

Insider ownership and firm value: one shape does not fit all

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Insider ownership and firm value: one shape does not fit all

Abstract

We examine the lack of consensus in the literature about the impact of insider ownership on firm value. We apply non-parametric and semi-parametric methods to analyze various subsamples based on firm size, age, index listing, and institutional ownership. Sample selection is an important determinant of the discord in the literature. Different subsamples lead to widely different estimated ownership-firm value relationships – from upward sloping to downward sloping to flat to V and inverse-V. We replicate and show this for four influential papers (Morck, Shleifer, and Vishny, 1988; McConnell and Servaes, 1990; Himmelberg, Hubbard, and Palia, 1999; and Agrawal and Knoeber, 1996). By cataloguing systematic differences across subsamples that mirror corresponding disagreements among existing studies, we provide a unifying perspective on the literature.

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1. Introduction

How does the ownership of insiders affect the value of a firm? Despite a large number of studies attempting to address this question, there seems to be no consensus. For example, among three of the most influential papers whose conclusions are shown in Figure 1:¹

1. Morck, Shleifer, and Vishny (1988) estimate a piecewise linear model using a sample of Fortune 500 firms and conclude that the relationship between ownership and firm value is increasing at low levels of ownership, decreasing at intermediate levels, and finally, increasing again at high levels of ownership.
2. McConnell and Servaes (1990) estimate a quadratic model for a sample of firms found on the Value Line Investment Survey and conclude that firm value increases with ownership for both low and intermediate levels of ownership and declines thereafter. Both Morck, Shleifer, and Vishny (1988) and McConnell and Servaes (1990) interpret the increasing relation as indicative of the alignment of interests between insiders and minority shareholders and the decreasing relation as indicative of the entrenchment of insiders and a worsening of the agency problem.
3. Himmelberg, Hubbard, and Palia (1999) find an insignificant relationship for a random sample of firms and argue that it is difficult to conclude that managerial ownership affects firm performance.

[Figure 1 here]

Other studies continue to use different samples, different model specifications, and different econometric techniques and tend to arrive at different conclusions. Our goal in this paper is straightforward. We use a comprehensive sample of U.S. firms to disentangle these empirical patterns in order to reconcile

¹ As of September 2020, the Web of Science Core Collection (Google Scholar) shows that Morck, Shleifer, and Vishny (1988) have been cited 2,567 (10,424) times, McConnell and Servaes (1990) have been cited 1,443 (6,106) times, and Himmelberg, Hubbard, and Palia (1999) have been cited 905 (3,568) times.

what has been observed and thereby facilitate more meaningful future discussion on *why* we observe what we observe. To remain agnostic regarding the relationship, we employ non-parametric and semi-parametric approaches to analyze both the full sample and pertinent subsamples.² We find that the relationship for the full sample is different from that of most subsamples and that a majority of the conflicting results in the literature are due to sample selection.

Table 1 summarizes papers that examine the relationship between insider ownership and firm value, as proxied by Tobin's Q.³ In Panel A, we list studies that use linear or piecewise linear specifications. In Panel B, we list studies that use quadratic specifications.⁴ Most papers use samples of firms from ExecuComp, Value Line Investment Survey, Forbes 500, Fortune 500, or the S&P 500. When samples cover large index-listed firms they typically find that firm values first increase with insider ownership at low ownership levels and then decrease at higher levels. The few studies that use random samples of firms (mixing firms of different sizes and types) or include smaller, younger, or off-index firms often find an insignificant relationship or one that is decreasing at low levels of ownership and increasing at higher levels.⁵ Because the preponderance of the samples used in this literature are comprised of large, established firms (in which insiders tend to own a fairly small proportion of equity), the literature has largely been interpreted as indicating a robust positive correlation between insider ownership and firm value at low and intermediate levels of ownership and a possible negative correlation at higher levels of ownership.⁶

² Because the results of our non-parametric and semi-parametric tests are graphical, we refrain from discussing statistical significance.

