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Capital Allocation by Public and Private Firms

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Abstract

We compare investment policies across public and private firms in different institutional settings. Using a large cross-country data set, we find that public listed firms are better positioned to take advantage of growth opportunities than private firms. Specifically, public listed firms exhibit higher investment sensitivity to growth opportunities than private firms. This differential, however, only exists in countries with well-developed stock markets. Furthermore, the relative advantage public firms have at allocating capital depends on the degree of agency costs and reliance on external equity.

I. Introduction

The economic differences between public and private corporations have been recognized since at least Berle and Means (1932). There is little empirical evidence, however, on how differences in the organizational form (public vs. private) impact a firm's investment policy. While capital allocation occupies a prominent place in empirical research, most studies focus on public firms, mainly due to data availability. In this paper, we take advantage of the fact that both public and private European firms report financial data to compare the investment policies of public and private firms in different institutional settings.

Berle and Means ((1932), p. 6) point out that, as a result of ownership dispersion, separation of ownership and control becomes almost complete in publicly held corporations. This leads to agency problems such as managerial consumption of perquisites, empire building, and myopia that impact firms' investment behavior.[1] This strand of research suggests that the costs associated with

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[1] See Jensen and Meckling (1976). See Stein (2003) for a survey of the literature on the manager-stockholder conflict. The tendency of management for empire building is discussed in Baumol (1959),

ownership dispersion can cause public firms to allocate capital less efficiently than private firms.

On the other hand, a company's investment activity may benefit from access to public equity markets. First, the additional source of capital may allow public firms to take advantage of growth opportunities that they otherwise would be constrained from taking.[2] For example, liquidity associated with public equity markets may lower the cost of capital.[3] Furthermore, to the extent that share prices contain information related to firm performance that is otherwise unavailable to investors, secondary market prices may help with information production (Dow and Gorton (1997), Subrahmanyam and Titman (1999)) and monitoring and contracting (Holmstrom and Tirole (1993), Edmans (2009)), and thus facilitate value-maximizing investment decisions.[4] This strand of research suggests that the benefits associated with being part of a public equity market can cause public firms to allocate capital more efficiently than private firms. Given the inherent trade-offs between the costs associated with ownership dispersion and the benefits associated with being part of the public equity markets, the impact of organizational form on corporate investments is theoretically ambiguous and requires empirical investigation.[5]

International research pioneered by La Porta, López-de-Silanes, Shleifer, and Vishny (1997), (1998) suggests that the trade-offs across public and private firms may depend on the effectiveness of the country's legal and financial institutions. Strong shareholder rights at the country level, for example, could mitigate agency problems at the firm level, reducing the costs associated with ownership dispersion. Also, a well-developed stock market could enhance any benefits associated with being part of a public equity market. Thus, the advantage public firms have over private firms at allocating capital may depend on institutional settings.

The goal of this paper is twofold. First, we examine whether investment policies differ across public and private firms. Do benefits associated with being part of the public equity markets outweigh costs associated with the ownership dispersion causing public firms to allocate capital more efficiently? Second, we investigate whether the relative advantage of public firms is affected by the quality of countries' institutions.

Our analysis is based on a large data set that contains firm-level financial information for a sample of public listed, public unlisted, and private European

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Marris (1964), Williamson (1964), Donaldson (1984), and Jensen (1986), (1993), among others. Managerial tendencies to base their investment decisions on what would increase short-term prices are discussed by Narayanan (1985), Stein (1988), (1989), and Bebchuk and Stole (1993).

[2]Brau and Fawcett (2006) survey a sample of chief financial officers (CFOs) to learn the reasons for taking companies public. A large portion of CFOs consider the need for capital to support growth as a very important reason.

[3]Stoll and Whaley (1983) suggest that investors adjust returns for expected transaction costs, while Amihud and Mendelson (1986) present a formal model.

[4]See Chen, Goldstein, and Jiang (2007) and Edmans, Goldstein, and Jiang (2012) for empirical evidence.

[5]It is also possible that organizational form has no impact on capital allocation (see, e.g., Demsetz (1983)).

firms from 1996 to 2006.[6] Firm-level information comes from the Bureau van Dijk (BvD) database. This comprehensive database provides a unique opportunity to examine the investment behavior of not only public but also private firms. Furthermore, it spans several countries, allowing us to investigate how legal and financial institutions affect the capital allocation of public and private firms.

We begin by investigating the extent to which public and private firms increase their investments when their growth opportunities are good and reduce their investments when growth opportunities are poor. Standard investment models suggest that growth opportunities are the key determinant of a firm's investment policy. Market imperfections, such as those discussed above, however, may affect the ability of public and private firms to respond to growth opportunities differently and thus influence the efficiency of capital allocation (see, e.g., Hubbard (1998) and Wurgler (2000)).

We find that investments by public listed firms are more sensitive to growth opportunities than investments by public unlisted and private firms. The results are robust to alternative estimation techniques and alternative sample selection criteria. We interpret these findings as consistent with public firms being more efficient at allocating capital than private firms. The findings also suggest that the benefits associated with being part of public equity markets outweigh the costs associated with ownership dispersion.

In additional analyses, we investigate several alternative explanations for our results. First, we show that the investment sensitivity results are unlikely to reflect differential measurement problems across public and private firms. To that end, we use alternative proxies for growth opportunities, tax reforms in Europe as an exogenous shock to growth opportunities, and duration analysis. Second, we examine whether firms with higher investment sensitivity to growth opportunities choose to be listed, while firms with lower sensitivity choose to stay unlisted. While we cannot formally rule out this explanation, as we do not have a good set of instruments, our results using a self-selection model and a subsample of firms that changed status from private to public suggest that such selection plays a minor role.

Next, we examine whether the relative advantage public firms have at allocating capital is affected by institutional settings. We find evidence that the relative advantage of public firms declines with the degree of agency costs, using both country- and firm-level proxies, consistent with the trade-offs across public and private firms. Furthermore, we find that the investment sensitivity of public listed firms is higher in countries with developed stock markets. More important, listed firms exhibit higher investment sensitivity to growth opportunities than unlisted firms *only* in countries with developed stock markets. We interpret these results as evidence that a well-developed stock market enhances the ability of public firms to allocate capital efficiently, consistent with the stock-market-benefits argument. In additional support of this argument, we find that the relative advantage public firms have at allocating capital is related to their industry dependence on external equity. Finally, our results suggest that global capital flows may also impact the

[6] A public firm in our sample is defined as listed if its stock is listed on a major exchange; otherwise, the firm is defined as unlisted.

relative advantage of public firms. Our findings identify the channels that provide the edge listed firms have over unlisted firms at allocating capital and suggest that the economic advantage of public firms varies with institutional settings.

Our study is the first, to the best of our knowledge, to provide systematic evidence on investment policies across public and private firms using a large cross-country data set.[7] Our findings contribute to the theoretical literature that originated hypotheses on the relative investment policies of public firms (e.g., Berle and Means (1932), Holmstrom and Tirole (1993), and Subrahmanyam and Titman (1999)), which have received little attention from empirical studies. Our cross-country results are related to the literature studying the relationship between countries' financial systems and economic growth.[8] Among these, our paper is closest in spirit to that of Wurgler (2000), who finds that stock market development plays an important role in improving industry-level allocation efficiency. We add to this literature by not only providing a firm-level test of (and evidence consistent with) the hypothesis that a well-developed stock market improves the efficiency of capital allocation, but also by investigating how the capital allocation efficiency of public firms relative to private firms varies with institutional settings.

More generally, our work is related to the empirical literature that compares other aspects of corporate policy across private and public firms. Giannetti (2003), for instance, compares the capital structure of listed and unlisted European firms. Michaely and Roberts (2012) investigate the dividend policy of public and private firms in the United Kingdom, and Burgstahler, Hail, and Leuz (2006) examine earnings management incentives across European public and private firms.

The remainder of the paper is organized as follows: Section II describes our data and methodology. Section III presents results on investment sensitivity to growth opportunities across public and private firms. Section IV examines alternative explanations for the results. Section V provides cross-sectional tests of the trade-offs between the costs associated with ownership dispersion and the benefits associated with being part of the public equity markets. Section VI concludes the paper.

II. Data and Methods

In this section, we start by describing our data and sample selection procedures. We then introduce our empirical methodology.

A. The Data

Our primary data source is the 2007 version of Amadeus, by BvD. This database provides balance sheet and income statement items for a set of European

[7]For U.S. evidence, see Sheen (2009) and Asker, Farre-Mensa, and Ljungqvist (2010).

