture non-equity investments, such as investments in bonds and real estate, and, more importantly, we do not capture indirect equity investments, e.g., investments through mutual funds. The exclusion of investments in mutual funds and hedge funds may bias our measures of diversification downwards. To control for this potential bias, in Section 4.3 we perform a number of robustness tests that show how this issue has a very limited impact on the main findings of the paper. Third, we are unable to include equity investments in firms incorporated outside Europe. Thus, we may possibly understate the diversification of investors who are well diversified across continents. However, since investors typically exhibit a home bias (e.g., French and Poterba (1991) and Coval and Moskowitz (1999)), the magnitude of this measurement error is likely to be small. To further support this argument, Faccio, Marchica and Mura (2011) find that only a tiny proportion of controlling owners of European firms hold larger-than-5% shares of equity in non-European firms.

Measures of demand uncertainty

We follow Leahy and Whited (1996) and Bond and Cummins (2004) and use industry return volatility as a proxy for demand uncertainty in that industry.

2-digit industry demand uncertainty is calculated as follows. We compute the equally-weighted return of each 2-digit SIC industry each week across all countries. Then, we define the 2-digit SIC return volatility in a given year as the standard deviation of this equally-weighted weekly industry return computed over the previous year.

Measure of financial development

Financial development is a country-level index, equal to the average of six indicators of stock market and financial intermediaries development proposed by Demirgüç-Kunt and Levine (1996): market capitalization over gross domestic product (GDP), total value traded over GDP, total value traded over market capitalization, the ratio of liquid liabilities (M3) to GDP, credit going to the private sector over GDP, and total claims of deposit money over GDP. Financial development is taken at the beginning of each year of our sample period.

Control variables

We include the following additional variables in the investment-to-assets and profit margin regressions

that were found in past literature to be related to investment and profitability.

Sales growth is used as a proxy for investment opportunities, as an available substitute for Tobin's q, which is the usual measure of investment opportunities (e.g., Kaplan and Zingales (1997) and Cleary (1999) among many others). We use sales growth instead of Tobin's q, since the latter is unavailable for private firms, which constitute the majority of our sample.[14] Sales growth is defined as the annual relative growth rate in total revenues. As sales growth exhibits large positive skewness, it is winsorized at the bottom 1% and at the top 5% of its distribution.

Cash flow, which has been shown to be related to investment (e.g., Fazzari, Hubbard and Petersen (1988), Kaplan and Zingales (1997), Erickson and Whited (2000, 2002), and Lyandres (2007)) is the ratio of income plus depreciation to beginning-of-year total assets.

Firm age, has been shown to be related to profitability (e.g., Anderson and Reeb (2003)), since investment and profit opportunities of mature firms may be different from those of young firms. Firm age is defined as the number of years since a firm's incorporation. Because of its skewness, we winsorize age at the top 1% of its distribution and use $\ln(1 + Age)$ as the measure of age.

Total Leverage is defined as the ratio of total debt to total assets (e.g., Lang, Ofek and Stulz (1996) and Ahn, Denis and Denis (2006)) where total debt includes non-current liabilities (long term debt and other non-current liabilities) and current liabilities (loans, creditors and others).

Ln (Size) is the natural log of total assets (in thousands US$), expressed in 1999 prices.

4 Empirical tests

4.1 Univariate analysis

Table 1 reports the descriptive statistics for our sample that counts 528,110 firm-year observations from 1999 to 2010, corresponding to 162,688 unique firms across 34 different European countries. As evident from Panel A of Table 1, the most represented countries in our sample are: United Kingdom (23.36%), France (20.31%), Spain (11.37%), and Italy (8.98%). In almost all countries (with the exception of Liechtenstein, Republic of Macedonia, and Russian Federation) we have at least 100

[14] In addition, Erickson and Whited (2000), Gomes (2001) and Alti (2003) show that their may be a measurement error in estimated average Tobin's q, which may bias coefficient estimates in investment regressions.

observations. The vast majority of firms in our sample are privately held (95.9%).

Insert Table 1 here

Panel B of Table 1 shows the differences in mean (median) of our main dependent variables across privately-held and publicly-traded companies. We compare the levels of investment-to-assets ratio and profit margin, measured by ROS, between public and private firms in the entire sample and in the two matched samples (one for each dependent variable). We use the propensity score matching estimator to find for each public firm a possible match within the sub-sample of private firms (e.g., Rosenbaum and Rubin (1983)). For the propensity score matching estimation of the investment model, we include: sales growth, cash flow, firm age, along with year, country and industry (1-dgt SIC code) dummies. For the propensity score matching estimation of the profitability model, we include: total leverage, firm size, firm age, along with year, country and industry (1-dgt SIC code) indicators. We require that the difference between the propensity score of a public firm and its matching peer does not exceed 0.1% in absolute value.

On average, public companies have a significantly higher investment-to-assets ratio than private firms both when we consider the entire sample and when we match each public company to a private firm with similar characteristics. Similar findings are obtained when we compare the median values of the investment-to-assets ratios of private and public firms. This result is similar to the evidence in Mortal and Reisel (2012), obtained using a sample of Western European companies.[15] Privately-held firms have a significantly higher mean profit margin than public firms in both full sample and matched sample. This finding is consistent with a number of recent studies that report that privately held companies are significantly more profitable than public ones across various countries and years (e.g., Brav (2009), Asker, Farre-Mensa and Ljungqvist (2011a), and Faccio, Marchica, McConnell and Mura (2012)).[16] The comparison of median profit margins is less conclusive and depends on whether the medians are computed within the full sample of private firms or within the matched sample.

Panel C of Table 1 reports descriptive statistics at a company level of the main independent variables and the control variables included in the regressions. The ultimate largest shareholder in our sample seems to hold on average 21 firms in her portfolio (No. Firms). However, the median number of

[15] Interestingly, this evidence differs from the results in Asker, Farre-Mensa and Ljungqvist (2012), who show that in the U.S. publicly-traded firms invest less than matched private firms.

[16] Brav (2009) reports that the average ratio of EBIT-to-total-assets is 8.3% (4.9%) for private (public) companies in the UK market over the period of 1993-2003. Similarly, Asker, Farre-Mensa and Ljungqvist (2011a) show that the average ROA of US private (public) companies is 7.5% (6.5%) between 2002 and 2007. Faccio, Marchica, McConnell and Mura (2012) document that the mean annual equally-weighted return on book equity (ROE) of European private companies is 25.1% versus a mean annual ROE of public firms of 10.1% over the period of 1996-2008.

firms in the largest shareholder's portfolio is two. Thus, a typical largest shareholder is only moderately diversified. This evidence is consistent with Faccio, Marchica and Mura (2011) in a similar sample and to the evidence reported in Barber and Odean (2000), Moskowitz and Vissing-Jørgensen (2002), and Goetzman and Kumar (2008) in the US market, and Karhunen and Keloharju (2001) in the Finnish market. Portfolio diversification varies substantially across investor-year observations. For instance, 42% of our largest ultimate shareholders hold more than two companies in their portfolios, 10% of them hold at least 5 companies, and 0.5% of controlling shareholders hold at least 50 companies in their portfolio. Further, the average largest shareholder holds more than 62% of the cash flow rights and 63% of the voting rights in her company (untabulated statistics). This corroborates the presumption that the relations between portfolio diversification and investment and operating decisions are indeed a consequence of the decisions of the largest ultimate shareholder. Untabulated results are very similar to the main findings reported in the paper when we either include cash flow rights in all our regressions or when we restrict the sample to companies in which the largest shareholder owns more than 50% of the cash flow rights or she sits on the Board of Directors.

Our proxy for demand uncertainty shows variability across different sectors. In our sample sectors with the lowest volatility of returns (0.016) are generally those related to the food and retail industries (e.g., "Food and Kindred Products", "Food Stores"; "Wholesale Trade"), while those with the highest volatility (0.032) are those related to the agriculture and mining industries (e.g., "Fishing, Hunting, and Trapping", "Agricultural Production-Livestock and Animal Specialties"; "Coal Mining", "Metal Mining").

The financial development index varies substantially across countries with Switzerland (1.42), Netherlands (1.29) and United Kingdom (1.25) showing the highest average index over time and Republic of Macedonia (0.095), Romania (0.218) and Serbia (0.253) the lowest. The ranking of Western European countries based on this index is very similar to those reported in previous studies, despite the differences in sample periods (e.g., Demirgüç-Kunt and Levine (1996) and Love (2003)).[17,18]

[17] Demirgüç-Kunt and Levine (1996) provide evidence on both stock markets and financial intermediaries development indices over the period 1986-1993, while Love (2003) computes aggregate financial development index over the period 1988-1998. Both studies do not include Eastern European countries.

[18] See Table A1 for the country-level summary statistics of the financial development index.

4.2 Multivariate analysis

We use OLS regressions to estimate the following two models:

$$inv\_to\_assets_{i,t} = \alpha PUB_{i,t} + \beta PRI_{i,t} + \gamma(PUB_{i,t} * MainVar_{i,t}) + \delta(PRI_{i,t} * MainVar_{i,t}) + \overline{\theta X_{i,t}} + CountryFE + IndustryFE + YearFE + u_{i,t}, \quad (21)$$

$$profit\_mgn_{i,t} = \alpha PUB_{i,t} + \beta PRI_{i,t} + \gamma(PUB_{i,t} * MainVar_{i,t}) + \delta(PRI_{i,t} * MainVar_{i,t}) + \overline{\theta Z_{i,t}} + CountryFE + IndustryFE + YearFE + u_{i,t}, \quad (22)$$

For predictions 1a-1b and 2a-2b, $PUB_{i,t}$ is a indicator variable equalling one if company i is publicly-traded in year t, and equalling zero otherwise, while $PRI_{i,t}$ is an indicator equalling one if company i is privately-held in year t, and equalling zero otherwise. For predictions 3a-3b, we replace $PUB_{i,t}$ by "partially constrained," defined as an indicator variable equalling one if company i is publicly traded and it does not belong to the top decile of public companies' size and age distributions in year t, and equalling zero otherwise; while we replace $PRI_{i,t}$ by Fully (un)constrained, defined as an indicator variable equalling one if company i is privately-held or if it is publicly-traded and it belongs to the top decile of public companies' size and age distributions in year t, and equalling zero otherwise. $MainVar_{i,t}$ stands for: 1) one of the three measures of controlling owner's portfolio diversification: ln(Number of firms), (1-Herfindhal Index), and (-Correlation) for predictions 1a-1b; 2) demand uncertainty for predictions 2a-2b; 3) financial development index for predictions 3a-3b. $\overline{X_{i,t}}$ is a vector of control variables that includes: 1) sales growth; 2) cash flow; and 3) ln(1+age). $\overline{Z_{i,t}}$ includes: 1) total leverage; 2) ln(size); and 3) ln(1+age). All regressions include country, 3-digit SIC industry, and year fixed effects. $\widehat{\gamma}$ and $\widehat{\delta}$ represent the estimated sensitivities of investment and operating strategies respectively to changes in each $MainVar_{i,t}$ for public and private companies separately. Below their p-values we report the economic impacts of these estimated coefficients when statistically significant. The economic impact is calculated as follows: $\widehat{\gamma}$ ($\widehat{\delta}$) is multiplied by one standard deviation of corresponding main variable. The product is then standardized by the mean of the corresponding main variable.

4.2.1 Controlling owner's portfolio diversification

Table 2 reports results of estimating the regressions of publicly-traded and privately-held firms' investment-to-assets ratios and profit margins on measures of their owners' portfolio diversification. Panel A of Table 2 shows that controlling owner's portfolio diversification has significantly different impacts on the investment rates of public and private firms. Across all measures of owner's portfolio

diversification, the relation between portfolio diversification and investment-to-assets ratio is positive and significant for publicly-traded firms (columns 1-3), while it is negative and significant for privately held ones for two measures of portfolio diversification out of three (columns 1-2). This impact is also economically important, especially for public companies. For example, a one standard deviation increase in ln(Number of firms) corresponds to an average increase of almost 8% in investment-to-assets ratio, ceteris paribus. This result generally holds also for the matched sample, consistent with empirical prediction 1a.

Panel B of Table 2 documents the relation between measures of portfolio diversification and profit margins of public and private companies. An increase in portfolio diversification is associated with a significant increase in average profit margin of publicly traded companies. This is in line with the model's result that for a sufficiently high investment efficiency, the positive effect of cost-reducing investment on equilibrium profit margin more than offsets the negative impact on it of increased equilibrium output. For public firms, the positive relation between owner's portfolio diversification and profit margin is also economically sizeable: for example, a one standard deviation increase in ln(Number of firms) is associated with more than 31% increase in the average return on sales. When we turn to privately held firms, the relation between firms' profit margins and measures of their owners' portfolio diversification is strongly negative across all diversification measures. This finding is consistent with the model's result for fully constrained firms, for which increased equilibrium output due to higher diversification of a controlling owner lowers the equilibrium profit margin of a fully constrained firm, whose capital investment is held constant. Interestingly, the magnitude of this effect is larger for the sub-sample of matched private firms, in which a one standard deviation increase in Ln(Number of firms) is associated with a decrease of more than 42% in the average return on sales.