[8]See Levine (2004) for a literature review. More recent papers include Bekaert, Harvey, and Lundblad (2005) and Bekaert, Harvey, Lundblad, and Siegel (2007), who use cross-country data; Gupta and Yuan (2009), Fisman and Love (2004), and Rajan and Zingales (1998), who use industry-level data; and Butler and Cornaggia (2011), who use U.S. data from the agricultural industry.

firms from 1996 to 2006. An important advantage of Amadeus is that it includes data for public and private firms (in fact, most of the firms in the data set are private). This advantage is made possible in part because European law requires both public and private firms to report financial statements. The data are collected from each national official public body in charge of collecting the annual accounts in its country and always come from the officially filed and audited accounts.

The Amadeus data set is broken into 3 parts. The 1st part contains the largest 250,000 firms in the database, the 2nd part has the next-largest ⅓ of firms, and the 3rd part contains the remaining firms. Our sample comes from the 1st part of the data set (the 250,000 largest firms).

The data set includes a flag for whether the company is listed on a major stock exchange. However, the data set reports only contemporaneous information rather than historical information for this variable. We complement this measure by collecting data on initial public offerings (IPOs) and delistings from the Internet version of Osiris, another data set provided by BvD,[9] to learn about the listing status of the firm for each year. Using these merged data, we consider a firm-year to be "listed" if it is currently listed and it was first listed in the year following its IPO (i.e., it was classified as unlisted before its IPO). Similarly, we consider as "unlisted" a firm that is currently unlisted and that became unlisted the year after its delisting (i.e., it was classified as listed before the delisting event).

We further classify firms into public and private firms (while all listed firms are public, the unlisted category includes both public and private firms). To do so, we use the legal form field of the data set. For example, in Austria the legal form GmbH refers to a private company, while the legal form AG refers to a public company.[10] We also use this field to exclude unlimited partnerships, sole proprietorships, cooperatives, foreign companies, foundations, and government enterprises. While the majority of our analysis focuses on comparing investment sensitivity to growth opportunities of listed and unlisted firms (which includes both public unlisted and private unlisted firms), in the robustness section we perform tests that separate public and private unlisted firms.

As in Giannetti (2003), we exclude Eastern European economies, since the quality of the accounting data provided for these economies is poor; however, as robustness we also perform analysis including Eastern European countries. We require nonmissing data on sales and fixed assets, and we trim observations at the 1% level to avoid the effect of outliers. Additionally, we exclude firm-years with total assets of less than 10 million U.S. dollars, and following the existing literature on firm investment behavior, we exclude financial and miscellaneous firms, firm-year observations with fixed assets (defined as tangible fixed assets in Amadeus) of less than 1 million dollars, and observations that display sales

[9] Osiris provides data on public companies. Access to some data sets distributed by BvD is available through Wharton Research Data Services as well as the search engine provided by the company (the Internet version). At the time we collected the data, the IPO and delisting dates were available only through the Internet version.

[10] BvD has made available a list that classifies the legal forms within each country into public and private organizational types. We also would like to thank Ulrike Shultze for helping us classify some of the legal forms not on BvD's list.

growth or growth in fixed assets exceeding 100%.[11] These filters result in 305,664 firm-year observations.

We complement firm-level data with country indexes of financial and legal development. Following Demirgüç-Kunt and Levine (1996) and Love (2003), we compute an index of stock market development that equals the sum of standardized market capitalization to gross domestic product (GDP), total value traded to GDP, and turnover (total value traded to market capitalization). We obtain each of the elements of this index from the World Bank. To gauge the degree of investor protection, we use the anti-self-dealing index from Djankov, La Porta, López-de-Silanes, and Shleifer (2008), which measures how difficult it is for minority shareholders to thwart the consumption of private benefits by controlling parties. Djankov et al. argue that self-dealing is the central problem of corporate governance in most countries.

B. The Matching Procedure

The majority of firms in our sample are unlisted, including both public and private unlisted firms. Indeed, only 4% of the firm-year observations in our sample are listed firms. To make the samples of listed and unlisted firms more comparable in size, we match listed firms to unlisted firms based on country, industry code, and total assets. We keep our matching criteria simple to allow for comparisons between public and private firms across multiple characteristics. We later employ a self-selection model that controls for differences across public and private firms on multiple dimensions.

In order to match listed to unlisted firms, we first consider all listed firms in 2004, choosing this year because it contains the largest number of firms for a given year in our sample. We then exclude the largest listed companies (total assets of the company exceeds total assets of the largest unlisted company in the country by 20 million U.S. dollars or more), as these companies are likely to have easy access to international financial markets and are less likely to be subject to the constraints imposed by domestic markets (see Giannetti (2003)). There are 66 companies excluded with this restriction. Next, we require exact matches on country and industry code and the closest possible match on total assets measured as of 2004. Matching on country and industry ensures that we compare public firms to private from the same country and industry.[12] Our matched sample includes only the largest private corporations. We perform most of the tests using the matched sample. To the extent that the largest private companies are more likely to behave like public companies, this procedure may bias our results toward finding no

[11] See, for example, Almeida, Campello, and Weisbach (2004) and Campello and Graham (2013). These studies argue that large jumps in sales or assets usually indicate major corporate events, such as mergers. Also, linear investment spending models are inadequate for firms with very little capital in place.

[12] This matching controls for differences in investment sensitivities across listed and unlisted firms that are due to country or industry characteristics. We also run our analysis using only the United Kingdom, the country with the largest number of observations in our sample, and find our results are robust.

differences between public and private firms. In robustness checks, we find that our results continue to hold when we use the full (unmatched) sample instead.

C. Descriptive Statistics

Table 1 compares balance sheet data for listed and unlisted firms for the matched and unmatched samples. We present balance sheet data for the firms in the sample as of 2004, the year in which we do the matching. We document the average total assets in millions of dollars. All other figures are the balance sheet items scaled by the firm's total assets. For example, on average, listed firms' fixed assets are 47% of total assets.

TABLE 1

Descriptive Statistics: Balance Sheet Data

Table 1 presents balance sheet and ownership data for the firms in the samples in 2004. We provide descriptive statistics for both the nonmatched (Panel A) and matched (Panel B) samples. Details of the matching procedure are provided in the text. The data are from the 2007 version of Amadeus. The sample includes nonfinancial firms from Western European countries. Accounting items are scaled by total assets. Majority owner is the percentage owned by the firm's majority shareholder. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Panel A. Nonmatched Sample					*Panel B. Matched Sample*				
	Listed		Unlisted			Listed		Unlisted		
	Mean	*N*	Mean	*N*	Diff.	Mean	*N*	Mean	*N*	Diff.
Assets										
Fixed Assets	0.47	1,837	0.38	47,900	0.09***	0.47	1,771	0.43	1,771	0.04***
Intangible	0.11	1,836	0.04	47,372	0.07***	0.11	1,770	0.05	1,763	0.06***
Tangible	0.30	1,837	0.29	47,900	0.01*	0.30	1,771	0.30	1,771	0.00
Current Assets	0.53	1,837	0.62	47,900	−0.09***	0.53	1,771	0.57	1,771	−0.04***
Cash and Cash Equiv.	0.10	1,802	0.08	45,422	0.02***	0.10	1,736	0.08	1,668	0.02***
Total Assets ($ mill.)	2,787	1,837	200	47,900	2,587***	1,666	1,771	1,237	1,771	429**
Liabilities										
Shareholders' Funds	0.45	1,796	0.35	45,841	0.10***	0.45	1,731	0.36	1,766	0.09***
Capital	0.11	1,836	0.11	47,723	0.00	0.11	1,770	0.12	1,760	−0.01*
Noncurrent Liabilities	0.21	1,833	0.20	47,440	0.01**	0.21	1,767	0.23	1,760	−0.02**
Long-Term Debt	0.14	1,767	0.12	44,759	0.02***	0.14	1,703	0.14	1,673	0.00
Current Liabilities	0.36	1,837	0.49	47,899	−0.13***	0.36	1,771	0.44	1,771	−0.08***
Loans	0.09	1,722	0.13	44,672	−0.04***	0.09	1,659	0.14	1,628	−0.05***
Ownership Data										
Majority owner (%)	32.91	1,714	77.45	31,056	−44.54***	32.93	1,651	80.02	1,025	−47.09***

As expected, listed firms are significantly larger than unlisted firms, with average total assets of 2.79 billion versus 200 million dollars, respectively. This gap in firm size narrows in the matched sample: After matching, average total assets for listed and unlisted firms are 1,666 and 1,237 million dollars, respectively. Our summary statistics also reveal other interesting economic differences. Listed and unlisted firms are comparable in terms of tangible assets, but unlisted firms have lower intangible assets (11% vs. 4%). In addition, unlisted firms tend to be financed with less equity and more short-term loans: On average, 45% (35%) of listed (unlisted) firms' financing comes from shareholder funds, and 9% (13%) comes from short-term loans. These results are consistent with Giannetti (2003), who also finds that unlisted firms are more leveraged and use more short-term financing.