Insert Table 2 here

4.2.2 Demand uncertainty

Table 3 documents that industry demand uncertainty has different impacts on the investment and operating strategies of publicly-traded and privately-held companies in line with predictions 2a-2b of the model. In Panel A we observe that an increased demand uncertainty in firms' industry is associated with a significant reduction in the investment-to-assets ratios of public firms, while it only marginally increases the investment-to-assets ratios of private firms. The effect of demand uncertainty appears more pronounced for public rather than private companies when we use either the entire sample or the matched sample. A one standard deviation increase in the measure of demand uncertainty is associated with a decrease of almost 11% in the investment-to-assets ratio of an average public firm. When private

companies are matched to public ones, the results strongly support the model's prediction: an increase in demand uncertainty is associated with a significant reduction in public firms' investment-to-assets ratios and with a significant increase in private firms' investment-to-assets ratios.

Turning to profit margin regressions, reported in Panel B of Table 3, demand uncertainty has a strong negative association with the return on sales of public firms, whereas profit margins of privately-held firms are insensitive to changes in demand uncertainty. Overall, the results in Table 3 are strongly consistent with the model's prediction regarding the relation between demand uncertainty and public and private firms' investment strategies, while the support for predictions regarding the relation between demand uncertainty and firms' operating strategies and outcomes are only supported for public firms.

Insert Table 3 here

4.2.3 Financial development

Results in Table 4 describe the different impacts that financial market development has on companies with various degrees of financial constraints. In order to test the model's empirical prediction, we distinguish between partially constrained firms (i.e. public firms except the largest and oldest ones), on one hand, and fully constrained (private) and unconstrained (largest and oldest public) firms, on the other hand. The evidence in Panel A of Table 4 shows that investment-to-assets ratios of partially constrained firms are significantly related to the development of financial markets. A one standard deviation change in the financial development index is associated with an average increase of 41% in the investment-to-assets ratio of partially constrained firms within the whole sample (column 1) and with an average increase of 24% within the matched sample.[19] On the other hand, fully constrained and unconstrained firms are less sensitive to the development of financial markets. Within the whole sample, the sensitivity of these firms' investment-to-assets ratios to the financial development index is significantly lower (14%) than the one of partially constrained firms. Moreover, within the matched sample, the investment-to-assets ratio of fully constrained and fully unconstrained firms is insensitive to financial markets development, in line with the model's prediction.

The estimated relation between financial development and firms' profit margins, reported in Panel B of Table 4, are less supportive of the model's prediction. In particular, in the matched sample, the relation between the financial development index and profit margins of partially constrained firms is insignificant, while the relation is significantly negative for fully constrained and fully unconstrained

[19] These economic impacts may be driven by the wide heterogeneity in the degree of development of financial markets across countries in our sample. Appendix A1 shows indeed a striking difference between Western and Eastern European countries.

firms. Consistent with the model. however, the impact of financial development on fully financially constrained and unconstrained firms is significantly more negative than that on partially constrained firms.

Insert Table 4 here

4.3 Robustness tests

In this section we assess the robustness of our results with respect to a number of alternative specifications and to potential self-selection of firms into private and public incorporation modes.

4.3.1 Alternative dependent variables

Our model's predictions refer specifically to firms' capital expenditures and their profit margins. Nonetheless, since R&D expenditures may be as important as capital expenditures for some firms, we define an alternative variable for the investment model, which takes into account R&D expenditures in addition to capital expenditures. Following Gianetti (2003), we use the change in total intangible assets as a proxy for R&D expenditures and assign the value of zero to R&D expenditures in cases they are missing. We define total investment-to-assets ratio as the year-to-year change in the sum of gross fixed assets and total intangible assets divided by lagged total assets. Further, as an alterative proxy for profitability, we use the ratio of EBIT to total assets (ROA), following much of the existing literature. Table 5 includes the results of estimating all specifications for both the alternative investment measures (Panel A) and profitability measures (Panel B) respectively.

Generally, our main findings are robust to alternative definitions of the dependent variables across most of the specifications in both panels. Total-investment-to-assets ratio is increasing in all measures of owner's portfolio diversification and is decreasing in demand uncertainty, while it is generally decreasing in portfolio diversification and is increasing in demand uncertainty for private firms. In addition, the relation between financial development and total-investment-to-assets ratio is significantly stronger for partially financially constrained firms than for firms that are either fully constrained or fully unconstrained. Similar qualitative results are observed in Panel B, in which the dependent variable is EBIT-to-assets ratio (ROA). Notably, unlike in the main specification reported in Table 4, the relation between financial development and ROA for partially constrained firms is positive and significant, consistent with the model's prediction.

Insert Table 5 here

4.3.2 Ultimate shareholders: Dual class shares

To trace back the ultimate shareholder of each company included in our sample we reconstruct the ownership pyramids from each direct shareholder of each firm. One limitation of this procedure is that we are unable to take into account the presence of dual class shares. The use of dual class shares, when legally allowed, is observed not only within public firms, bit also in private companies. However, there are no official sources providing accurate information on the extent of dual class shares use among privately held firms. The omission of dual class shares in the calculation of both cash flow and voting rights of firms' ultimate shareholders may potentially create a measurement error in the identification of the (ultimate) controlling owners and, therefore, in the construction of our proxies for portfolio diversification. However, previous studies show that dual class shares are used extensively in only a few European countries (e.g., Faccio and Lang (2002) and Nenova (2003)). Further, Pajuste (2005) documents that an increasing number of firms in continental Europe have recently unified their shares into a single class. This has been also reported by the ECGI in their study commissioned by the European Union (2007). In particular, Pajuste (2005) shows that, at the end of 2001, after several legal reforms aimed at improving investor protection across Europe, only six countries still seem to have at least 10% of their public companies using dual class shares: Sweden (46.3%), Denmark (36.6%), Italy (34.6%), Switzerland (26.4%), Finland (23.9%) and Germany (11.5%). Therefore, we believe that this potential measurement error has a limited impact on the identification of firms' ultimate shareholders. Nevertheless, we re-examine the results in light of this potential bias. As there is no accurate information on the use of dual class shares among privately held firms, we conservatively assume that public companies' use of dual class shares mirrors the one by privately held firms. Therefore, we exclude the countries above from our sample and re-run all specifications for both investment and profitability models. The results, reported in Table 6, demonstrate that dual class shares are generally not responsible for the empirical results reported in Tables 2-4.

Insert Table 6 here

4.3.3 Portfolio diversification measures

As mentioned in Section 3.1, a potential limitation of our portfolio diversification measures is that we are not able to capture indirect equity investments, such as investments through mutual funds. The exclusion of investments in mutual and hedge funds may bias our measures of diversification downwards. Further, we are not able to capture small equity positions and investment in companies that are not included in Amadeus or that are incorporated outside Europe. This may bias our portfolio

measures even further if the presence of mutual and hedge funds in the European markets is as pervasive as in the U.S. market.[20] However, the descriptive statistics of our portfolio diversification measures are similar to estimates reported in Barber and Odean (2000), Goetzman and Kumar (2008), for US investors, and Karhunen and Keloharju (2001) for Finnish investors. In addition, a comparable level of diversification is documented by Moskowitz and Vissing-Jørgensen (2002) for U.S. households investing in the private equity market. Further, as mentioned above, Faccio, Marchica and Mura (2011) provide evidence that European investors are affected by the well-known home bias. Nonetheless, we try to reduce the potential downward bias of our portfolio diversification measures in two ways.

First, we look at the fraction of households' total financial assets invested in "Mutual fund shares" as reported in the National Accounts. We calculate this fraction at the end of 2006 to take into account that in the first half of the decade several European countries experienced a significant increase in the holdings of mutual fund shares (e.g., Ynesta (2008)). In 6 out of 22 countries with available information this fraction is above 10%: Belgium, Austria, Spain, Sweden, Germany, and Switzerland, suggesting that in these countries the downwards bias that may potentially may affect our portfolio diversification measures is larger. Therefore, we exclude these countries from our sample and re-run all the specifications for both investment and profitability models. The results, reported in Table 7, are generally consistent with our baseline results, suggesting that our failure to capture investments in mutual funds and hedge funds is unlikely to drive our empirical results.

Insert Table 7 here

Second, to proxy for the share of mutual fund investments in the stock markets of different countries, we examine the fraction of market capitalization in each country held by mutual funds as of 2005, reported in Ferreira and Matos (2008). The fraction of European market capitalization held by institutional investors in general and by mutual funds in particular is well below the corresponding figures in the U.S. market. In only 6 countries out of 34 in our sample, the ownership of the stock market by mutual funds exceeds 5%: Sweden, Ireland, Finland, Luxembourg, Netherlands, and Switzerland. As in the previous test, we exclude these countries from our sample and re-run all the specifications for both investment and profitability models. Results, which are reported in Table 8, are consistent with the full-sample findings.

Insert Table 8 here

[20] Gillan and Starks (2007) show that at the end of 2006 the proportion of total outstanding U.S. equities held by institutional investors was more than 70%.

4.3.4 Disclosure requirements and accounting standards

Although most of the countries in our sample require companies to file financial statements (albeit sometimes in reduced form), in some countries the regulations (and/or filing practices) are different. For instance, in Bosnia, Romania, Russia, and Switzerland private firms are not required to publish financial statements. In Portugal and Germany, few companies comply with the filing requirements. Additionally, in Liechtenstein, Malta, Monaco, and the Slovak Republic the criteria for publication of financial statements are undefined in Amadeus. Further, in some countries, firms that are not required to file financial reports choose to file them.[21] This could lead to a potential selection bias towards successful (private) companies that choose to file their financial reports. While in all our models we include country fixed effects, which should control for different levels of disclosure requirements in various countries and/or differences in filing practices, we try to further mitigate this potential bias by excluding private firms incorporated in the countries listed above and in other countries in which private firms are not required to file. The results, reported in Table 9, mirror our previous findings.

Insert Table 9 here

A further potential concern relates to the quality of accounting information across the countries in our sample. Although all our countries have adopted the International Financial Reporting Standards (IFRS) during the 2000s or decided to adopt them at some point in the near future (e.g., Russia), there could be still differences in reporting standards. This may potentially affect our findings, in particular those related to firms' operating strategies. We follow Porter and Schwab (2008) and use the Executive Opinion Survey conducted by the World Economic Forum between 2007 and 2008 to gauge the extent of these differences.[22] The Survey was completed by 2,881 top European management business leaders with an average of 88 respondents per country. The Survey asks the executives to provide their expert opinions on various aspects of the business environment in which they operate. We are interested in the question related to the strength of financial auditing and reporting standards regarding company financial performance (item 1.16). The evaluation is on a scale between 1 and 7, where 1 represents the worst possible operating condition or situation, and 7 represents the best. In our sample, the highest score is 6.2 (Austria), while the worst is 3.6 (Bosnia and Herzegovina). Countries with the lowest score (in the bottom decile of the distribution) are: Bosnia and Herzegovina, Ukraine, Russia,

[21] See Faccio, Marchica, McConnell and Mura (2012) for a more detailed analysis of the disclosure requirements in European countries.

[22] The World Economic Forum has conducted the annual Survey for nearly 30 years. The Executive Opinion Survey results serve as a major component of research by a number of international and national organizations, government and research bodies, and companies.

and Bulgaria. To control for potential misreporting bias, we exclude the above countries from our main models. Table 10 shows that our previous findings are robust to the exclusion of countries with questionable reporting practices.

Insert Table 10 here

4.3.5 Self-selection bias: Treatment effect model

One of the potential shortcomings of the matching estimator results presented earlier is that this methodology only allows to condition on observable characteristics of the two samples. Nonetheless, concerns may arise if the self-selection of companies into public (or private) status is driven by characteristics that are not measurable by an econometrician. This issue can be partially addressed by adopting the two-stage Heckman selection model. In this context, the inclusion of the inverse Mills ratio term in the second stage should enable controlling for such unobservable characteristics. Consequently, as another attempt to address the potential endogeneity concern, we employ a treatment effects model. The first step of this model is a probit model, which is intended to capture the decision of companies to be publicly traded or privately held. **{WE NEED TO DESCRIBE THE FIRST-STAGE MODEL}** From the residuals of this regression we calculate the inverse Mills ratio, which we include in the second step alongside the dummy variable characterizing the legal status, public/private incorporation mode, and control variables. In this way we can explicitly test whether the public/private incorporation mode affects firms' investment and operating strategies, after the self-selection due to unobservable factors has been controlled for.