We also report the percentage owned by a major shareholder across listed and unlisted firms to gauge the level of ownership concentration. BvD provides data

on the firm's shareholders. Specifically, we have data on the owner type (e.g., family, financial company, industrial company, public, etc.); the owner's name, when available; and the percentage owned. These data items are static and available only for the last reported year. We exclude owner types "public" and "unnamed shareholders" while calculating the percentage owned by a major shareholder, because in these cases the numbers are aggregated. As expected the ownership concentration is significantly higher for unlisted than listed firms: On average, the majority shareholder owns 77% in unlisted firms compared to 33% in listed firms.

In the next section, we analyze how these economic differences between public and private firms impact their investment behavior.

D. Methodology

Our 1st approach to studying the relative efficiency of capital allocation across listed and unlisted firms is similar to that of Wurgler (2000). In particular, we expect a firm to increase investment when its growth opportunities are high and to reduce investment when its growth opportunities are low. We therefore estimate the following simple specification separately for listed and unlisted firms:

$$(1) \qquad Investment_{it} = \alpha + \beta \times Growth\ Opportunities_{it} + \sum firm_i + \sum year_t + \varepsilon_{it},$$

where our measure of investment is the change in gross fixed tangible assets (computed as the change in net fixed tangible assets over a year plus depreciation) divided by net fixed tangible assets (an analog to property, plant, and equipment in Compustat) at the beginning of the period; our measure of growth opportunities is sales growth, which is calculated as the 1-year change in sales divided by the beginning-of-year sales; and *firm* and *year* capture firm- and year-specific effects, respectively. As we indicate in the Introduction, we expect market imperfections to affect investment sensitivity to growth opportunities across listed and unlisted firms differently. Accordingly, we test the null hypothesis that the β for listed firms is equal to the β for unlisted firms. In Section IV, we consider alternative approaches to studying investment policies across listed and unlisted firms.

Our specification resembles standard investment models except that we use sales growth to proxy for growth opportunities instead of market-to-book ratio (MB). Sales growth is commonly used to proxy for growth opportunities,[13] and MB is unavailable for unlisted firms. In Section IV, we verify that our results are robust to alternative measures of growth opportunities. Furthermore, since the Fazzari, Hubbard, and Petersen (1988) investment models include cash flow to

[13]See, for example, Lehn and Poulsen (1989), Martin (1996), Shin and Stulz (1998), Whited (2006), Acharya, Almeida, and Campello (2007), Billett, King, and Mauer (2007), and Akdoğu and MacKay (2008), among others. Using simulations, Whited demonstrates that sales growth well captures information related to growth opportunities at the firm level.

capture the firm's financial position, we also run a version of specification (1) with cash flow as a proportion of lagged total assets.[14]

Table 2 presents summary statistics for our main variables of interest: investment, sales growth, and cash flow. We present pooled means for the matched sample by country. Listed firms invest on average at a higher rate than unlisted firms, though their growth opportunities (as proxied by sales growth) and cash flows are not any larger than those of unlisted firms. Listed firms' fixed assets grow on average by 34%, while unlisted firms' fixed assets grow by 29%. Listed firms grow faster in 9 out of 15 countries. In this study, however, we are not looking at growth rates per se. Rather, our goal is to investigate efficiency of capital allocation; that is, we seek to determine whether the firms that are growing at faster rates are the firms that have the greatest growth opportunities. We turn to this question next.

TABLE 2

Descriptive Statistics: Investment, Growth Opportunities, and Cash Flow by Country

Table 2 presents descriptive statistics for the main variables used in the analysis for the matched sample over the 1996–2006 period. Details of the matching procedure are provided in the text. We present pooled sample means and sample size for each country and for the total sample. The data are from the 2007 version of Amadeus. The sample includes nonfinancial firms from Western European countries. *Investment* is computed as the 1-year change in the value of net tangible assets plus depreciation divided by beginning-of-period net tangible assets. *Sales Growth* is computed as the 1-year change in sales divided by beginning-of-period sales. *Cash Flow* is net income plus depreciation divided by lagged tangible assets.

	Investment		Sales Growth		Cash Flow	
Country	Mean	*N*	Mean	*N*	Mean	*N*
AUSTRIA						
Listed	0.29	91	0.08	91	0.31	91
Unlisted	0.30	79	0.16	79	0.59	79
DENMARK						
Listed	0.27	196	0.09	196	0.38	196
Unlisted	0.23	186	0.08	186	0.63	186
FINLAND						
Listed	0.34	534	0.12	534	0.53	533
Unlisted	0.26	459	0.09	459	0.94	459
FRANCE						
Listed	0.42	1,234	0.10	1,234	0.70	1,233
Unlisted	0.38	1,379	0.09	1,379	0.89	1,378
GERMANY						
Listed	0.32	1,385	0.09	1,385	0.49	1,384
Unlisted	0.29	878	0.07	878	0.60	876
GREECE						
Listed	0.39	1,335	0.15	1,335	0.72	1,335
Unlisted	0.30	1,227	0.14	1,227	0.45	1,225
ICELAND						
Listed	0.30	7	0.17	7	0.49	7
Unlisted	0.07	7	0.13	7	0.24	7
IRELAND						
Listed	0.20	18	0.14	18	0.87	18
Unlisted	0.21	16	0.31	16	0.39	16

(continued on next page)

[14]We should note that cash flow in our setting is likely to capture growth opportunities, not just financial position. For cash flow to only capture a firm's financial position, one would have to use a precise measure of q (see, e.g., Hubbard (1998) and Cummins, Hassett, and Oliner (2006)).

TABLE 2 (continued)

Descriptive Statistics: Investment, Growth Opportunities, and Cash Flow by Country

	Investment		Sales Growth		Cash Flow	
Country	Mean	*N*	Mean	*N*	Mean	*N*
ITALY						
Listed	0.36	245	0.08	245	0.36	245
Unlisted	0.38	270	0.11	270	0.47	270
NETHERLANDS						
Listed	0.34	689	0.08	689	0.58	689
Unlisted	0.58	554	0.11	555	0.26	555
NORWAY						
Listed	0.51	255	0.12	255	0.88	254
Unlisted	0.33	268	0.11	368	0.76	268
PORTUGAL						
Listed	0.21	178	0.07	178	0.24	178
Unlisted	0.21	147	0.07	147	0.29	147
SPAIN						
Listed	0.29	702	0.09	702	0.54	702
Unlisted	0.32	652	0.13	652	0.66	652
SWEDEN						
Listed	0.37	410	0.13	410	0.64	409
Unlisted	0.30	409	0.11	409	1.19	406
UNITED KINGDOM						
Listed	0.32	4,209	0.10	4,209	0.62	4,201
Unlisted	0.26	4,349	0.11	4,349	0.68	4,331
ALL						
Listed	0.34	11,488	0.11	11,488	0.60	11,475
Unlisted	0.29	10,881	0.11	10,881	0.69	10,854

III. Base Tests and Robustness Checks

In this section, we first present results for our main specifications using the matched sample; then, we discuss a number of robustness checks using alternative estimation techniques and alternative samples.

A. Main Specifications

Table 3 presents results for equation (1), the baseline specification, and the version of equation (1) that includes cash flow (CF) as an additional variable, the CF specification. We present investment models for listed and unlisted firms and test for the null hypothesis that the coefficients are equal across the 2 models using seemingly unrelated estimation, which incorporates the covariance between the estimators.

In the baseline specification, we find that a 1% increase in sales growth increases investment by 0.32% for listed firms and 0.16% for unlisted firms; this difference of 0.16 percentage points is significant at the 1% level. In the CF specification, the coefficient on sales growth continues to be much larger for listed firms than unlisted firms, at 0.29 versus 0.16, and the magnitude of the difference is still quite large at 0.13, significant at the 1% level.

Overall, these results indicate that listed firms have higher investment sensitivity to growth opportunities than unlisted firms, suggesting that listed firms allocate capital more efficiently. We now turn to several robustness checks of these results.

TABLE 3

Investment Policies across Listed and Unlisted Firms: Main Specifications

Table 3 presents results of OLS regressions for listed and matched unlisted firms. Details of the matching procedure are provided in the text. The data are from the 2007 version of Amadeus. The sample includes nonfinancial firms from Western European countries over the 1996–2006 period. The dependent variable is *Investment*, computed as the 1-year change in the value of net tangible assets plus depreciation divided by beginning-of-period net tangible assets. *Sales Growth* is computed as the 1-year change in sales divided by beginning-of-period sales. *Cash Flow* is net income plus depreciation divided by lagged tangible assets. The row headed *Difference* contains the difference between the listed and unlisted coefficients. We test for the null hypothesis that the coefficients are equal across the 2 models using seemingly unrelated estimation. Each regression includes intercept, firm, and year dummy variables (not reported). The estimation procedures correct standard errors for heteroskedasticity and serial correlation. Robust standard errors are in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Sales Growth	Cash Flow	*N*	Adj. R^2
Panel A. Baseline Specification				
Listed	0.32***		11,488	0.36
	(0.02)			
Unlisted	0.16***		10,881	0.33
	(0.02)			
Difference	0.16***			
Panel B. Cash Flow Specification				
Listed	0.29***	0.04***	11,475	0.37
	(0.03)	(0.01)		
Unlisted	0.16***	0.02***	10,845	0.34
	(0.02)	(0.01)		
Difference	0.13***	0.02		

B. Alternative Estimation Techniques and Samples

One potential concern is that the ordinary least squares (OLS) estimates reported in Table 3 are biased because the regressors are correlated with the error term. To address this concern, we estimate the 1st differences of our main investment equations with generalized method of moments (GMM) using lags 3 and 4 of the regressors as well as year dummy variables as instruments. Another potential concern is related to the delayed responses. To address this concern, we measure investments over a longer horizon (2 years). In all these cases, we find that our results are robust. See the Internet Appendix for details on all robustness checks discussed in this subsection.[15]

We also investigate whether our main results hold in alternative samples. We consider the matched sample that includes Eastern European countries, the full (unmatched) sample, and a subsample that includes only observations after 2002 (the time period that is not affected by the survivorship bias in the BvD). In all cases, we continue to find that investment sensitivity to growth opportunities is significantly higher for listed than unlisted firms. When we examine how unlisted public and private firms compare to listed firms, we find that investment sensitivity to growth opportunities is always higher for listed firms. The results also suggest that unlisted public and private firms have similar investment sensitivities to growth opportunities. Thus, being listed on a major stock exchange seems to be a key factor in explaining investment sensitivity to growth opportunities, supporting the stock-market-benefits argument.

[15]The Internet Appendix can be found at www.jfqa.org

Overall, the robustness checks above confirm the evidence found in the base tests, discussed in Section III.A, that investment sensitivity to growth opportunities is significantly higher for listed than unlisted firms. The results are consistent with listed firms being more efficient at allocating capital than unlisted firms. They also suggest that the benefits associated with access to public equity markets outweigh the costs associated with ownership dispersion. Next, we examine in more detail what may drive the higher investment sensitivity to growth opportunities for listed firms.

IV. Alternative Explanations

In this section, we consider alternative explanations for our results such as measurement problems and self-selection.

A. Measurement Problems

One potential concern is that results in the previous sections that rely on sales growth as a proxy for growth opportunities are due to measurement problems. For example, sales growth may be more closely related to growth opportunities for listed than unlisted firms, or it may capture firm financial position rather than growth opportunities. Thus, it is important to verify that the differences we document in investment policies across public and private firms are not an artifact of using sales growth as a proxy for growth opportunities. To that end, we consider alternative proxies for growth opportunities, exogenous shocks to growth opportunities (tax rate changes in a country), and employ a method that compares investment policies across listed and unlisted firms that does not depend on a measure of growth opportunities (duration analysis).

1. Alternative Measures of Growth Opportunities

In this section, we consider a number of alternative proxies for growth opportunities, such as predicted MB; the valuation ratio for the industry as it is priced in global capital markets; the 1st principal component extracted from firm and industry fundamentals; and the median industry MB in a country.

MB is a commonly used measure of growth opportunities, but it is not available for unlisted firms. For this reason, we instead use predicted MB, which we estimate using data available from listed firms. Specifically, we compute predicted MB for listed and unlisted firms, using the regression coefficients from regressions of MB on contemporaneous and lagged values of earnings, sales growth, cash flows, and industry sales growth; the regressions also include lagged values of capital investment and industry capital investment.[16] This approach is close to that employed by Campello and Graham (2013) and allows us to construct an index that captures information related to firm growth opportunities conveyed by its fundamentals. Furthermore, findings in Cummins et al. (2006) suggest that

[16]Earnings is computed as earnings before interest, taxes, depreciation, and amortization scaled by lagged total assets. The industry variables are computed by taking the average of the variable in question for each country, industry, and year. The model R^2 is 0.19.

a measure of growth opportunities based on firm fundamentals is likely to be more informative in explaining investment decisions than a measure based on market value.

The results using the predicted MB are reported in Panel A of Table 4. Similarly to the base tests, we find that investment sensitivity to growth opportunities is higher for listed than unlisted firms. The coefficients in the baseline specifications are 0.31 and 0.21, respectively. Interestingly, the predicted MB seems to work well in explaining investments not only for listed but also unlisted firms, as the coefficient is highly statistically significant. More importantly, the difference between the 2 coefficients is also highly statistically significant.

TABLE 4

Alternative Proxy for Growth Opportunities

Table 4 presents results of OLS regressions for listed and matched unlisted firms. Details of the matching procedure are provided in the text. The data are from the 2007 version of Amadeus. The sample includes nonfinancial firms from Western European countries. The dependent variable is *Investment*, computed as the 1-year change in the value of net tangible assets plus depreciation divided by beginning-of-period net tangible assets. *Predicted MB* is calculated using the projection of market-to-book on a number of firm- and industry-level variables that capture a firm's growth opportunities (see text for details). *Global PE* is the global price-earnings ratio for each 3-digit SIC industry. *Cash Flow* is net income plus depreciation divided by lagged tangible assets. Each regression includes intercept, firm, and year dummy variables. The row headed *Difference* contains the difference between the listed and unlisted coefficients. We test for the null hypothesis that the coefficients are equal across the 2 models using the seemingly unrelated estimation. Robust standard errors are in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. Predicted MB

	Baseline Specifications		Cash Flow Specifications		
	Predicted MB	*N*	Predicted MB	Cash Flow	*N*
Listed	0.31*** (0.02)	9,713	0.26*** (0.03)	0.03*** (0.01)	9,713
Unlisted	0.21*** (0.02)	8,626	0.19*** (0.02)	0.01*** (0.01)	8,626
Difference	0.10***		0.07**	0.02*	

Panel B. Global PE

	Baseline Specifications		Cash Flow Specifications		
	Global PE	*N*	Global PE	Cash Flow	*N*
Listed	0.002*** (0.00)	10,539	0.002*** (0.00)	0.05*** (0.01)	10,527
Unlisted	−0.000 (0.00)	10,030	−0.000 (0.00)	0.02*** (0.01)	10,005
Difference	0.002***		0.002***	0.03***	

Furthermore, following Bekaert et al. (2007), we proxy for growth opportunities by employing the valuation ratio for the industry as it is priced in global capital markets (global price-earnings (PE) ratio). The important advantage of this measure is that it represents an exogenous proxy for growth opportunities that is not based solely on firm- or country-specific information. We obtain the annual global PE ratios for each industry from DataStream and manually match the DataStream industry codes to 3-digit Standard Industrial Classification (SIC) codes. We continue to find that investment sensitivity to growth opportunities is significantly higher for listed than unlisted firms (see Panel B of Table 4).

Additionally, we consider principal component analysis to capture information related to firm growth opportunities conveyed by its fundamentals. We continue to find that investment sensitivity to growth opportunities is higher for

listed than unlisted firms. Finally, we consider the median industry MB in a country as a measure of growth opportunities. Our results are qualitatively similar to those obtained using sales growth (see the Internet Appendix for details).

2. Tax Reforms

A number of countries in Europe implemented significant tax cuts during our sample period. For example, Germany reduced its highest marginal corporate tax rate from 51.60% to 38.36% in 2001. Changes in tax rates are reasonable exogenous shocks to growth opportunities. A tax cut leads to an increase in the number of profitable investment projects. Thus, if listed firms are better positioned to take advantage of growth opportunities than unlisted firms, we would expect investment of listed firms to be more sensitive to tax changes.

We get the data on tax rates from the World Bank, which has data available starting in 1999. We include countries in our sample with tax cuts of at least 3% that have firm-level data available before and after the tax cut for both listed and unlisted firms. These countries with tax reductions are France in 2000, Germany in 2001, Greece and Portugal in 2004, and the Netherlands in 2005.

We run a regression model where, in addition to sales growth and cash flow, we add an indicator for the firm being headquartered in a country with a tax cut in that particular year, and an interaction for each of these variables with an indicator for the firm being listed. Results are documented in Table 5. We include, though do not report, an indicator for the firm being listed and firm dummy variables. We find that tax cuts do not affect significantly the investment policies of unlisted firms. Listed firms, however, respond favorably to tax cuts. The coefficient on the interaction of tax cut with listed is 0.16, significant at the 1% level.[17] Thus, listed firms are better positioned to take advantage of growth opportunities than unlisted firms, consistent with the sales growth results.