For this model to be correctly specified, it is important to include at least one exogenous variable from the first stage choice model (e.g., Lennox, Francis, and Wang (2011)). For this purpose, we use the fraction of privately held companies in each 3-digit SIC industry in a country in which a company is headquartered in order to predict the decision of being private without otherwise affecting corporate investment and operating decisions. One may argue that private companies could be more clustered in certain industries. In this case the exclusion restriction may be correlated, although indirectly, with the left had side of the second-stage models. To mitigate this potential concern, we include industry, country and year dummies in both the first-stage and second-stage regressions. The results of the second stage regressions of both investment and profitability models for the portfolio diversification and demand uncertainty specifications are reported in Table 11. Augmenting the regressions by including the inverse Mills ratio to correct for self-selection does not affect the qualitative relations between portfolio diversification and demand uncertainty on one hand and investment-to-assets ratio

and profit margin of private and public firms on the other hand.

Insert Table 11 here

5 Conclusions

In this paper we investigate theoretically and empirically a potential reason for the vastly different investment and operating strategies of public and private firms. We argue that one of the important consequences of the public mode of incorporation is lower costs of external financing due, for example, to lower degree of information asymmetry surrounding public firms.

External financing costs affect firms' investment and operating strategies. To examine these effects theoretically, we construct a simple model of a partially financially constrained firm that operates under uncertainty and is controlled by an imperfectly diversified owner, who maximizes her expected utility. Uncertainty and underdiversification affect (relatively financially unconstrained) public firms' investment and operating strategies in ways that are different from those of (relatively constrained) private firms. In particular, the model leads to clear empirical predictions regarding the relations between diversification of firms' controlling owners and uncertainties surrounding firms on one hand and public and private firms' equilibrium investment-to-asset ratios and profit margins on the other hand.

We test the model's predictions empirically using the Amadeus Top 250,000 database, which provides comprehensive accounting and ownership data on firms in 34 European countries over a twelve-year period. Our empirical results are largely consistent with the model's predictions regarding the effects of owners' diversification and demand uncertainty on public and private firms' investment and operating strategies.

Our theoretical and empirical results suggest that differences in the costs of accessing external capital markets between public and private firms are partially responsible for the observed differences in operating and investment policies and their outcomes between public and private firms. In this paper we purposely abstract from choices that public and private firms make other than investment and production decisions, such as firms' capital structures and payout policies. Examining the potential reasons for the differences between public firms' leverage ratios and dividend and share repurchase ratios and those of private firms is likely to shed additional light on the importance of the mode of incorporation on all dimensions of firms' value maximization.

Appendix

Proof of Lemma 1

Partially differentiating (9) with respect to I and q, equating these derivatives to zero and solving the resulting system of two equations results in unconstrained optimal K^* and q^* in (14) and (15) respectively. Equating I^* to zero (or K^* to W) results in $\overline{F}$ in (13). For $F > \overline{F}$, unconstrained I^* is negative. Given the constraint of $I^* \geq 0$, $I^* = 0$ for $F \geq \overline{F}$. Differentiating (9) with respect to q, while setting I to zero (or, alternatively, K^* to W), equating the derivative to zero and solving the resulting equation with respect to q results in q^* in (16).

Proof of Proposition 1

Dividing the optimal capital investment in the unconstrained case in (14) by assets, as in (17), results in an unconstrained firm's investment-to-assets ratio:

$$\mathbb{I}^*_{unconst} = \frac{\delta^2(\mu - c - a\rho s\sigma_p x)}{(1+F)^2(4\alpha s^2\eta - 8\beta c) + (1+2F)\delta^2(\mu - a\rho s\sigma_p x) + \delta^2 c}. \tag{23}$$

Differentiating $\mathbb{I}^*_{unconst}$ in (23) with respect to σ_p results in

$$\frac{\partial \mathbb{I}^*_{unconst}}{\partial \sigma_p} = -\frac{2ac(1+F)sx\delta^2\rho((4\beta + 2as^2\eta)(1+F) - \delta^2)}{(4(2\beta c + acs^2\eta)(1+F)^2 - \delta^2 c - \delta^2\mu(1+2F) + asx\delta^2\rho\sigma_p(1+2F))^2}. \tag{24}$$

The denominator of (24) is clearly positive. The numerator of (24) is positive due to the constraint in (11). Thus, $\frac{\partial \mathbb{I}^*_{unconst}}{\partial \sigma_p}$ in (24) is negative.

Differentiating $\mathbb{I}^*_{unconst}$ in (23)with respect to ρ results in

$$\frac{\partial \mathbb{I}^*_{unconst}}{\partial \rho} = -\frac{2ac(1+F)sx\delta^2\sigma_p((4\beta + 2as^2\eta)(1+F) - \delta^2)}{(4(2\beta c + acs^2\eta)(1+F)^2 - \delta^2 c - \delta^2\mu(1+2F) + asx\delta^2\rho\sigma_p(1+2F))^2}. \tag{25}$$

$\frac{\partial \mathbb{I}^*_{unconst}}{\partial \rho}$ in (25) is negative for the same reason as $\frac{\partial \mathbb{I}^*_{unconst}}{\partial \sigma_p}$ in (24).

Dividing the capital investment in the constrained case, W, by assets, as in (17), results in a constrained firm's investment-to-assets ratio:

$$\mathbb{I}^*_{const} = \frac{W}{W + \frac{(c - \sqrt{W}\delta)(\mu - c - a\rho s\sigma_p x + \sqrt{W}\delta)}{2\beta + as^2\eta}}. \tag{26}$$

Differentiating $\mathbb{I}^*_{const}$ in (26) with respect to σ_p results in

$$\frac{\partial \mathbb{I}^*_{const}}{\partial \sigma_p} = \frac{asWx\rho(c - \sqrt{W}\delta)(2\beta + as^2\eta)}{(W(2\beta - \delta^2 + as^2\eta) + \sqrt{W}(2c\delta - \mu\delta + asx\delta\rho\sigma_p) - c^2 + c\mu - acsx\rho\sigma_p)^2}. \tag{27}$$

$c - \sqrt{W}\delta$ has to be positive to ensure positive marginal cost of production, therefore $\frac{\partial \mathbb{I}^*_{const}}{\partial \sigma_p}$ in (27) is positive as well.

Differentiating $\mathbb{I}^*_{const}$ in (26) with respect to ρ results in

$$\frac{\partial \mathbb{I}^*_{const}}{\partial \rho} = \frac{asWx\sigma_p(c - \sqrt{W}\delta)(2\beta + as^2\eta)}{(W(2\beta - \delta^2 + as^2\eta) + \sqrt{W}(2c\delta - \mu\delta + asx\delta\rho\sigma_p) - c^2 + c\mu - acsx\rho\sigma_p)^2}, \tag{28}$$

which is positive for the same reason as $\frac{\partial \mathbb{I}^*_{const}}{\partial \sigma_p}$ in (27).

Proof of Proposition 2

Plugging in equilibrium K^* and q^* in (14) and (15) respectively into the net profit margin in (19) results in unconstrained equilibrium profit margin:

$$\Pi^*_{unconst} = \frac{(1+F)^2(-4\beta c - 4acs^2\eta + 4\beta\mu + 4as^2\mu\eta + 4asx\beta\rho\sigma_p) - (1+2F)asx\delta^2\rho\sigma_p - \delta^2\mu + \delta^2 c}{2(1+F)(2(1+F)(\beta c + \beta\mu + as^2\mu\eta asx\beta\rho\sigma_p) - \delta^2\mu)}. \tag{29}$$

Differentiating $\Pi^*_{unconst}$ in (29) with respect to σ_p results in

$$\frac{\partial \Pi^*_{unconst}}{\partial \sigma_p} = -\frac{2asx\rho((4\beta + 2as^2\eta)(1+F) - \delta^2)(4\beta c(1+F)^2 - \delta^2\mu(1+2F))}{2(1+F)(2(1+F)(\beta c + \beta\mu + as^2\mu\eta + asx\beta\sigma_p\rho) - \delta^2\mu)^2}. \tag{30}$$

The denominator of (30) is positive. $(4\beta+2as^2\eta)(1+F)-\delta^2$ in the numerator of (30) is positive as well, due to the constraint in (11). The sign of (30), thus, depends on the sign of $4\beta c(1+F)^2-\delta^2\mu(1+2F)$ in the numerator. This expression is positive (negative), as is $\frac{\partial \Pi^*_{unconst}}{\partial \sigma_p}$ in (30), when $\delta < \sqrt{\frac{4\beta c(1+(1-d)f)^2}{\mu(1+2(1-d)f)}}$ ($\delta > \sqrt{\frac{4\beta c(1+(1-d)f)^2}{\mu(1+2(1-d)f)}}$).

Differentiating (29) with respect to ρ results in

$$\frac{\partial \Pi^*_{unconst}}{\partial \rho} = -\frac{2asx\sigma_p((4\beta + 2as^2\eta)(1+F) - \delta^2)(4\beta c(1+F)^2 - \delta^2\mu(1+2F))}{2(1+F)(2(1+F)(\beta c + \beta\mu + as^2\mu\eta + asx\beta\sigma_p\rho) - \delta^2\mu)^2}. \tag{31}$$

$\frac{\partial \Pi^*_{unconst}}{\partial \rho}$ in (31) is positive (negative) in the same range of δ as (30).

Plugging in equilibrium q^* in the constrained case in (16) and $K = W$ into (19) results in constrained equilibrium profit margin:

$$\Pi^*_{const} = 1 - \frac{(2\beta + as^2\eta)(W + \frac{(c-\sqrt{W}\delta)(\mu - c - a\rho s\sigma_p x + \sqrt{W}\delta)}{2\beta + as^2\eta})}{(\mu - c - a\rho s\sigma_p x + \sqrt{W}\delta)(\mu + \frac{\beta(\mu - c - a\rho s\sigma_p x + \sqrt{W}\delta)}{2\beta + as^2\eta})}. \tag{32}$$

Differentiating Π^*_{const} in (32) with respect to σ_p results in

$$\frac{\partial \Pi^*_{const}}{\partial \sigma_p} = \frac{asx\beta\rho(c - \sqrt{W}\delta)(2\beta + as^2\eta)}{(\beta c + \beta\mu - W\beta\delta + as^2\mu\eta + asx\beta\rho\sigma_p)^2}, \tag{33}$$

which is clearly positive.

Differentiating Π^*_{const} in (32) with respect to ρ results in

$$\frac{\partial \Pi^*_{const}}{\partial \sigma_p} = \frac{asx\beta\sigma_p(c - \sqrt{W}\delta)(2\beta + as^2\eta)}{(\beta c + \beta\mu - W\beta\delta + as^2\mu\eta + asx\beta\rho\sigma_p)^2}, \tag{34}$$

which is also positive.

Proof of Proposition 3

Differentiating $\mathbb{I}^*_{unconst}$ in (23) with respect to s results in

$$\frac{\partial \mathbb{I}^*_{unconst}}{\partial s} = -\frac{2ac(1+F)(\delta^2(x\rho\sigma_p((4\beta x + 2as^2\eta\rho)(1+F) - \delta^2) + 4s\eta(\mu - c)))}{(4(2\beta c + acs^2\eta)(1+F)^2 - \delta^2 c - \delta^2\mu(1+2F) + asx\delta^2\rho\sigma_p(1+2F))^2}. \tag{35}$$

The denominator of (35) is positive. The numerator of (35) is positive as well: $4\beta x\rho\sigma_p + 2as^2 x\eta\rho\sigma_p)(1+F) - \delta^2$ is positive due to the constraint in (11). In addition, $\mu > c$, resulting in (35) being negative.

Differentiating $\mathbb{I}^*_{const}$ in (26) with respect to s results in

$$\frac{\partial \mathbb{I}^*_{const}}{\partial \sigma_p} = \frac{aW(c - \sqrt{W}\delta)(s\eta(\mu - c + 2\sqrt{W}\delta) + s\eta(\mu - c - asx\delta\rho\sigma_p)}{(W(2\beta - \delta^2 + as^2\eta) + \sqrt{W}(2c\delta - \mu\delta + asx\delta\rho\sigma_p) - c^2 + c\mu - acsx\rho\sigma_p)^2}, \tag{36}$$

where both the numerator and the denominator are positive.

Proof of Proposition 4

Differentiating $\Pi^*_{unconst}$ in (29) with respect to σ_p results in

$$\frac{\partial \Pi^*_{unconst}}{\partial s} = \frac{a(\delta^2(x\rho\sigma_p((4\beta x\rho\sigma_p + 2as^2 x\eta\rho\sigma_p)(1+F) - \delta^2) + 4s\eta(\mu - c)))(4\beta c(1+F)^2 - \delta^2\mu(1+2F))}{2(1+F)(2(1+F)(\beta c + \beta\mu + as^2\mu\eta + asx\beta\sigma_p\rho) - \delta^2\mu)^2}. \tag{37}$$

The denominator of (37) is positive. The sign of the numerator of (37) is the same as the sign of $4\beta c(1+F)^2 - \delta^2\mu(1+2F)$, which is positive (negative) when $\delta < \sqrt{\frac{4\beta c(1+(1-d)f)^2}{\mu(1+2(1-d)f)}}$ ($\delta > \sqrt{\frac{4\beta c(1+(1-d)f)^2}{\mu(1+2(1-d)f)}}$).