TABLE 5

Tax Rate Changes

Table 5 presents results of OLS regressions for listed and matched unlisted firms. The data are from the 2007 version of Amadeus. The sample includes nonfinancial firms from Western European countries over the 1999–2006 period from countries that decreased the highest marginal corporate tax rates by at least 3% during the sample period. The dependent variable is *Investment*, computed as the 1-year change in the value of net tangible assets plus depreciation divided by beginning-of-period net tangible assets. *Tax Cut* is an indicator variable for a firm with a tax cut of at least 3% in a year. *Sales Growth* is computed as the 1-year change in sales divided by beginning-of-period sales. *Cash Flow* is net income plus depreciation divided by lagged tangible assets. Listed is an indicator variable for the firm being listed. Each regression includes an indicator variable for the firm being listed and firm dummy variables (not reported). The estimation procedures correct standard errors for heteroskedasticity and serial correlation. Robust standard errors are in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Tax Cut	Tax Cut × Listed	Sales Growth	Sales Growth × Listed	Cash Flow	Cash Flow × Listed	*N*	Adj. R^2
Baseline Specification	0.01 (0.02)	0.16*** (0.02)	0.18*** (0.03)	0.12*** (0.04)			7,376	0.33
Cash Flow Specification	0.00 (0.01)	0.16*** (0.02)	0.18*** (0.03)	0.11** (0.04)	0.03*** (0.01)	0.00 (0.01)	7,369	0.34

[17] Our results remain unchanged when instead we consider tax cuts of 5% or more.

3. Duration Analysis

Duration analysis is another technique to detect differences in investment policies across listed and unlisted firms. If unlisted firms face additional costs relative to listed firms in adjusting capital stock, then they would display delays between episodes of intense investments (see, e.g., Whited (2006), Akdoğu and MacKay (2008)). In this section, we investigate how long it takes firms to undertake large investment projects. One important advantage of the duration analysis is that by focusing on investment timing rather than investment levels, duration models alleviate measurement problems associated with capturing growth opportunities.

We use a mixed proportional hazard specification,

$$\lambda_i(t) \quad = \quad \omega_i \, \lambda_0(t) \exp(x_i(t)'\beta), \tag{2}$$

where t is the number of years the firm has not reached an investment threshold; $\lambda_i(t)$ is the hazard function; ω_i is a random variable that represents unobserved heterogeneity; $\lambda_0(t)$ is the so-called baseline hazard function that may be shifted by $x_i(t)$, a vector of covariates; and β is the corresponding vector of unknown coefficients.

The hazard function tells us the probability that a firm will undertake a large investment project in the current year conditional on not having done so in the previous t years. Here, ω_i is analogous to random effects in a standard linear model and assumed to be independent of $x_i(t)$ and normally distributed. We run our models both with and without these random effects.

Following Whited (2006), we define investment thresholds as twice the median firm-specific investment level. Our covariates include cash flow, time period, and industry dummy variables. We require availability of at least 5 consecutive years of data. Furthermore, we rerun the matching procedure and now require an exact match on the number of business segments as well as the country and as close as possible a match on total assets.[18] Whited demonstrates that asynchronous decision making across business segments within a firm can lower the estimated hazard function by smoothing firm-level investment; thus, matching on the number of business segments is important.

Table 6 presents estimates of the baseline hazards, our main variables of interest. We find that baseline hazard rates are higher for listed than unlisted firms, and all differences, except the 2-year hazard rates, are statistically significant. For example, the probability that a listed firm will undertake a large investment project if it has not done so in the previous 3 years is 0.29, while this probability is only 0.14 for an unlisted firm. Thus, in addition to our findings in Section III that listed firms have higher sensitivity to growth opportunities, we find that listed firms are less likely to delay investments in large projects. These findings provide some assurance that the investment sensitivity results are not due to measurement problems.

We exclude sales growth from the list of covariates in Table 6 to minimize issues with the measurement problems discussed above. For robustness, however,

[18] We have only static data on the number of business segments within a firm.

TABLE 6

Proportional Hazard Model

Table 6 presents results of the mixed proportional hazard model for the matched sample of listed and unlisted firms. We require exact matches on the number of business segments across listed and unlisted firms. Details on the matching procedure are provided in the text. The data are from the 2007 version of Amadeus. The sample includes nonfinancial firms from Western European countries. Investment threshold is defined as twice the firm median investment level. The 1st specification reports results without random effects with cluster-adjusted standard errors. The 2nd specification reports results with random effects. Each specification includes cash flow, industry, and year dummy variables (not reported). Robust standard errors are in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Without Random Effects			With Random Effects		
	Listed	Unlisted	Diff.	Listed	Unlisted	Diff.
1-year hazard, λ_1	0.47***	0.26***	0.21***	0.45***	0.26***	0.19***
	(0.08)	(0.04)		(0.08)	(0.04)	
2-year hazard, λ_2	0.21***	0.16***	0.05	0.21***	0.16***	0.05
	(0.04)	(0.03)		(0.04)	(0.03)	
3-year hazard, λ_3	0.29***	0.14***	0.15***	0.29***	0.14***	0.15**
	(0.06)	(0.03)		(0.06)	(0.03)	
4-year hazard, λ_4	0.31***	0.18***	0.13*	0.32***	0.18***	0.14*
	(0.07)	(0.04)		(0.08)	(0.04)	
5-year hazard, λ_5	0.26***	0.11***	0.15**	0.28***	0.12***	0.16**
	(0.07)	(0.03)		(0.08)	(0.03)	
N	3,095	2,907		3,095	2,907	
Log likelihood	−1,311.88	−1,264.38		−1,299.71	−1,252.25	

we rerun our models including sales growth and cash holdings, since Whited (2006) suggests these variables may shift the baseline hazard, and we find that including these variables has little bearing on the conclusion.

Taken together, the findings in this section suggest that results in Section III are unlikely to be due to measurement problems, and sales growth is a reasonable proxy for growth opportunities that allows us to compare investment policies across public and private firms.

B. Prelisting Firm Characteristics and Investment Sensitivity to Growth Opportunities

So far, we have documented that listed firms exhibit higher investment sensitivity to growth opportunities than unlisted firms, suggesting that listed firms have an advantage at allocating capital. One explanation for these results is that listing status improves efficiency of capital allocation. A potential alternative explanation is that firms that allocate capital efficiently choose to become listed. For this explanation to be true, however, one would have to explain why firms that allocate capital efficiently would opt to go public for reasons other than to maintain the ability to allocate capital efficiently. Nevertheless, to investigate whether such self-selection explains our results, we first estimate a self-selection model and then analyze firms that changed status.

1. The Self-Selection Model

We employ a 2-stage Heckman (1979) model to address the self-selection issue. We use the full sample (as opposed to the matched sample) in this test. Following recent papers on the choice to go public (Bharath and Dittmar (2010),

Aslan and Kumar (2011)), we include in the 1st-stage probit regression variables that are found to be important in explaining the firm's choice of organizational form. Specifically, in addition to our measures of growth opportunities and cash flow, we include the log of total assets, leverage, cash flow volatility, level of stock market development, firm age, and industry and year dummy variables.

Table 7 reports the results. We use both sales growth and the predicted MB to proxy for growth opportunities. Similar to the base tests, we find that listed firms have higher sensitivity to growth opportunities than unlisted firms.

TABLE 7

Self-Selection Model

Table 7 presents results of the 2nd stage for the Heckman (1979) self-selection model. The data are from the 2007 version of Amadeus. The sample includes nonfinancial firms from Western European countries over the 1996–2006 period. The dependent variable is *Investment*, computed as the 1-year change in the value of net tangible assets plus depreciation divided by beginning-of-period net tangible assets. We proxy for growth opportunities with *Sales Growth*, computed as the 1-year change in sales divided by beginning-of-period sales, and *Predicted MB*, calculated using the projection of market-to-book on a number of firm- and industry-level variables capturing the firm's growth opportunities. *Cash Flow* is net income plus depreciation divided by lagged tangible assets. The row headed *Difference* contains the difference between the listed and unlisted coefficients. We test for the null hypothesis that the coefficients are equal across the 2 models using the seemingly unrelated estimation. The results for the 2nd stage of the Heckman 2-stage model are reported for the full (nonmatched) sample. Intercept, industry, and country dummy variables are included but not reported. The 1st-stage probit (untabulated) includes a measure of growth opportunities, cash flow, log of total assets, leverage, firm age, level of stock market development, cash flow volatility, and industry and year dummy variables. Standard errors are calculated using bootstrapping. Robust standard errors are in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Growth Opportunities	Cash Flow	Self-Selection Variable	*N*	Adj. R^2
Panel A. Sales Growth Specification					
Listed	0.39***	0.05***	0.04***	9,164	0.41
	(0.02)	(0.00)	(0.01)		
Unlisted	0.23***	0.05***	−0.06***	171,878	0.33
	(0.00)	(0.00)	(0.01)		
Difference	0.16***	0.00			
Panel B. Predicted MB Specification					
Listed	0.18***	0.04***	0.05***	8,878	0.42
	(0.01)	(0.00)	(0.01)		
Unlisted	0.11***	0.05***	−0.03***	164,945	0.33
	(0.00)	(0.00)	(0.01)		
Difference	0.07***	−0.01			

2. Firms That Changed Status

In this section, we investigate how the sensitivity of investment to growth opportunities differs before and after the listing date for the subsample of firms that changed status during the sample period. If only firms with high investment sensitivity to growth opportunities chose to be listed, and the change in status does not affect investment sensitivity, then we should find no difference in investment sensitivity before and after the change in status. We should note, however, that our data on the listing status may be noisy. As noted earlier, we use the Internet version of Osiris to get information on the listing status. There are issues related to matching the 2 databases, as the firms' identification numbers in Osiris, in some cases, do not match the numbers in Amadeus. This may bias our results toward finding no effect.

With this caveat in mind, using the subsample of firms that change status, we run regressions that include sales growth and an interaction variable that is the product of growth opportunities and a dummy variable for whether the firm is listed (*growth* × *listed*). If investment is more sensitive to growth opportunities when firms are listed, then we expect the interaction variable (*growth* × *listed)* to be positive. In an alternative specification, we include cash flow and an interaction variable that is the product of cash flow and a listed dummy variable (*cash flow* × *listed*). In both specifications we also include, but do not report, an indicator variable for the firm being listed and firm dummy variables.

Table 8 presents the results. We first report results using sales growth as a measure of growth opportunities. We find that the coefficient on *growth* × *listed* is positive and significant at the 5% level. In the cash flow specification, the coefficient on *growth* × *listed* is again positive but marginally insignificant. The coefficient on *cash flow* × *listed*, however, is positive and highly significant. To the extent that cash flow in this setting is likely to capture growth opportunities, our results are consistent with listed firms having higher investment sensitivity to growth opportunities than unlisted firms.

TABLE 8

Change in Status

Table 8 presents results of OLS regressions for a subsample of firms that changed status through listing. The data are from the 2007 version of Amadeus. The sample includes nonfinancial firms from Western European countries over the 1996–2006 period. The dependent variable is *Investment*, computed as the 1-year change in the value of net tangible assets plus depreciation divided by beginning-of-period net tangible assets. We proxy for growth opportunities with *Sales Growth*, computed as the 1-year change in sales divided by beginning-of-period sales, and *Predicted MB*, calculated using the projection of market-to-book on a number of firm- and industry-level variables capturing the firm's growth opportunities. *Cash Flow* is net income plus depreciation divided by lagged tangible assets. Listed is an indicator variable for the firm being listed. We interact growth opportunities and cash flow with the indicator variable listed. Each regression includes an indicator variable for the firm being listed and firm dummy variables (not reported). The estimation procedures correct standard errors for heteroskedasticity and serial correlation. Robust standard errors are in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Growth Opportunities	Growth × Listed	Cash Flow	Cash Flow × Listed	*N*	Adj. R^2
Panel A. Sales Growth						
Baseline specification	0.29***	0.14**			1,675	0.38
	(0.07)	(0.09)				
Cash flow specification	0.27***	0.08	0.03	0.08***	1,671	0.41
	(0.07)	(0.09)	(0.02)	(0.02)		
Panel B. Predicted MB						
Baseline specification	0.22***	0.24***			1,370	0.42
	(0.06)	(0.06)				
Cash flow specification	0.15**	0.22***	0.04	0.02	1,370	0.43
	(0.08)	(0.07)	(0.05)	(0.04)		

We also report results using the predicted MB as a measure of growth opportunities. Results using the predicted MB are very strong. The coefficients on *growth* × *listed* are positive and highly statistically significant both in the basic and CF specifications.

The results in Tables 7 and 8 suggest that listed firms' greater investment sensitivity to growth opportunities is unlikely to be due to prelisting firm characteristics. One potential limitation, however, is that we do not have a good set

of instruments to formally rule out this explanation. At the very least, our results suggest that public listed status does not destroy allocation efficiency (compared to private firms in an economy) as the cost of ownership dispersion argument suggests.

V. Countries' Institutions and the Trade-Offs across Public and Private Firms

In this section, we investigate whether the effectiveness of a county's legal and financial institutions affects the trade-offs across public and private firms and provide additional robustness tests of the main findings.

A. Shareholder Rights, Agency Costs, and the Relative Efficiency of Capital Allocation

Previous literature argues that greater investor protection at the country level reduces agency costs at the firm level (see La Porta et al. (1997), (1998) and, more recently, Djankov et al. (2008)). Thus, the advantage public firms have over private firms at allocating capital may depend on the degree of shareholder rights in a country and thus may vary with the institutional settings.

To investigate whether shareholder rights affect the investment sensitivity to growth opportunities, we first partition our sample into 2 groups using the anti-self-dealing index: one with the index above the median and the other with the index below the median. We present results in Table 9: Panel A reports results using sales growth as a proxy for growth opportunities, and Panel B reports results using the predicted MB. We find that the relative investment sensitivity to growth opportunities for listed firms does not differ significantly between the 2 groups of countries. One possible reason for this result is that the variation in the anti-self-dealing index is low within Western European countries. When we include Eastern European countries in the sample, we find evidence that the anti-self-dealing index impacts the relative advantage public firms have at allocating capital. Specifically, listed firms exhibit higher investment sensitivity to growth opportunities than unlisted firms only in countries with strong shareholder rights. These results suggest that public firms with a high degree of agency costs are less likely to have an advantage over private firms at allocating capital (see the Internet Appendix for details on this test).

In the Internet Appendix, we present further evidence that the advantage of public firms depends on the degree of agency costs using both country- and firm-level proxies. We consider the impact of the rule of law measure from the Political Risk Services International Country Risk Guide, leverage, and dividend payout.

The results in this section also indicate that our findings in Section III are not due to overinvestment, as we find evidence that the investment sensitivity of listed firms is lower (not higher, as the overinvestment argument would predict) when the agency costs are higher.

TABLE 9

Anti-Self-Dealing Index and Investment Policies across Listed and Unlisted Firms

Table 9 presents results of OLS regressions for listed and matched unlisted firms by level of shareholder rights. Details of the matching procedure are provided in the text. The financial data are from the 2007 version of Amadeus. The sample includes nonfinancial firms from Western European countries over the 1996–2006 period. We present results for countries with an anti-self-dealing index above the median on the left, and an anti-self-dealing index below the median on the right. The anti-self-dealing index is from Djankov et al. (2008). The dependent variable is *Investment*, computed as the 1-year change in the value of the net tangible assets plus depreciation divided by beginning-of-period net tangible assets. We proxy for growth opportunities with *Sales Growth*, computed as the 1-year change in sales divided by beginning-of-period sales, and *Predicted MB* (*Prd. MB*), calculated using the projection of the market-to-book on a number of firm- and industry-level variables capturing the firm's growth opportunities. *Cash Flow* is net income plus depreciation divided by lagged tangible assets. The row headed *Difference* contains the difference between the listed and unlisted coefficients, and the column headed *Difference* contains the difference between the growth opportunity coefficients across high and low levels of the anti-self-dealing index. We test for the null hypothesis that the coefficients are equal across each of the 2 models using the seemingly unrelated estimation. Each regression includes firm and year dummy variables (not reported). The estimation procedures correct standard errors for heteroskedasticity and serial correlation. Robust standard errors are in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. Sales Growth as a Measure of Growth Opportunities

	Anti-Self-Dealing above Median				Anti-Self-Dealing below Median				
	Sales Growth	Cash Flow	*N*	Adj. R^2	Sales Growth	Cash Flow	*N*	Adj. R^2	Difference in Sales Growth Coeff.
Baseline Specification									
Listed	0.34***		5,635	0.39	0.30***		5,853	0.33	0.04
	(0.03)				(0.04)				
Unlisted	0.16***		5,695	0.33	0.16***		5,186	0.33	0.00
	(0.03)				(0.03)				
Difference	0.18***				0.14***				
Cash Flow Specification									
Listed	0.32***	0.04***	5,625	0.40	0.27***	0.04***	5,850	0.34	0.05
	(0.03)	(0.01)			(0.04)	(0.01)			
Unlisted	0.15***	0.02***	5,677	0.33	0.16***	0.03***	5,177	0.35	−0.01
	(0.03)	(0.01)			(0.03)	(0.01)			
Difference	0.17***	0.02			0.11***	0.01			

Panel B. Predicted MB as a Measure of Growth Opportunities

	Anti-Self-Dealing above Median				Anti-Self-Dealing below Median				
	Prd. MB	Cash Flow	*N*	Adj. R^2	Prd. MB	Cash Flow	*N*	Adj. R^2	Difference in Prd. MB Coeff.
Baseline Specification									
Listed	0.33***		4,748	0.43	0.30***		4,965	0.35	0.03
	(0.03)				(0.03)				
Unlisted	0.21***		4,548	0.36	0.22***		4,078	0.35	−0.01
	(0.03)				(0.03)				
Difference	0.12***				0.08**				
Cash Flow Specification									
Listed	0.27***	0.04***	4,748	0.43	0.26***	0.02*	4,965	0.35	0.01
	(0.04)	(0.01)			(0.03)	(0.01)			
Unlisted	0.19***	0.01	4,548	0.36	0.18***	0.02***	4,078	0.36	0.01
	(0.03)	(0.01)			(0.03)	(0.01)			
Difference	0.08*	0.03**			0.08*	0.00			

B. Public Equity Markets and the Relative Efficiency of Capital Allocation

We argue that listed firms' advantage over unlisted firms is associated with the stock market and in turn is related to the degree of the stock market's development. Thus, we not only expect listed firms to allocate capital more efficiently in developed stock markets, but we also expect stock market development to affect the advantage listed firms have over unlisted firms at allocating capital.