Differentiating Π^*_{const} (32) with respect to s results in

$$\frac{\partial \Pi^*_{unconst}}{\partial s} = \frac{a\beta(c - \sqrt{W}\delta)(s\eta(\mu - c + 2\sqrt{W}\delta) + s\eta(\mu - c - asx\delta\rho\sigma_p)}{(\beta c + \beta\mu - W\beta\delta + as^2\mu\eta + asx\beta\rho\sigma_p)^2}, \tag{38}$$

which is positive.

Proof of Proposition 5

Differentiating $\mathbb{I}^*_{unconst}$ in (23) with respect to d results in

$$\frac{\partial \mathbb{I}^*_{unconst}}{\partial d} = \frac{2f\delta^2(\mu - c - asx\rho\sigma_p)((1+F)(8\beta c + 4acs^2\eta) - \delta^2(\mu - asx\rho\sigma_p)}{(8\beta c(1+F) - 4acs^2\eta(1+F)^2 + (1+2F)\delta^2(\mu - asx\rho\sigma_p) + \delta^2 c)^2}. \tag{39}$$

The denominator of (39) is positive. The sign of the numerator of (39) equals the sign of $(1+F)(8\beta c + 4acs^2\eta) - \delta^2(\mu - asx\rho\sigma_p)$, which can be rewritten as

$$(2c(1+F)(4\beta + 2as^2\eta) - \delta^2(\mu - c - asx\rho\sigma_p)) + (c((1+F)(4\beta + 2as^2\eta) - \delta^2) \tag{40}$$

$(c((1+F)(4\beta + 2as^2\eta) - \delta^2)$ is positive due to the constraint in (11). The condition that ensures that the equilibrium production cost in (4) is nonnegative is obtained by plugging the equilibrium unconstrained investment in (14) into the production cost function in (4). The resulting condition is

$\delta^2(\mu - c - asx\rho\sigma_p) < 2c(1+F)(4\beta + 2as^2\eta)$, ensuring that (40) is positive and $\frac{\partial \mathbb{I}^*_{unconst}}{\partial d}$ in (39) is positive as well.

$\frac{\partial \mathbb{I}^*_{unconst}}{\partial d}$ in (39) approaches 0 as $f \longrightarrow 0$. $\mathbb{I}^*_{const}$ in (26) is not a function of d, which completes the proof.

Proof of Proposition 6

Differentiating $\Pi^*_{unconst}$ in (29) with respect to d results in

$$\frac{\partial \Pi^*_{unconst}}{\partial d} = \frac{f\delta^2(\mu - c - asx\rho\sigma_p)((1+F)(4\beta c + 4F(\beta\mu + afs^2\mu\eta + afsx\beta\rho\sigma_p)) + \delta^2\mu)}{2(1-F)^2((1+F)(\beta\mu + \beta c + 2as^2\mu\eta + 2asx\beta\rho\sigma_p) - \delta^2\mu)^2} \tag{41}$$

Both the numerator and the denominator of (41) are clearly positive.

$\frac{\partial \Pi^*_{unconst}}{\partial d}$ in (41) approaches 0 as $f \longrightarrow 0$. Π^*_{const} in (32) is not a function of d, which completes the proof.

References

Ahn, S., Denis D. and Denis D., 2006, Leverage and investment in diversified firms, *Journal of Financial Economics* 79, 317-337.

Alti, A., 2003. How sensitive is investment to cash flow when financing is frictionless?, *Journal of Finance* 58, 707–722.

Anderson, R., and Reeb, D., 2003, Founding-family ownership, corporate diversification, and firm leverage, *Journal of Law and Economics* 46, 653-684.

Arrow, K., 1971, Essays in the Theory of Risk-Bearing, Chicago: Markham Publishing Co.

Asker, J., Farre-Mensa, J., and Ljungqvist, A., 2011a, Comparing the investment behavior of public and private firms, New York University working paper.

Asker, J., Farre-Mensa, J., and Ljungqvist, A., 2011b, What Do Private Firms Look like? Data Appendix to "Does the Stock Market Distort Investment Incentives?", New York University working paper.

Barber, B. and Odean, T., 2000, Trading is hazardous to your wealth: The common stock investment performance of individual investors, *Journal of Finance* 55, 773-806.

Benveniste, L. and Spindt. P., 1989, How investment bankers determine the offer price and allocation of new issues, *Journal of Financial Economics* 24, 343-361.

Bodnaruk, A., Kandel, E., Massa, M., and Simonov, A., 2008, Shareholder diversification and the decision to go public, *Review of Financial Studies* 21, 2779-2824.

Bond, S. and Cummins, J., 2004, Uncertainty and investment: An empirical investigation using data on analysts' profit forecasts, University of Oxford working paper.

Brav, O., 2009, Access to capital, capital structure, and the funding of the firm, *Journal of Finance* 64, 263-308.

Chod, J., and Lyandres, E., 2011, Strategic IPOs and product market competition, *Journal of Financial Economics* 100, 45-67.

Claessens, S. Djankov, S. and Lang, L., 2000, The separation of ownership and control in East Asian corporations, *Journal of Financial Economics* 58, 81-112.

Cleary, S., 1999. The relationship between firm investment and financial status, *Journal of Finance* 54, 673–692.

Coval, J. and Moskowitz, T., 1999, Home bias at home: Local equity preference in domestic portfolios, *Journal of Finance* 54, 2045-2074.

Daske, H., Hail, L., Leuz, C., and Verdi, R., 2012, Adopting a Label: Heterogeneity in the Economic Consequences of IFRS Adoptions, *Journal Accounting Research*, forthcoming.

Demirgüç-Kunt, A. and Levine, R., 1996, Stock market development and financial intermediaries: Stylized facts, 1996, *World Bank Economic Review* 10, 291-321.

Derrien and Kecskés, 2007, The initial public offerings of listed firms, *Journal of Finance* 62, 447–479.

Dow, J. and Gorton, G., 1997, Noise trading, delegated portfolio management, and economic welfare, *Journal of Political Economy* 105, 1024-1050.

ECGI, 2007, Report on the proportionality principle in the European Union. External study commissioned by the European Union.

Erickson, T. and Whited, T., 2000. Measurement error and the relationship between investment and q, *Journal of Political Economy* 108, 1027–1057.

Erickson, T. and Whited, T., 2002. Two-step GMM estimation of the errors-in-variables model using high-order moments, *Econometric Theory* 18, 776–799.

Faccio, M., and Lang, L., 2002, The ultimate ownership of Western European corporations, *Journal of Financial Economics* 65, 365-395.

Faccio, M., Marchica, M., and Mura, R., 2011, Large shareholder diversification and corporate risk-taking, *Review of Financial Studies*, forthcoming.

Faccio, M., Marchica, M., McConnel, J., and Mura, R., 2011, Returns and risks to private equity, Purdue University working paper.

Fazzari, S., Hubbard, G., and Petersen, B., 1988. Finance constraints and corporate investment, *Brookings Papers on Economic Activity* 1, 141–195.

Ferreira, M. and Matos, P., 2008. The colors of investors' money: The role of institutional investors around the world, *Journal of Financial Economics* 88, 499–533.

French, K. and Poterba, J., 1991, Investor diversification and international equity markets, *American Economic Review* 81, 222-226.

Giannetti, M., 2003, Do better institutions mitigate agency problems? Evidence from corporate finance choices, *Journal of Financial And Quantitative Analysis* 38, 185-212.

Gillan, S. and Starks, L., 2007. The evolution of shareholder activism in the United States, *Journal of Applied Corporate Finance* 19, 55–73.

Goetzman, W. and Kumar, A., 2008, Equity portfolio diversification, *Review of Finance* 12, 433-463.

Gomes, J., 2001. Financing investment, *American Economic Review* 91, 1263–1285.

Heaton, J., and Lucas, D., 2004, Capital structure, hurdle rates, and portfolio choice – Interactions in an entrepreneurial firm, Northwestern University working paper.

Hsu, H., Reed, A. and Rocholl, J., 2010. The new game in town: competitive effects of IPOs. *Journal of Finance* 65, 495-528.

Jain, B. and Kini, O., 1994, The post-issue operating performance of IPO firms, *Journal of Finance* 49, 1699-1726.

Kaplan, S. and Zingales, L., 1997, Do investment-cash flow sensitivities provide useful measures of financial constraints, *Quarterly Journal of Economics* 112, 169-215.

Karhunen, J., and Keloharju, M., 2001, Share ownership in Finland 2000, *Finnish Journal of Business Economics* 50, 188-226.

Klapper, L., Leaven, L. and Rajan, R., 2012, Trade credit contracts, *Review of Financial Studies* 25, 838-867.

Lang, L., Ofek, E. and Stulz, R., 1996. Leverage, investment, and firm growth, *Journal of Financial Economics* 40, 3-29.

Leahy, J. and Whited, T., 1996, The effect of uncertainty on investment: some stylized facts, *Journal of Money, Credit, and Banking* 28, 64-83.

Lennox, C., Francis, J. and Wang, Z., 2012. Selection models in accounting research, *Accounting Review*, forthcoming.

Loughran, T. and Ritter, J., 1997, The operating performance of firms conducting seasoned equity offerings, *Journal of Finance* 52, 1823–1850.

Love, I., 2003, Financial development and financing constraints: International evidence from the structural investment model, *Review of Financial Studies* 16, 765-791.

Lyandres, E., 2007, Costly external financing, investment timing, and investment-cash flow sensitivity, *Journal of Corporate Finance* 13, 959-980.

Michaely, R., and Roberts, M., 2012, Corporate dividend policies: Lessons from private firms, *Review of Financial Studies* 25, 711-746.

Mikkelson, W., Partch, M., and Shah, K., 1997, Ownership and operating performance of companies that go public, *Journal of Financial Economics* 44, 279-307.

Mortal, S., and Reisel, N., 2012, Capital Allocation by Public and Private Firms, *Journal of Financial and Quantitative Analysis*, forthcoming.

Moskowitz, T., and Vissing-Jørgensen, A., 2002, The returns to entrepreneurial investment: A private equity premium puzzle?, *American Economic Review* 92, 745-778.

Myers, S. and Majluf, N., 1984, Corporate financing and investment decisions when firms have information that investors do not have". *Journal of Financial Economics* 13 (2): 187–221.

Nenova, T., 2003, The value of corporate voting rights and control: A cross-country analysis, *Journal of Financial Economics* 68, 325-351.

Pagano, M., Panetta, F. and Zingales, L., 1998, Why do companies go public? An empirical analysis, *Journal of Finance* 53, 27-64.

Pajuste, A, 2005, Determinants and consequences of the unification of by dual-class shares, European Central Bank working paper.

Popov, A. and Roosenboom, P., 2009, Does private equity investment spur innovation? Evidence from Europe, European Central Bank working paper.

Porter, M., and Schwab, K., 2008, The Global Competitiveness Report 2008–2009, *World Economic Forum.*

Pratt, J., 1964, Risk aversion in the small and in the large, *Econometrica* 32, 122-136.

Rosenbaum, P. and Rubin, D., 1983, The central role of the propensity score in observational studies for causal effects, *Biometrika* 70, 4155.

Rothschild, M. and Stiglitz, J., 1971, Increasing risk II: its economic consequences, *Journal of Economic Theory* 3, 66-84.

Saunders, A., and Steffen, S., 2011, The Costs of Being Private: Evidence from the Loan Market?, *Review of Financial Studies* 23, 4091–4122.

Schenone, C., 2010, Lending Relationships and Information Rents: Do Banks Exploit their Information Advantages?, *Review of Financial Studies* 24, 1149–1199.

Shah, S., and Thakor, A., 1988, Private versus public ownership: investment, ownership distribution, and optimality, *Journal of Finance* 43, 41-59.

Sheen, A., 2009, Do public and private firms behave differently? An examination of investment in the chemical industry, UCLA working paper.

Ynesta, I., 2008, Households' wealth composition across OECD countries and financial risks borne by households, *OECD Journal: Financial Market Trends*, 2008/2.