To investigate the relation between stock market development and investment efficiency, we partition our sample into firms located in countries with more developed stock markets (the stock market development index above the median) and firms located in countries with less developed stock markets (the stock market development index below the median). Results are presented in Table 10. In Panel A we use sales growth, while in Panel B we use the predicted MB.

TABLE 10

Stock Market Development and Investment Policies across Listed and Unlisted Firms

Table 10 presents results of OLS regressions for listed and matched unlisted firms by stock market development. Details of the matching procedure are provided in the text. The financial data are from the 2007 version of Amadeus. The sample includes nonfinancial firms from Western European countries over the 1996–2006 period. We present results for countries with a stock market development index above the median on the left, and a stock market development index below the median on the right. The stock market development index is constructed from World Bank data following Demirgüç-Kunt and Levine (1996). The dependent variable is *Investment*, computed as the 1-year change in the value of net tangible assets plus depreciation divided by beginning-of-period net tangible assets. We proxy for growth opportunities with *Sales Growth*, computed as the 1-year change in sales divided by beginning-of-period sales, and *Predicted MB* (*Prd. MB*), calculated using the projection of market-to-book on a number of firm- and industry-level variables capturing the firm's growth opportunities. *Cash Flow* is net income plus depreciation divided by lagged tangible assets. The row headed *Difference* contains the difference between the listed and unlisted coefficients, and the column headed *Difference* contains the difference between the growth opportunity coefficients across high and low levels of stock market development. We test for the null hypothesis that the coefficients are equal across each of the 2 models using the seemingly unrelated estimation. Each regression includes firm and year dummy variables (not reported). The estimation procedures correct standard errors for heteroskedasticity and serial correlation. Robust standard errors are in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. Sales Growth as a Measure of Growth Opportunities

	Stock Mkt. Dev. above Median				Stock Mkt. Dev. below Median				
	Sales Growth	Cash Flow	*N*	Adj. R^2	Sales Growth	Cash Flow	*N*	Adj. R^2	Difference in Sales Growth Coeff.
Baseline Specification									
Listed	0.35***		9,163	0.41	0.19***		2,325	0.24	0.16***
	(0.03)				(0.05)				
Unlisted	0.18***		8,681	0.35	0.08**		2,200	0.26	0.10***
	(0.02)				(0.03)				
Difference	0.17***				0.11*				
Cash Flow Specification									
Listed	0.32***	0.04***	9,151	0.42	0.17***	0.04***	2,324	0.25	0.15***
	(0.03)	(0.01)			(0.05)	(0.02)			
Unlisted	0.18***	0.02***	8,656	0.36	0.07**	0.05***	2,198	0.28	0.11***
	(0.02)	(0.00)			(0.03)	(0.02)			
Difference	0.14***	0.02			0.10	−0.01			

Panel B. Predicted MB as a Measure of Growth Opportunities

	Stock Mkt. Dev. above Median				Stock Mkt. Dev. below Median				
	Prd. MB	Cash Flow	*N*	Adj. R^2	Prd. MB	Cash Flow	*N*	Adj. R^2	Difference in Prd. MB Coeff.
Baseline Specification									
Listed	0.34***		7,782	0.45	0.15***		1,931	0.34	0.19***
	(0.02)				(0.06)				
Unlisted	0.22***		6,854	0.38	0.15***		1,772	0.27	0.07
	(0.03)				(0.05)				
Difference	0.12***				0.00				
Cash Flow Specification									
Listed	0.30***	0.02***	7,782	0.45	0.07	0.06***	1,931	0.25	0.23***
	(0.03)	(0.01)			(0.06)	(0.03)			
Unlisted	0.20***	0.01**	6,854	0.39	0.10***	0.03***	1,772	0.27	0.10**
	(0.03)	(0.01)			(0.05)	(0.02)			
Difference	0.10***	0.01			−0.03	0.03			

Consistent with previous studies, we find that stock market development improves the efficiency of capital allocation. The investment sensitivity to growth opportunities for listed firms is higher in countries with more developed stock markets. Interestingly, we also find that stock market development improves the efficiency of capital allocation not only for listed firms, but also for unlisted firms. This is possibly because stock market development is correlated with institutional characteristics that also benefit unlisted firms. Most importantly, our results suggest that stock market development affects the relative advantage listed firms have at allocating capital. Listed firms display higher investment sensitivity to growth opportunities than unlisted firms only in countries with more developed stock markets. The difference is statistically insignificant in countries with less developed stock markets in all specifications but one. When we consider an alternative sample that includes Eastern European countries, we continue to find that listed firms exhibit higher investment sensitivity to growth opportunities than unlisted firms only in countries with developed stock markets (see the Internet Appendix for details). We interpret these results as evidence that a well-developed stock market enhances the ability of public firms to allocate capital efficiently, consistent with the stock-market-benefits argument.

As an additional test of this argument, we investigate how industry variations in the need for external financing affect the relative advantage listed firms have at allocating capital. Rajan and Zingales (1998) and Gupta and Yuan (2009) document the importance of industry-level variation in the need for external financing for industry growth. We focus on industry dependence on external equity. Specifically, we expect private firms to be at a disadvantage in industries that depend on external equity. Similar to Rajan and Zingales, we define dependence on external equity as the ratio of the net amount of equity issues (sale of common and preferred stocks minus purchase of common and preferred stocks) to capital expenditures. We construct the industry measure as the median value of this ratio for each 3-digit SIC code using Compustat data for U.S. firms over 1980–1996.[19] Rajan and Zingales argue that an industry's dependence on external funds as identified in the United States is a reliable measure of its dependence in other countries.

Table 11 presents the results. We find that investment sensitivity to growth opportunities for unlisted firms is lower when industry dependence on external equity is higher. Interestingly, using predicted MB, we also find that investment sensitivity to growth opportunities does not differ significantly across listed and unlisted firms in industries with low dependence on external equity. By contrast, investment sensitivity to growth opportunities is always higher for listed firms than for unlisted firms in industries with high dependence on external equity. Our results suggest that the relative advantage public firms have at allocating capital is related to their dependence on external equity.

C. Global Capital Flows and the Relative Efficiency of Capital Allocation

European countries have made tremendous strides to integrate capital markets. We also have the introduction of the euro during our sample period. Given

[19] Our results are robust to alternative time periods (e.g., 1980–1989 and 1980–2006).