Table 1. Summary statistics

Panel A reports some statistics of country coverage of our sample and the proportion of public and private firms in each country. Panel B reports the difference in means of the main dependent variables between public and private firms for both the entire sample and the matched sample. *Investments-to-assets ratio* is defined as the year-to-year change in gross fixed assets divided by lagged total assets. Total assets are computed as the sum of fixed and current assets. *Profit Margin* is defined as the ratio of earnings before interest and taxes (EBIT) to sales. Panel C reports descriptive statistics of all control variables for both the entire and matched samples. *Private* is a dummy equal to 1 if a company is privately held in a given year, zero otherwise. *No. Firms* is the total number of firms in which a company's controlling owner holds shares, directly or indirectly, in a given year, across all countries in our sample. The *Herfindhal Index* is the sum of the squared values of the weight that each investment has in a controlling owner's portfolio. *-Correlation* is correlation of the mean stock return of public firms in a firm's industry with the shareholder's overall portfolio returns, multiplied by -1. *Demand Uncertainty* is defined as the standard deviation over a given year of the equally-weighted weekly return of each 2-digit SIC industry across all countries in our sample. *Demand Uncertainty* is taken at the beginning of each year of our sample period. *Financial Development* is a country-level index, equal to the average of six indicators of stock market and financial intermediaries development as proposed by Demirgüç-Kunt and Levine (1996): market capitalization over gross domestic product (GDP), total value traded over GDP, total value traded over market capitalization, the ratio of liquid liabilities (M3) to GDP, the ratio of credit going to the private sector to GDP, and the ratio of total claims of deposit money banks to GDP. *Financial Development* is taken at the beginning of each year of our sample period. *Sales growth* is defined as the annual relative growth rate in total revenues. *Cash flow* is the ratio of income plus depreciation to lagged total assets. *Total Leverage* is defined as the ratio of total debt to total assets where total debt includes non-current liabilities (long term debt and other non-current liabilities) and current liabilities (loans, creditors and others). *Ln (Size)* is the natural log of total assets (in thousands US$), expressed in 1999 prices. *Firm age* is the number of years since incorporation. We use the propensity score matching estimator to find for each public firm a possible match in the sub-sample of private companies (Rosenbaum and Rubin, 1983). For the propensity score matching estimation of the investment model, we include: sales growth, cash flow, firm age, along with year, country and industry (1-dgt US SIC code) dummies. For the propensity score matching estimation of the profitability model, we include: total leverage, firm size, firm age, along with year, country and industry (1-dgt US SIC code) dummies. We require that the maximum difference between the propensity score of the public firm and its matching peer does not exceed 0.1% in absolute value.

Panel A. Descriptive statistics: countries

country	No. Obs	% Public	% Private	country	No. Obs	% Public	% Private
AUSTRIA	2,388	0.02	0.44	**LUXEMBOURG**	354	0.00	0.06
BELGIUM	29,999	0.08	5.60	**NETHERLANDS**	6,980	0.08	1.24
BOSNIA-HERZEGOVINA	247	0.02	0.02	**NORWAY**	20,338	0.11	3.74
BULGARIA	3,338	0.09	0.54	**POLAND**	9,426	0.02	1.76
CROATIA	4,848	0.13	0.79	**PORTUGAL**	8,661	0.03	1.61
CZECH REPUBLIC	5,776	0.02	1.08	**REPUBLIC OF MACEDONIA**	1	0.00	0.00
DENMARK	16,194	0.11	2.95	**ROMANIA**	5,663	0.05	1.02
ESTONIA	1,083	0.00	0.20	**RUSSIAN FEDERATION**	32	0.00	0.00
FINLAND	6,894	0.08	1.23	**SERBIA**	2,736	0.22	0.30
FRANCE	107,285	0.51	19.81	**SLOVAK REPUBLIC**	170	0.01	0.03
GERMANY	21,897	0.33	3.81	**SLOVENIA**	644	0.02	0.11
GREECE	14,341	0.31	2.40	**SPAIN**	60,044	0.18	11.19
HUNGARY	647	0.01	0.12	**SWEDEN**	22,922	0.16	4.18
ICELAND	130	0.01	0.02	**SWITZERLAND**	466	0.03	0.05
IRELAND	126	0.01	0.02	**UKRAINE**	3,619	0.02	0.67
ITALY	47,401	0.17	8.80	**UNITED KINGDOM**	123,350	1.30	22.06
LATVIA	102	0.00	0.02				
LIECHTENSTEIN	8	0.00	0.00	***Total***	*528,110*	*4.13*	*95.87*

Panel B. Descriptive statistics: dependent variables

	Full sample				Matched Sample			
	Mean	**Median**	**St. Dev**	**No. obs**	**Mean**	**Median**	**St. Dev**	**No. obs**
				Investment-to-Assets ratio				
Public	0.1087	0.0612	0.2265	21,800	0.1107	0.0633	0.2259	21,211
Private	0.0693	0.0313	0.1589	506,310	0.0698	0.0303	0.1740	21,211
p-val of difference	0.0000	0.0000			0.0000	0.0000		
				ROS				
Public	0.0074	0.0505	0.3447	21,558	0.0067	0.0502	0.3458	21,342
Private	0.0388	0.0314	0.1669	504,974	0.0554	0.0526	0.2719	21,342
p-val of difference	0.0000	0.0000			0.0000	0.0030		

Panel C. Descriptive statistics: main and control variables

	Full sample			Matched Sample		
Variable	**Mean**	**Median**	**St. Dev**	**Mean**	**Median**	**St. Dev**
		Main variables				
Private	0.9587	1.0000	0.1989	0.5000	0.5000	0.5000
No.Firms	20.7036	2.0000	70.4857	32.1113	3.0000	96.2263
Ln(1+No.Firms)	1.3241	0.6931	1.5286	1.5941	1.0986	1.6978
(1-Herfindhal Index)	0.3320	0.2733	0.3413	0.3762	0.3872	0.3557
-Correlation	-0.8092	-1.0000	0.2344	-0.7645	-0.8235	0.2555
Demand Uncertainty	0.0201	0.0186	0.0078	0.6758	1.0000	0.4681
Financial Development	0.9236	0.8881	0.2930	0.0215	0.0196	0.0083
		Other control variables				
Sales Growth	0.1116	0.0512	0.5161	0.1875	0.0502	0.8254
Cash Flow	0.0875	0.0723	0.1161	0.0778	0.0725	0.1226
Total Leverage	0.6706	0.7031	0.2292	0.5355	0.5439	0.2416
Total Assets ($)	167,706.70	22,753.9	2,624,713.0	971,464	85,708	8,240,338
Ln(Size)	10.2076	10.0325	1.3860	11.4878	11.3587	1.7728
Age	25.1843	18.0000	21.5692	33.8208	22.0000	30.6166
Ln(1+Age)	2.9777	2.9444	0.7693	3.1885	3.1355	0.8753
Firm year observations		528,110			42,422	
No. of firms		162,688			12,326	

Table 2. Controlling Owner's Portfolio Diversification

This table reports OLS results of both investment (Panel A) and profitability (Panel B) models for the entire sample (columns 1-3) and for the matched sample (columns 4-6). We use the propensity score matching estimator to find for each public firm a possible match in the sub-sample of private companies (Rosenbaum and Rubin, 1983). For the propensity score matching estimation of the investment model, we include: sales growth, cash flow, firm age, along with year, country and industry (1-dgt US SIC code) dummies. For the propensity score matching estimation of the profitability model, we include: total leverage, firm size, firm age, along with year, country and industry (1-dgt US SIC code) dummies. We require that the maximum difference between the propensity score of the public firm and its matching peer does not exceed 0.1% in absolute value. *Investments-to-assets ratio* is defined as the year-to-year change in gross fixed assets divided by lagged total assets. Total assets are computed as the sum of fixed and current assets. *Profit Margin* is defined as the ratio of earnings before interest and taxes (EBIT) to sales. Panel C reports descriptive statistics of all control variables for both the entire and matched samples. *Private* is a dummy equal to 1 if a company is privately held in a given year, zero otherwise. *No. Firms* is the total number of firms in which a company's controlling owner holds shares, directly or indirectly, in a given year, across all countries in our sample. The *Herfindhal Index* is the sum of the squared values of the weight that each investment has in a controlling owner's portfolio. -*Correlation* is correlation of the mean stock return of public firms in a firm's industry with the shareholder's overall portfolio returns, multiplied by -1. *Sales growth* is defined as the annual relative growth rate in total revenues. *Cash flow* is the ratio of income plus depreciation to lagged total assets. *Total Leverage* is defined as the ratio of total debt to total assets where total debt includes non-current liabilities (long term debt and other non-current liabilities) and current liabilities (loans, creditors and others). *Ln (Size)* is the natural log of total assets (in thousands US$), expressed in 1999 prices. *Firm age* is the number of years since incorporation. All regressions include country, industry, and year fixed effects. P-values, adjusted for heteroskedasticity and clustering at the industry and country level, are reported in brackets below the coefficients. The economic significance of the portfolio diversification variables is reported beneath the p-values (in bold) when the corresponding estimated coefficient is statistically significant; this number is the percentage change in the dependent variable (relative to its mean) in response to an increase in the portfolio diversification variable equal to one standard deviation.

Panel A. Investment-to-assets ratio

	Full sample			**Matched samples**		
	Ln(1+No.Firms)	***1-Herfindhal Index***	***-Correlation***	***Ln(1+No.Firms)***	***1-Herfindhal Index***	***-Correlation***
Public	0.0682***	0.0741***	0.0965***	0.1804***	0.1134***	0.1240***
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
Private	0.0382***	0.0421***	0.0425***	0.1444***	0.0744***	0.065***
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
Public x Portfolio Diversification	0.0037***	0.0145***	0.0213***	0.0020**	0.0067	0.0106*
	[0.0000]	[0.0007]	[0.0002]	[0.0382]	[0.1528]	[0.0873]
	7.98%	***6.98%***	***7.04%***	***3.76%***	***2.64%***	***3.00%***
Private x Portfolio Diversification	-0.0003***	-0.0025***	0.0003	-0.002***	-0.0083**	-0.0094*
	[0.0093]	[0.0012]	[0.8976]	[0.0049]	[0.0283]	[0.0826]
	-0.65%	***-1.20%***	***0.10%***	***-3.76%***	***-3.27%***	***-2.66%***
Sales Growth	0.0554***	0.0555***	0.0552***	0.0528***	0.0520***	0.0520***
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
Cash Flow	0.2466***	0.2535***	0.2484***	0.3259***	0.3377***	0.3299***
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
Age	-0.0033***	-0.0032***	-0.0032***	-0.0132***	-0.0132***	-0.0130***
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
R-squared	0.161	0.163	0.162	0.183	0.185	0.183
Firm year observations	528,110	518,501	525,686	42,422	41,729	42,227

Panel B. Profit margin

	Full sample			Matched samples		
	Ln(1+No.Firms)	***1-Herfindhal Index***	***-Correlation***	***Ln(1+No.Firms)***	***1-Herfindhal Index***	***-Correlation***
Public	-0.0217**	-0.0262**	0.0285***	-0.1932***	-0.1482***	-0.1480***
	[0.0381]	[0.0121]	[0.0083]	[0.0000]	[0.0000]	[0.0000]
Private	0.0442***	0.0421***	0.0255***	-0.1251***	-0.0766***	-0.15***
	[0.0000]	[0.0000]	[0.0003]	[0.0000]	[0.0035]	[0.0000]
Public x Portfolio Diversification	0.0077***	0.0440***	0.0525***	0.0024	0.0265***	0.0155
	[0.0000]	[0.0000]	[0.0000]	[0.1702]	[0.0024]	[0.1914]
	31.34%	***39.98%***	***32.77%***	***--***	***30.35%***	***--***
Private x Portfolio Diversification	-0.0013***	-0.008***	-0.0155***	-0.0076***	-0.0275***	-0.0535***
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
	-5.29%	***-7.27%***	***-9.67%***	***-42.33%***	***-31.50%***	***-44.56%***
Total Leverage	-0.0912***	-0.0827***	-0.0889***	-0.0473***	-0.0362***	-0.0440***
	[0.0000]	[0.0000]	[0.0000]	[0.0007]	[0.0085]	[0.0016]
Ln(Size)	0.0064***	0.0061***	0.0065***	0.0176***	0.0156***	0.0175***
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
Ln(1+Age)	-0.0004	-0.0005	-0.0005	0.0066**	0.0067**	0.0066**
	[0.6746]	[0.5305]	[0.5757]	[0.0362]	[0.0312]	[0.0347]
R-squared	0.061	0.06	0.061	0.085	0.084	0.085
Firm year observations	526,532	516,974	524,122	42,627	42,317	42,525

Table 3. Demand Uncertainty

This table reports OLS results of both investment (Panel A) and profitability (Panel B) models for the entire sample (columns 1-3) and for the matched sample (columns 4-6). We use the propensity score matching estimator to find for each public firm a possible match in the sub-sample of private companies (Rosenbaum and Rubin, 1983). For the propensity score matching estimation of the investment model, we include: sales growth, cash flow, firm age, along with year, country and industry (1-dgt US SIC code) dummies. For the propensity score matching estimation of the profitability model, we include: total leverage, firm size, firm age, along with year, country and industry (1-dgt US SIC code) dummies. We require that the maximum difference between the propensity score of the public firm and its matching peer does not exceed 0.1% in absolute value. *Investments-to-assets ratio* is defined as the year-to-year change in gross fixed assets divided by lagged total assets. Total assets are computed as the sum of fixed and current assets. *Profit Margin* is defined as the ratio of earnings before interest and taxes (EBIT) to sales. Panel C reports descriptive statistics of all control variables for both the entire and matched samples. *Private* is a dummy equal to 1 if a company is privately held in a given year, zero otherwise. *Demand Uncertainty* is defined as the standard deviation over a given year of the equally-weighted weekly return of each 2-digit SIC industry across all countries in our sample. *Demand Uncertainty* is taken at the beginning of each year of our sample period. *Sales growth* is defined as the annual relative growth rate in total revenues. *Cash flow* is the ratio of income plus depreciation to lagged total assets. *Total Leverage* is defined as the ratio of total debt to total assets where total debt includes non-current liabilities (long term debt and other non-current liabilities) and current liabilities (loans, creditors and others). *Ln (Size)* is the natural log of total assets (in thousands US$), expressed in 1999 prices. *Firm age* is the number of years since incorporation. All regressions include country, industry, and year fixed effects. P-values, adjusted for heteroskedasticity and clustering at the industry and country level, are reported in brackets below the coefficients. The economic significance of the demand uncertainty variable is reported beneath the p-values (in bold) when the corresponding estimated coefficient is statistically significant; this number is the percentage change in the dependent variable (relative to its mean) in response to an increase in the demand uncertainty variable equal to one standard deviation.