TABLE 11

Industry Equity Dependence and Investment Policies across Listed and Unlisted Firms

Table 11 presents results of OLS regressions for listed and matched unlisted firms by external equity dependence. Details of the matching procedure are provided in the text. The financial data are from the 2007 version of Amadeus. The sample includes nonfinancial firms from Western European countries over the 1996–2006 period. We present results for firms in industries with external equity dependence above the median on the left, and external equity dependence below the median on the right. The external industry equity dependence measure is constructed as the median ratio of the net amount of equity issues to capital expenditures for U.S. firms over the 1980–1996 period. The dependent variable is *Investment*, computed as the 1-year change in the value of net tangible assets plus depreciation divided by beginning-of-period net tangible assets. We proxy for growth opportunities with *Sales Growth*, computed as the 1-year change in sales divided by beginning-of-period sales, and *Predicted MB* (*Prd. MB*), calculated using the projection of market-to-book on a number of firm- and industry-level variables capturing the firm's growth opportunities. *Cash Flow* is net income plus depreciation divided by lagged tangible assets. The row headed *Difference* contains the difference between the listed and unlisted coefficients, and the column headed *Difference* contains the difference between the growth opportunity coefficients across high and low levels of external equity dependence. We test for the null hypothesis that the coefficients are equal across each of the 2 models using the seemingly unrelated estimation. Each regression includes firm and year dummy variables (not reported). The estimation procedures correct standard errors for heteroskedasticity and serial correlation. Robust standard errors are in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. Sales Growth as a Measure of Growth Opportunities

	Ext. Equity Dep. above Median				Ext. Equity Dep. below Median				
	Sales Growth	Cash Flow	*N*	Adj. R^2	Sales Growth	Cash Flow	*N*	Adj. R^2	Difference in Sales Growth Coeff.
Baseline Specification									
Listed	0.29***		3,750	0.38	0.32***		6,843	0.32	−0.03
	(0.03)				(0.03)				
Unlisted	0.13***		3,152	0.38	0.18***		6,842	0.28	−0.05*
	(0.03)				(0.02)				
Difference	0.16***				0.14***				
Cash Flow Specification									
Listed	0.26***	0.04***	3,741	0.39	0.29***	0.04***	6,841	0.33	−0.03
	(0.03)	(0.01)			(0.03)	(0.01)			
Unlisted	0.12***	0.02***	3,143	0.39	0.18***	0.02***	6,825	0.29	−0.04*
	(0.03)	(0.01)			(0.02)	(0.01)			
Difference	0.14***	0.02*			0.11***	0.02***			

Panel B. Predicted MB as a Measure of Growth Opportunities

	Ext. Equity Dep. above Median				Ext. Equity Dep. below Median				
	Prd. MB	Cash Flow	*N*	Adj. R^2	Prd. MB	Cash Flow	*N*	Adj. R^2	Difference in Prd. MB Coeff.
Baseline Specification									
Listed	0.31***		3,116	0.42	0.31***		5,849	0.34	0.00
	(0.03)				(0.03)				
Unlisted	0.16***		2,431	0.42	0.26***		5,486	0.30	−0.10***
	(0.03)				(0.03)				
Difference	0.15***				0.05				
Cash Flow Specification									
Listed	0.25***	0.03**	3,116	0.42	0.26***	0.03***	5,849	0.34	−0.01
	(0.04)	(0.01)			(0.03)	(0.01)			
Unlisted	0.13***	0.02*	2,431	0.42	0.24***	0.01*	5,486	0.30	−0.11***
	(0.04)	(0.01)			(0.03)	(0.01)			
Difference	0.12***	0.01			0.02	0.02**			

that most European countries are relatively small economies, global capital flows are likely to be economically important. Indeed, findings in Bekaert et al. (2007) and Gupta and Yuan (2009) suggest that cross-country capital flows help reduce financial constraints and align growth opportunities with growth.

In this section, we investigate whether global capital flows impact the relative advantage of public firms. Global capital flows could be an additional channel that allows public firms to allocate capital more efficiently than private firms if they go

disproportionately to public firms. We analyze the interaction effect between our proxy for growth opportunities and a variable that captures global capital flows in a country (*sales growth* × *global capital flow*). Our measure of the capital flows is the sum of total loans and portfolio flows from Balance of Payments and International Investment Position Statistics distributed by the International Monetary Fund[20] scaled by GDP.

Table 12 presents the results. We find that global capital flows help align capital investments with growth opportunities for listed firms. The interaction

TABLE 12

Global Capital Flows and Investment Policies across Listed and Unlisted Firms

Table 12 presents results of OLS regressions for listed and matched unlisted firms. Details of the matching procedure are provided in the text. The data are from the 2007 version of Amadeus. The sample includes nonfinancial firms from Western European countries over the 1996–2006 period. The dependent variable is *Investment*, computed as the 1-year change in the value of net tangible assets plus depreciation divided by beginning-of-period net tangible assets. We proxy for growth opportunities with *Sales Growth*, computed as the 1-year change in sales divided by beginning-of-period sales, and *Predicted MB* (*Prd. MB*), calculated using the projection of the market-to-book on a number of firm- and industry-level variables capturing the firm's growth opportunities. *Global Capital Flows* is the sum of loans and portfolio flows scaled by GDP. The row headed *Difference* contains the difference between the listed and unlisted coefficients. We test for the null hypothesis that the coefficients are equal across the 2 models using seemingly unrelated estimation. Each regression includes intercept, global capital flows, and firm dummy variables (not reported). The estimation procedures correct standard errors for heteroskedasticity and serial correlation. Robust standard errors are in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. Sales Growth as a Measure of Growth Opportunities

	Sales Growth	Sales Growth × Global Capital Flows	Cash Flow	Cash Flow × Global Capital Flows	*N*	Adj. R^2
Baseline Specification						
Listed	0.30***	0.46**			11,248	0.36
	(0.03)	(0.23)				
Unlisted	0.16***	0.16			10,658	0.33
	(0.03)	(0.15)				
Difference	0.14***	0.30				
Cash Flow Specification						
Listed	0.28***	0.39*	0.03***	0.04	11,235	0.37
	(0.03)	(0.23)	(0.01)	(0.04)		
Unlisted	0.16***	0.15	0.03***	−0.06*	10,632	0.34
	(0.03)	(0.15)	(0.01)	(0.03)		
Difference	0.12***	0.24	0.00	0.10*		

Panel B. Predicted MB as a Measure of Growth Opportunities

	Prd. MB	Prd. MB × Global Capital Flows	Cash Flow	Cash Flow × Global Capital Flows	*N*	Adj. R^2
Baseline Specification						
Listed	0.29***	0.34**			9,600	0.38
	(0.03)	(0.15)				
Unlisted	0.21***	0.28*			8,519	0.33
	(0.03)	(0.15)				
Difference	0.08***	0.06				
Cash Flow Specification						
Listed	0.25***	0.30*	0.02**	0.01	9,600	0.39
	(0.03)	(0.17)	(0.01)	(0.04)		
Unlisted	0.17***	0.34**	0.02***	−0.06*	8,519	0.36
	(0.03)	(0.15)	(0.01)	(0.04)		
Difference	0.08**	−0.04	0.00	0.07		

[20]Portfolio flows measure investment in securities by foreigners, and loan flows measure lending by foreign banks. The variable takes a plus sign when foreigners buy securities (make loans) and a minus sign when foreigners sell securities (loans are repaid).

coefficient is positive and statistically significant. The interaction coefficient is insignificant for unlisted firms, suggesting that global capital flows could be an additional channel that drives the advantage public firms have over private firms at allocating capital. When we use the predicted MB, however, the interaction coefficients are significant both for listed and unlisted firms. Thus, global capital flows may help align capital investments with growth opportunities for unlisted firms as well. The difference in the interaction coefficients across listed and unlisted firms is statistically insignificant.

We also analyze the impact of the euro membership on the relative advantage of public firms. We compare investment sensitivity to growth opportunities before and after introduction of the euro across listed and unlisted firms. The coefficients on the interaction of growth opportunities with the euro indicator variable are positive and statistically significant for listed firms in 3 out of 4 specifications. The coefficients are always insignificant for unlisted firms. The differences across the coefficients are significant in 3 out of 4 specifications. These results again suggest that global capital flows could be an additional channel that drives the advantage public firms have over private at allocating capital.

Overall, the results in this section suggest that the economic advantage of listed firms varies with institutional setting and are consistent with the trade-offs between the costs associated with ownership dispersion and the benefits associated with being part of the public equity markets. They also further confirm that the findings in Table 3 are unlikely to be due to measurement problems: To attribute our results to a measurement problem, one would have to explain why the measurement error is correlated with stock market development, external equity dependence, and agency problems.

VI. Summary and Conclusions

In this paper, we examine how economic differences between public and private firms impact their investment decisions. The empirical literature comparing public and private firms' behavior is scarce because of data availability. We take advantage of the fact that both public and private firms in Europe are required to report their financial information.

We find that investment sensitivity to growth opportunities is higher for public listed than public unlisted or private firms. Our results are consistent with the notion that listed firms are better positioned to take advantage of growth opportunities than unlisted firms. We also show that the relative advantage of public firms is affected by the quality of countries' institutions. Specifically, investment sensitivity to growth opportunities is higher for listed firms *only* in countries with well-developed stock markets. The findings suggest that the benefits associated with being part of a well-developed stock market outweigh the agency costs associated with ownership dispersion.

Our findings are important for several reasons. First, they complement a growing empirical literature that compares the behavior between public and private firms; while the economic differences between public and private forms of ownership have been studied extensively in the theoretical literature, the empirical evidence is still limited. Furthermore, our findings shed new light on the debate

as to whether a firm's particular financial structure is relevant for real investment decisions. Specifically, our results suggest that well-developed stock markets allow listed firms to take advantage of investment opportunities that might not be undertaken if the firms were private. Our findings also suggest that the economic advantage of listed firms varies with institutional setting.

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