Panel A. Investment-to-assets ratio

	Full sample	Matched sample
Public	0.0959***	0.1313***
	[0.0000]	[0.0000]
Private	0.0357***	0.0641***
	[0.0000]	[0.0000]
Public x Demand Uncertainty	-0.9600***	-0.7257***
	[0.0000]	[0.0094]
	-10.55%	***-5.48%***
Private x Demand Uncertainty	0.0456	0.3877*
	[0.5003]	[0.0711]
	--	***4.32%***
Sales Growth	0.0554***	0.0524***
	[0.0000]	[0.0000]
Cash Flow	0.2468***	0.3256***
	[0.0000]	[0.0000]
Ln(1+Age)	-0.0033***	-0.0132***
	[0.0000]	[0.0000]
R-squared	0.161	0.182
Firm year observations	527,600	42,477

Panel B. Profit margin

	Full sample	Matched sample
Public	0.0470***	-0.1351***
	[0.0000]	[0.0000]
Private	0.047***	-0.1345***
	[0.0000]	[0.0000]
Public x Demand Uncertainty	-2.3121***	-2.1742***
	[0.0000]	[0.0000]
	-47.96%	***-49.06%***
Private x Demand Uncertainty	-0.1109	0.0997
	[0.1705]	[0.7998]
	--	--
Total Leverage	-0.0913***	-0.0468***
	[0.0000]	[0.0009]
Ln(Size)	0.0059***	0.0167***
	[0.0000]	[0.0000]
Ln(1+Age)	-0.0004	0.0062**
	[0.6578]	[0.0472]
R-squared	0.061	0.086
Firm year observations	526,026	42,579

Table 4. Financial Development

This table reports OLS results of both investment (Panel A) and profitability (Panel B) models for the entire sample (columns 1-3) and for the matched sample (columns 4-6). We use the propensity score matching estimator to find for each public firm a possible match in the sub-sample of private companies (Rosenbaum and Rubin, 1983). For the propensity score matching estimation of the investment model, we include: sales growth, cash flow, firm age, along with year, country and industry (1-dgt US SIC code) dummies. For the propensity score matching estimation of the profitability model, we include: total leverage, firm size, firm age, along with year, country and industry (1-dgt US SIC code) dummies. We require that the maximum difference between the propensity score of the public firm and its matching peer does not exceed 0.1% in absolute value. *Investments-to-assets ratio* is defined as the year-to-year change in gross fixed assets divided by lagged total assets. Total assets are computed as the sum of fixed and current assets. *Profit Margin* is defined as the ratio of earnings before interest and taxes (EBIT) to sales. Panel C reports descriptive statistics of all control variables for both the entire and matched samples. *Partially constrained* is a binary variable equal to 1 if a company is publicly traded and it doesn't belong to the top decile of public companies' size and age distributions at a given year, zero otherwise. *Fully (un)constrained* is a binary variable equal to 1 if a company is privately held or if a company is publicly traded and it belongs to the top decile of public companies' size and age distributions (least financially constrained public firm) at a given year, zero otherwise. *Financial Development* is a country-level index, equal to the average of six indicators of stock market and financial intermediaries development as proposed by Demirgüç-Kunt and Levine (1996): market capitalization over gross domestic product (GDP), total value traded over GDP, total value traded over market capitalization, the ratio of liquid liabilities (M3) to GDP, the ratio of credit going to the private sector to GDP, and the ratio of total claims of deposit money banks to GDP. *Financial Development* is taken at the beginning of each year of our sample period. *Sales growth* is defined as the annual relative growth rate in total revenues. *Cash flow* is the ratio of income plus depreciation to lagged total assets. *Total Leverage* is defined as the ratio of total debt to total assets where total debt includes non-current liabilities (long term debt and other non-current liabilities) and current liabilities (loans, creditors and others). *Ln (Size)* is the natural log of total assets (in thousands US$), expressed in 1999 prices. *Firm age* is the number of years since incorporation. All regressions include country, industry, and year fixed effects. P-values, adjusted for heteroskedasticity and clustering at the industry and country level, are reported in brackets below the coefficients. The economic significance of the financial development variable is reported beneath the p-values (in bold) when the corresponding estimated coefficient is statistically significant; this number is the percentage change in the dependent variable (relative to its mean) in response to an increase in the financial development variable equal to one standard deviation.

Panel A. Investment-to-assets ratio

	Full sample	**Matched sample**
Partially constrained	-0.0457***	0.0005
	[0.0000]	[0.9760]
Fully (un)constrained	-0.0218***	0.0026
	[0.0002]	[0.8759]
Partially constrained x Financial Development	0.0999***	0.0651***
	[0.0000]	[0.0002]
	41.29%	***23.93%***
Fully (un)constrained x Financial Development	0.0349***	0.0221
	[0.0000]	[0.1778]
	14.43%	--
Sales Growth	0.0557***	0.0530***
	[0.0000]	[0.0000]
Cash Flow	0.2539***	0.3317***
	[0.0000]	[0.0000]
Ln(1+Age)	-0.0028***	-0.0120***
	[0.0000]	[0.0000]
R-squared	0.164	0.182
Firm year observations	469,320	37,145

Panel B. Profit margin

	Full sample	**Matched sample**
Partially constrained	-0.0268**	-0.1083***
	[0.0437]	[0.0003]
Fully (un)constrained	0.054***	-0.0068
	[0.0000]	[0.8195]
Partially constrained x Financial Development	0.0343*	-0.0047
	[0.0172]	[0.8414]
	26.76%	--
Fully (un)constrained x Financial Development	0.004	-0.064***
	[0.4427]	[0.0094]
	--	***69.06%***
Total Leverage	-0.0914***	-0.0587***
	[0.0000]	[0.0000]
Ln(Size)	0.0046***	0.0124***
	[0.0000]	[0.0000]
Ln(1+Age)	0.0002	0.0002
	[0.8352]	[0.9588]
R-squared	0.069	0.097
Firm year observations	468,139	37,431

Table 5. Robustness Tests: Alternative Dependent Variables

This table reports OLS results of all specifications for both investment (Panel A) and profitability (Panel B) models for the entire sample. *Total Investment-to-Assets ratio as the year-to-year change in both gross fixed assets and total intangible assets divided by lagged total assets.* Total assets are computed as the sum of fixed (tangible and intangible) and current assets. *ROA* is defined as the ratio of earnings before interest and taxes (EBIT) to total assets. *Private* is a dummy equal to 1 if a company is privately held in a given year, zero otherwise. *Partially constrained* is a binary variable equal to 1 if a company is publicly traded and it doesn't belong to the top decile of public companies' size and age distributions at a given year, zero otherwise. *Fully (un)constrained* is a binary variable equal to 1 if a company is privately held or if a company is publicly traded and it belongs to the top decile of public companies' size and age distributions (least financially constrained public firm) at a given year, zero otherwise. *No. Firms* is the total number of firms in which a company's controlling owner holds shares, directly or indirectly, in a given year, across all countries in our sample. The *Herfindhal Index* is the sum of the squared values of the weight that each investment has in a controlling owner's portfolio. -*Correlation* is correlation of the mean stock return of public firms in a firm's industry with the shareholder's overall portfolio returns, multiplied by -1. *Demand Uncertainty* is defined as the standard deviation over a given year of the equally-weighted weekly return of each 2-digit SIC industry across all countries in our sample. *Demand Uncertainty* is taken at the beginning of each year of our sample period. *Financial Development* is a country-level index, equal to the average of six indicators of stock market and financial intermediaries development as proposed by Demirgüç-Kunt and Levine (1996): market capitalization over gross domestic product (GDP), total value traded over GDP, total value traded over market capitalization, the ratio of liquid liabilities (M3) to GDP, the ratio of credit going to the private sector to GDP, and the ratio of total claims of deposit money banks to GDP. *Financial Development* is taken at the beginning of each year of our sample period. All other control variables are included, but not reported in these tables. All regressions include country, industry, and year fixed effects. P-values, adjusted for heteroskedasticity and clustering at the industry and country level, are reported in brackets below the coefficients.

Table 5. Robustness Tests: Alternative Dependent Variables (cont'd)

Panel A. Total-investment-to-assets ratio

	Portfolio Diversification			Demand Uncertainty	Financial Development
	Ln(1+No.Firms)	*1-Herfindhal Index*	*1-Correlation*		
Public	0.0795***	0.0891***	0.1228***	0.1146***	
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	
Private	0.0355***	0.0427***	0.0429***	0.0329***	
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	
Public x Portfolio Diversification	0.0057***	0.0211***	0.0334***		
	[0.0000]	[0.0001]	[0.0000]		
Private x Portfolio Diversification	-0.0003*	-0.0029**	0.0014		
	[0.0519]	[0.0044]	[0.7497]		
Public x Demand Uncertainty				-1.1219***	
				[0.0000]	
Private x Demand Uncertainty				0.1051	
				[0.1705]	
Partially constrained					-0.0435***
					[0.0002]
Fully (un)constrained					-0.0129
					[0.1077]
Partially constrained x Financial Development					0.1191***
					[0.0000]
Fully (un)constrained x Financial Development					0.0241***
					[0.0031]
			CONTROL VARIABLES		
R-squared	0.155	0.156	0.155	0.155	0.161
Firm year observations	528,110	518,501	525,686	527,600	353,979

Table 5. Robustness Tests: Alternative Dependent Variables (cont'd)

Panel B. ROA

	Portfolio Diversification			Demand Uncertainty	Financial Development
	Ln(1+No.Firms)	***1-Herfindhal Index***	***1-Correlation***		
Public	0.1637***	0.1596***	0.2173***	0.2024***	
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	
Private	0.2109***	0.2084***	0.2013***	0.2076***	
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	
Public x Portfolio Diversification	0.0097***	0.0475***	0.0573***		
	[0.0000]	[0.0000]	[0.0000]		
Private x Portfolio Diversification	0.0007	-0.0015*	-0.0047***		
	[0.7102]	[0.1000]	[0.0000]		
Public x Demand Uncertainty				-1.1722***	
				[0.0000]	
Private x Demand Uncertainty				-0.0484	
				[0.3349]	
Partially constrained					0.1470***
					[0.0000]
Fully (un)constrained					0.1946***
					[0.0000]
Partially constrained x Financial Development					0.0265***
					[0.0001]
Fully (un)constrained x Financial Development					0.0105***
					[0.0217]
			CONTROL VARIABLES		
R-squared	0.155	0.156	0.155	0.122	0.131
Firm year observations	528,110	518,501	525,686	527,600	469,320

Table 6. Robustness Tests: Dual Class Shares

This table reports OLS results of all specifications for both investment (Panel A) and profitability (Panel B) models for a subsample that excludes those countries with more than 10% of public companies using dual class shares at the end of 2001 (Denmark, Finland, Germany, Italy, Sweden, and Switzerland). *Investments-to-assets ratio* is defined as the year-to-year change in gross fixed assets divided by lagged total assets. Total assets are computed as the sum of fixed and current assets. *Profit Margin* is defined as the ratio of earnings before interest and taxes (EBIT) to sales. *Private* is a dummy equal to 1 if a company is privately held in a given year, zero otherwise. *Partially constrained* is a binary variable equal to 1 if a company is publicly traded and it doesn't belong to the top decile of public companies' size and age distributions at a given year, zero otherwise. *Fully (un)constrained* is a binary variable equal to 1 if a company is privately held or if a company is publicly traded and it belongs to the top decile of public companies' size and age distributions (least financially constrained public firm) at a given year, zero otherwise. *No. Firms* is the total number of firms in which a company's controlling owner holds shares, directly or indirectly, in a given year, across all countries in our sample. The *Herfindhal Index* is the sum of the squared values of the weight that each investment has in a controlling owner's portfolio. -*Correlation* is correlation of the mean stock return of public firms in a firm's industry with the shareholder's overall portfolio returns, multiplied by -1. *Demand Uncertainty* is defined as the standard deviation over a given year of the equally-weighted weekly return of each 2-digit SIC industry across all countries in our sample. *Demand Uncertainty* is taken at the beginning of each year of our sample period. *Financial Development* is a country-level index, equal to the average of six indicators of stock market and financial intermediaries development as proposed by Demirgüç-Kunt and Levine (1996): market capitalization over gross domestic product (GDP), total value traded over GDP, total value traded over market capitalization, the ratio of liquid liabilities (M3) to GDP, the ratio of credit going to the private sector to GDP, and the ratio of total claims of deposit money banks to GDP. *Financial Development* is taken at the beginning of each year of our sample period. All other control variables are included, but not reported in these tables. All regressions include country, industry, and year fixed effects. P-values, adjusted for heteroskedasticity and clustering at the industry and country level, are reported in brackets below the coefficients.

Table 6. Robustness Tests: Dual class shares (cont'd)

Panel A. Investment-to-assets Ratio

	Portfolio Diversification			Demand Uncertainty	Financial Development
	Ln(1+No.Firms)	***1-Herfindhal Index***	***1-Correlation***		
Public	0.0549***	0.0766***	0.1050***	0.0859***	
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	
Private	0.0259***	0.0466***	0.046***	0.0249***	
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	
Public x Portfolio Diversification	0.0045***	0.0190***	0.0273***		
	[0.0000]	[0.0000]	[0.0000]		
Private x Portfolio Diversification	0.0005*	-0.002**	0.0003		
	[0.0973]	[0.0131]	[0.6935]		
Public x Demand Uncertainty				-1.0445***	
				[0.0000]	
Private x Demand Uncertainty				0.0221	
				[0.7677]	
Partially constrained					-0.0287***
					[0.0044]
Fully (un)constrained					-0.006***
					[0.0000]
Partially constrained x Financial Development					0.0875***
					[0.0000]
Fully (un)constrained x Financial Development					0.0215***
					[0.0042]
			CONTROL VARIABLES		
R-squared	0.167	0.169	0.168	0.167	0.166
Firm year observations	434,233	425,226	431,962	433,811	353,979

Table 6. Robustness Tests: Dual class shares (cont'd)

Panel B. Profit margin

	Portfolio Diversification			Demand Uncertainty	Financial Development
	Ln(1+No.Firms)	***1-Herfindhal Index***	***1-Correlation***		
Public	-0.0158	-0.0217*	0.0298**	0.0539***	
	[0.1719]	[0.0562]	[0.0134]	[0.0000]	
Private	0.046***	0.0437***	0.0288***	0.0479***	
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	
Public x Portfolio Diversification	0.0071***	0.0428***	0.0492***		
	[0.0000]	[0.0000]	[0.0000]		
Private x Portfolio Diversification	-0.0009***	-0.0062***	-0.0138***		
	[0.0000]	[0.0000]	[0.0000]		
Public x Demand Uncertainty				-2.4230***	
				[0.0000]	
Private x Demand Uncertainty				-0.04	
				[0.6647]	
Partially constrained					-0.0359**
					[0.0157]
Fully (un)constrained					0.0454***
					[0.0000]
Partially constrained x Financial Development					0.0565***
					[0.0002]
Fully (un)constrained x Financial Development					0.0115*
					[0.0858]
			CONTROL VARIABLES		
R-squared	0.064	0.063	0.064	0.064	0.077
Firm year observations	432,961	423,999	430,703	432,543	353,144

Table 7. Robustness Tests: Households Holding

This table reports OLS results of all specifications for both investment (Panel A) and profitability (Panel B) models for a subsample that excludes those countries where the fraction of the households' total financial assets invested in "Mutual fund shares" exceeds 10% at the end of 2006 (Belgium, Austria, Spain, Sweden, Germany, and Switzerland). *Investments-to-assets ratio* is defined as the year-to-year change in gross fixed assets divided by lagged total assets. Total assets are computed as the sum of fixed and current assets. *Profit Margin* is defined as the ratio of earnings before interest and taxes (EBIT) to sales. *Private* is a dummy equal to 1 if a company is privately held in a given year, zero otherwise. *Partially constrained* is a binary variable equal to 1 if a company is publicly traded and it doesn't belong to the top decile of public companies' size and age distributions at a given year, zero otherwise. *Fully (un)constrained* is a binary variable equal to 1 if a company is privately held or if a company is publicly traded and it belongs to the top decile of public companies' size and age distributions (least financially constrained public firm) at a given year, zero otherwise. *No. Firms* is the total number of firms in which a company's controlling owner holds shares, directly or indirectly, in a given year, across all countries in our sample. The *Herfindhal Index* is the sum of the squared values of the weight that each investment has in a controlling owner's portfolio. -*Correlation* is correlation of the mean stock return of public firms in a firm's industry with the shareholder's overall portfolio returns, multiplied by -1. *Demand Uncertainty* is defined as the standard deviation over a given year of the equally-weighted weekly return of each 2-digit SIC industry across all countries in our sample. *Demand Uncertainty* is taken at the beginning of each year of our sample period. *Financial Development* is a country-level index, equal to the average of six indicators of stock market and financial intermediaries development as proposed by Demirgüç-Kunt and Levine (1996): market capitalization over gross domestic product (GDP), total value traded over GDP, total value traded over market capitalization, the ratio of liquid liabilities (M3) to GDP, the ratio of credit going to the private sector to GDP, and the ratio of total claims of deposit money banks to GDP. *Financial Development* is taken at the beginning of each year of our sample period. All other control variables are included, but not reported in these tables. All regressions include country, industry, and year fixed effects. P-values, adjusted for heteroskedasticity and clustering at the industry and country level, are reported in brackets below the coefficients.

Table 7. Robustness Tests: Households Holding (cont'd)

Panel A. Investment-to-assets ratio

	Portfolio Diversification			Demand Uncertainty	Financial Development
	Ln(1+No.Firms)	***1-Herfindhal Index***	***1-Correlation***		
Public	0.0672***	0.0729***	0.0969***	0.0930***	
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	
Private	0.0372***	0.0419***	0.0409***	0.035***	
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	
Public x Portfolio Diversification	0.0040***	0.0154***	0.0231***		
	[0.0000]	[0.0010]	[0.0003]		
Private x Portfolio Diversification	-0.0006*	-0.0026***	1E-04		
	[0.011]	[0.0018]	[0.6197]		
Public x Demand Uncertainty				-0.8255***	
				[0.0013]	
Private x Demand Uncertainty				0.0924	
				[0.2543]	
Partially constrained					-0.0112
					[0.1598]
Fully (un)constrained					0.0117*
					[0.0187]
Partially constrained x Financial Development					0.1000***
					[0.0000]
Fully (un)constrained x Financial Development					0.033***
					[0.0000]
			CONTROL VARIABLES		
R-squared	0.162	0.164	0.162	0.162	0.164
Firm year observations	390,394	382,050	388,295	390,030	340,255

Table 7. Robustness Tests: Households Holding (cont'd)

Panel B. Profit margin

	Portfolio Diversification			Demand Uncertainty	Financial Development
	Ln(1+No.Firms)	***1-Herfindhal Index***	***1-Correlation***		
Public	-0.0234*	-0.0332***	0.0275**	0.0505***	
	[0.0535]	[0.0059]	[0.0261]	[0.0000]	
Private	0.0418***	0.0369***	0.0265***	0.0445***	
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	
Public x Portfolio Diversification	0.0074***	0.0463***	0.0546***		
	[0.0000]	[0.0000]	[0.0000]		
Private x Portfolio Diversification	-0.0016***	-0.0067***	-0.0134***		
	[0.0000]	[0.0000]	[0.0023[		
Public x Demand Uncertainty				-2.6479***	
				[0.0000]	
Private x Demand Uncertainty				-0.1383	
				0.1641	
Partially constrained					-0.0277**
					[0.0462]
Fully (un)constrained					0.0481***
					[0.0000]
Partially constrained x Financial Development					0.0384**
					[0.0113]
Fully (un)constrained x Financial Development					0.0034
					[0.5676]
			CONTROL VARIABLES		
R-squared	0.065	0.063	0.065	0.053	0.076
Firm year observations	389,276	380,978	389,276	336,439	339,474

Table 8. Robustness Tests: Mutual Funds Holding

This table reports OLS results of all specifications for both investment (Panel A) and profitability (Panel B) models for a subsample that excludes those countries where the fraction of market capitalization held by Mutual Funds exceeds 5% at the end of 2005 (Sweden, Ireland, Finland, Luxembourg, Netherlands, and Switzerland). *Investments-to-assets ratio* is defined as the year-to-year change in gross fixed assets divided by lagged total assets. Total assets are computed as the sum of fixed and current assets. *Profit Margin* is defined as the ratio of earnings before interest and taxes (EBIT) to sales. *Private* is a dummy equal to 1 if a company is privately held in a given year, zero otherwise. *Partially constrained* is a binary variable equal to 1 if a company is publicly traded and it doesn't belong to the top decile of public companies' size and age distributions at a given year, zero otherwise. *Fully (un)constrained* is a binary variable equal to 1 if a company is privately held or if a company is publicly traded and it belongs to the top decile of public companies' size and age distributions (least financially constrained public firm) at a given year, zero otherwise. *No. Firms* is the total number of firms in which a company's controlling owner holds shares, directly or indirectly, in a given year, across all countries in our sample. The *Herfindhal Index* is the sum of the squared values of the weight that each investment has in a controlling owner's portfolio. -*Correlation* is correlation of the mean stock return of public firms in a firm's industry with the shareholder's overall portfolio returns, multiplied by -1. *Demand Uncertainty* is defined as the standard deviation over a given year of the equally-weighted weekly return of each 2-digit SIC industry across all countries in our sample. *Demand Uncertainty* is taken at the beginning of each year of our sample period. *Financial Development* is a country-level index, equal to the average of six indicators of stock market and financial intermediaries development as proposed by Demirgüç-Kunt and Levine (1996): market capitalization over gross domestic product (GDP), total value traded over GDP, total value traded over market capitalization, the ratio of liquid liabilities (M3) to GDP, the ratio of credit going to the private sector to GDP, and the ratio of total claims of deposit money banks to GDP. *Financial Development* is taken at the beginning of each year of our sample period. All other control variables are included, but not reported in these tables. All regressions include country, industry, and year fixed effects. P-values, adjusted for heteroskedasticity and clustering at the industry and country level, are reported in brackets below the coefficients.

Table 8. Robustness Tests: Mutual Funds Holding (cont'd)

Panel A. Investment-to-assets ratio

	Portfolio Diversification			Demand Uncertainty	Financial Development
	Ln(1+No.Firms)	*1-Herfindhal Index*	*1-Correlation*		
Public	0.0668***	0.0739***	0.0992***	0.0946***	
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	
Private	0.0378***	0.0439***	0.0432***	0.0366***	
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	
Public x Portfolio Diversification	0.0042***	0.0168***	0.0241***		
	[0.0000]	[0.0002]	[0.0001]		
Private x Portfolio Diversification	0.0002***	-0.0022***	1E-04		
	[0.0061]	[0.0015]	[0.6643]		
Public x Demand Uncertainty				-0.9262***	
				[0.0001]	
Private x Demand Uncertainty				0.0266	
				[0.7072]	
Partially constrained					-0.0552***
					[0.0000]
Fully (un)constrained					-0.0328***
					[0.0000]
Partially constrained x Financial Development					0.1050***
					[0.0000]
Fully (un)constrained x Financial Development					0.041***
					[0.0000]
			CONTROL VARIABLES		
R-squared	0.164	0.166	0.165	0.164	0.167
Firm year observations	490,368	481,067	488,064	489,911	433,084

Table 8. Robustness Tests: Mutual Funds Holding (cont'd)

Panel B. Profit margin

	Portfolio Diversification			Demand Uncertainty	Financial Development
	Ln(1+No.Firms)	***1-Herfindhal Index***	***1-Correlation***		
Public	-0.0155	-0.0207*	0.0320***	0.0542***	
	[0.1524]	[0.0527]	[0.0054]	[0.0000]	
Private	0.047***	0.0453***	0.029***	0.0492***	
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	
Public x Portfolio Diversification	0.0074***	0.0434***	0.0499***		
	[0.0000]	[0.0000]	[0.0000]		
Private x Portfolio Diversification	-0.0016***	-0.0076***	-0.0151***		
	[0.0000]	[0.0000]	[0.0000]		
Public x Demand Uncertainty				-2.4049***	
				[0.0000]	
Private x Demand Uncertainty				-0.0789	
				[0.3508]	
Partially constrained					-0.0273**
					[0.0473]
Fully (un)constrained					0.052
					[0.0000]
Partially constrained x Financial Development					0.0414***
					[0.0050]
Fully (un)constrained x Financial Development					0.0024
					[0.6996]
			CONTROL VARIABLES		
R-squared	0.061	0.06	0.061	0.061	0.071
Firm year observations	488,920	479,669	486,630	488,467	432,026

Table 9. Robustness Tests: Disclosure Requirements

This table reports OLS results of all specifications for both investment (Panel A) and profitability (Panel B) models for a subsample that excludes those countries where private firms are not required to publish financial statements (Bosnia-Herzegovina, Romania, Russia, and Switzerland), or where a few companies comply with the filing requirements (Portugal and Germany), or where the criteria for publication of financial statements are undefined in *Amadeus* (Lichtenstein). *Investments-to-assets ratio* is defined as the year-to-year change in gross fixed assets divided by lagged total assets. Total assets are computed as the sum of fixed and current assets. *Profit Margin* is defined as the ratio of earnings before interest and taxes (EBIT) to sales. *Private* is a dummy equal to 1 if a company is privately held in a given year, zero otherwise. *Partially constrained* is a binary variable equal to 1 if a company is publicly traded and it doesn't belong to the top decile of public companies' size and age distributions at a given year, zero otherwise. *Fully (un)constrained* is a binary variable equal to 1 if a company is privately held or if a company is publicly traded and it belongs to the top decile of public companies' size and age distributions (least financially constrained public firm) at a given year, zero otherwise. *No. Firms* is the total number of firms in which a company's controlling owner holds shares, directly or indirectly, in a given year, across all countries in our sample. The *Herfindhal Index* is the sum of the squared values of the weight that each investment has in a controlling owner's portfolio. -*Correlation* is correlation of the mean stock return of public firms in a firm's industry with the shareholder's overall portfolio returns, multiplied by -1. *Demand Uncertainty* is defined as the standard deviation over a given year of the equally-weighted weekly return of each 2-digit SIC industry across all countries in our sample. *Demand Uncertainty* is taken at the beginning of each year of our sample period. *Financial Development* is a country-level index, equal to the average of six indicators of stock market and financial intermediaries development as proposed by Demirgüç-Kunt and Levine (1996): market capitalization over gross domestic product (GDP), total value traded over GDP, total value traded over market capitalization, the ratio of liquid liabilities (M3) to GDP, the ratio of credit going to the private sector to GDP, and the ratio of total claims of deposit money banks to GDP. *Financial Development* is taken at the beginning of each year of our sample period. All other control variables are included, but not reported in these tables. All regressions include country, industry, and year fixed effects. P-values, adjusted for heteroskedasticity and clustering at the industry and country level, are reported in brackets below the coefficients.

Table 9. Robustness Tests: Disclosure Requirements (cont'd)

Panel A. Investment-to-assets ratio

	Portfolio Diversification			Demand Uncertainty	Financial Development
	Ln(1+No.Firms)	***1-Herfindhal Index***	***1-Correlation***		
Public	0.0694***	0.0757***	0.0910***	0.0983***	
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	
Private	0.0364***	0.0417***	0.035***	0.0343***	
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	
Public x Portfolio Diversification	0.0035***	0.0126***	0.0202***		
	[0.0001]	[0.0037]	[0.0005]		
Private x Portfolio Diversification	-0.0005**	-0.0024***	0.0002		
	[0.0121]	[0.0017]	[0.8355]		
Public x Demand Uncertainty				-1.0077***	
				[0.0000]	
Private x Demand Uncertainty				0.0851	
				[0.2295]	
Partially constrained					-0.0439***
					[0.0000]
Fully (un)constrained					-0.0198***
					[0.0009]
Partially constrained x Financial Development					0.0981***
					[0.0000]
Fully (un)constrained x Financial Development					0.0311***
					[0.0000]
			CONTROL VARIABLES		
R-squared	0.159	0.16	0.159	0.159	0.161
Firm year observations	493,540	484,631	491,223	493,052	435,143

Table 9. Robustness Tests: Disclosure Requirements (cont'd)

Panel B. Profit margin

	Portfolio Diversification			Demand Uncertainty	Financial Development
	Ln(1+No.Firms)	***1-Herfindhal Index***	***1-Correlation***		
Public	-0.0222*	-0.0300***	0.0262**	0.0484***	
	[0.0503]	[0.0090]	[0.0203]	[0.0000]	
Private	0.0429***	0.0388***	0.0242***	0.0464***	
	[0.0000]	[0.0000]	[0.0012]	[0.0000]	
Public x Portfolio Diversification	0.0075***	0.0436***	0.0511***		
	[0.0000]	[0.0000]	[0.0000]		
Private x Portfolio Diversification	-0.0015***	-0.0074***	-0.0159***		
	[0.0000]	[0.0000]	[0.0000]		
Public x Demand Uncertainty				-2.3848***	
				[0.0000]	
Private x Demand Uncertainty				-0.1045	
				[0.6647]	
Partially constrained					-0.0348**
					[0.0155]
Fully (un)constrained					0.0436***
					[0.0000]
Partially constrained x Financial Development					0.0421***
					[0.0062]
Fully (un)constrained x Financial Development					0.0081
					[0.1449]
			CONTROL VARIABLES		
R-squared	0.063	0.062	0.063	0.063	0.072
Firm year observations	492,018	483,158	489,715	491,533	434,014

Table 10. Robustness Tests: Accounting Standards

This table reports OLS results of all specifications for both investment (Panel A) and profitability (Panel B) models for a subsample that excludes those countries with the weakest financial auditing and reporting standards regarding company financial performance in the *Executive Opinion Survey* conducted by the World Economic Forum between 2007 and 2008: Bosnia and Herzegovina, Ukraine, Russia, and Bulgaria. *Investments-to-assets ratio* is defined as the year-to-year change in gross fixed assets divided by lagged total assets. Total assets are computed as the sum of fixed and current assets. *Profit Margin* is defined as the ratio of earnings before interest and taxes (EBIT) to sales. *Private* is a dummy equal to 1 if a company is privately held in a given year, zero otherwise. *Partially constrained* is a binary variable equal to 1 if a company is publicly traded and it doesn't belong to the top decile of public companies' size and age distributions at a given year, zero otherwise. *Fully (un)constrained* is a binary variable equal to 1 if a company is privately held or if a company is publicly traded and it belongs to the top decile of public companies' size and age distributions (least financially constrained public firm) at a given year, zero otherwise. *No. Firms* is the total number of firms in which a company's controlling owner holds shares, directly or indirectly, in a given year, across all countries in our sample. The *Herfindhal Index* is the sum of the squared values of the weight that each investment has in a controlling owner's portfolio. -*Correlation* is correlation of the mean stock return of public firms in a firm's industry with the shareholder's overall portfolio returns, multiplied by -1. *Demand Uncertainty* is defined as the standard deviation over a given year of the equally-weighted weekly return of each 2-digit SIC industry across all countries in our sample. *Demand Uncertainty* is taken at the beginning of each year of our sample period. *Financial Development* is a country-level index, equal to the average of six indicators of stock market and financial intermediaries development as proposed by Demirgüç-Kunt and Levine (1996): market capitalization over gross domestic product (GDP), total value traded over GDP, total value traded over market capitalization, the ratio of liquid liabilities (M3) to GDP, the ratio of credit going to the private sector to GDP, and the ratio of total claims of deposit money banks to GDP. *Financial Development* is taken at the beginning of each year of our sample period. All other control variables are included, but not reported in these tables. All regressions include country, industry, and year fixed effects. P-values, adjusted for heteroskedasticity and clustering at the industry and country level, are reported in brackets below the coefficients.

Table 10. Robustness Tests: Accounting Standards (cont'd)

Panel A. Investment-to-assets ratio

	Portfolio Diversification			Demand Uncertainty	Financial Development
	Ln(1+No.Firms)	***1-Herfindhal Index***	***1-Correlation***		
Public	0.0737***	0.0800***	0.0893***	0.0943***	
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	
Private	0.0367***	0.041***	0.0363***	0.0353***	
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	
Public x Portfolio Diversification	0.0025***	0.0077*	0.0145**		
	[0.0062]	[0.0824]	[0.0162]		
Private x Portfolio Diversification	-0.0005**	-0.0023***	0.0005		
	[0.0296]	[0.0061]	[0.6854]		
Public x Demand Uncertainty				-0.7378***	
				[0.0021]	
Private x Demand Uncertainty				0.0517	
				[0.4443]	
Partially constrained					-0.0290***
					[0.0032]
Fully (un)constrained					-0.029
					[0.7996]
Partially constrained x Financial Development					0.0856***
					[0.0000]
Fully (un)constrained x Financial Development					0.0416***
					[0.0000]
			CONTROL VARIABLES		
R-squared	0.159	0.161	0.16	0.159	0.161
Firm year observations	518,129	508,935	515,740	517,638	459,594

Table 10. Robustness Tests: Accounting Standards (cont'd)

Panel B. Profit margin

	Portfolio Diversification			Demand Uncertainty	Financial Development
	Ln(1+No.Firms)	***1-Herfindhal Index***	***1-Correlation***		
Public	-0.015	-0.0185*	0.0343***	0.0478***	
	[0.1711]	[0.0908]	[0.0011]	[0.0000]	
Private	0.0449***	0.0441***	0.0273***	0.0485***	
	[0.0000]	[0.0000]	[0.0001]	[0.0000]	
Public x Portfolio Diversification	0.0072***	0.0398***	0.0528***		
	[0.0000]	[0.0000]	[0.0000]		
Private x Portfolio Diversification	-0.0018***	-0.0072***	-0.0152***		
	[0.0000]	[0.0000]	[0.0000]		
Public x Demand Uncertainty				-2.1062***	
				[0.0000]	
Private x Demand Uncertainty				-0.1244	
				[0.1232]	
Partially constrained					0.0015
					[0.9199]
Fully (un)constrained					0.0469***
					[0.0000]
Partially constrained x Financial Development					0.0115
					[0.4725]
Fully (un)constrained x Financial Development					0.0085
					[0.1270]
			CONTROL VARIABLES		
R-squared	0.054	0.052	0.053	0.05	0.061
Firm year observations	516,610	507,466	514,235	437,657	458,470

Table 11. Robustness tests: treatment effect model

Table below reports results of the second stage of the two-stage Heckman model that we employ to address the self-selection issue related to the private/public status. In here the Heckman model is used on the baseline specifications of both investment and profitability models. In the second stage regressions the dependent variables are 1) investment to total assets, and 2) ROS. Across all models the instrumental variable for private/public dummy is the Fraction of Privately held Companies in each country, 3-dgt US SIC code and year of the company of interest. In the probit model in the first stage regressions all other control variables are also included along with country, industry, and year fixed effects. The Inverse Mills ratio is calculated from the predicted values of the first stage probit regressions. P-values, adjusted for heteroskedasticity and clustering at the industry and country level, are reported in brackets below the coefficients.

Table 11. Robustness tests: treatment effect model (cont'd)

Panel A. Investment-to-assets ratio

	Portfolio Diversification			Demand Uncertainty
	Ln(1+No.Firms)	***1-Herfindhal Index***	***1-Correlatio***	
Public	0.0181***	0.0172***	0.0458***	0.0440***
	[0.0000]	[0.0000]	[0.0000]	[0.0000]
Private	0.0131***	0.0112***	0.0128***	0.012***
	[0.0000]	[0.0000]	[0.0000]	[0.0000]
Public x Portfolio Diversification	0.0044***	0.0170***	0.0279***	
	[0.0000]	[0.0000]	[0.0000]	
Private x Portfolio Diversification	-0.0005***	-0.002***	0.0019	
	[0.0001]	[0.0000]	[0.1252]	
Public x Demand Uncertainty				-0.8496***
				[0.0000]
Private x Demand Uncertainty				0.0121
				[0.7668]
Inverse Mills Ratio	-0.0140***	-0.0145***	-0.0144***	-0.0142***
	[0.0000]	[0.0000]	[0.0000]	[0.0000]
		CONTROL VARIABLES		
Firm year observations	528,110	518,501	525,686	527,600

Table 11. Robustness tests: treatment effect model (cont'd)

Panel B. Profit margin

	Portfolio Diversification			Demand Uncertainty
	Ln(1+No.Firms)	***1-Herfindhal Index***	***1-Correlation***	
Public	-0.0336***	-0.0390***	0.0197***	0.0481***
	[0.0000]	[0.0000]	[0.0002]	[0.0000]
Private	0.0357***	0.0335***	0.0177***	0.0411***
	[0.0000]	[0.0000]	[0.0000]	[0.0000]
Public x Portfolio Diversification	0.0083***	0.0457***	0.0566***	
	[0.0000]	[0.0000]	[0.0000]	
Private x Portfolio Diversification	-0.0017***	-0.0083***	-0.0154***	
	[0.0000]	[0.0000]	[0.0000]	
Public x Demand Uncertainty				-2.4977***
				[0.0000]
Private x Demand Uncertainty				-0.0514
				[0.2510]
Inverse Mills Ratio	-0.0006	-0.0013	-0.001	0.0026*
	[0.7101]	[0.3952]	[0.5077]	[0.0799]
		CONTROL VARIABLES		
Firm year observations	526,532	516,974	524,122	526,026