³ We include studies published in *The Review of Financial Studies*, *Journal of Finance*, *Journal of Financial Economics*, *Journal of Financial and Quantitative Analysis*, *Journal of Banking and Finance*, *Journal of Corporate Finance*, *Financial Management*, *Journal of Business* (publication ceased in 2006), *American Economic Review*, *Quarterly Journal of Economics*, and *The Journal of Political Economy*. In order to keep the review focused and also to maintain a direct comparability between our results and those of the studies summarized here, we include only studies that examine the relationship between insider ownership and firm value for US firms.

⁴ It is worth noting that a few studies have employed higher-order polynomial (see, e.g., Gugler, Mueller, and Yurtoglu, 2008, for a cubic specification and Davies, Hillier, and McColgan, 2005, for a fifth-power specification) or more complex econometric specifications (e.g. Cheung and Wei, 2006) to assess this relationship. However, as the former two studies use non-US data and the latter uses a complex system-GMM approach not directly comparable to traditional OLS, we do not include them in our literature summary reported in Table 1.

⁵ We refer to firms that are not listed in one of the S&P 1500 indexes as "off-index firms".

⁶ Our conclusions in both Table 1 and Figure 1 are foreshadowed by Demsetz and Villalonga (2001). In describing Figure 1 of their paper where they review prior studies, they note that "[d]ifferences abound across these studies, in measurements and sample used, in estimating technique applied, in whether and how they account for the endogeneity of ownership structure, and in results obtained." (p. 211)

[Table 1 here]

Our paper starts with a replication of four of the most cited papers in this literature. We first use our best approximation of their data and empirical specifications to replicate their results and then repeat the study with a sample of all firms listed on CRSP and Compustat. Although findings cannot be perfectly reproduced over 20 years later, we do find results qualitatively consistent with them. This replicability breaks down when we use the full sample of CRSP and Compustat firms. The evidence is consistent with an inverted V-shaped relationship between ownership and firm value for larger, index-listed firms and a V-shaped relationship for broader samples.

Finally, we estimate the relationship between ownership and firm value using both non-parametric and semi-parametric methods for our full sample of firms and find conflicting results. In the non-parametric case, the overall relationship is roughly inverted-V shaped – increasing until ownership reaches around 20%, decreasing between insider ownership levels of 20% to 85%, and increasing thereafter. In the semi-parametric case, the relationship is V-shaped, decreasing until ownership reaches about 65% and increasing thereafter.

We also form subsamples based on firm size, age, index listing status, and level of institutional ownership and find that not only do the full sample results no longer consistently hold but there is also no distinct relationship between insider ownership and firm value that can be applied across the majority of subsamples.⁷ In semi-parametric tests, we find

1. clear V-shaped relationships for subsamples of smaller, younger, or off-index firms as well as those with low levels of institutional ownership,
2. a decreasing relationship for mature firms,
3. no clear pattern in the relationship for larger firms, index-listed firms, and those having high levels of institutional ownership.

⁷ Additional subsample results based on year of incorporation, year of observation, industry, and dual-class ownership structures are provided in the online appendix.

Our overall findings indicate that the variation in the observed relationship between insider ownership and firm value (increasing, decreasing, V-shaped, or inverted V-shaped) is, to a large extent, simply a function of sample selection. Therefore, the findings of any one study may not be extrapolated to draw conclusions about a different sample or the universe of firms. There exists not one, but a whole spectrum of possible ownership-firm value (OFV) relationships, and the one observed depends on the specific sample chosen by the researcher.

The remainder of the paper is organized as follows. Section 2 describes our data and sample selection. Section 3 provides an empirical perspective on the fragility of some of the most influential results in the literature. Section 4 provides our empirical analysis and results. Section 5 concludes.

2. Data

We start with all firms on CRSP and Compustat in 2004, 2009, and 2014.⁸ Following Basu, Paeglis, and Toffanin (2017), we remove foreign firms, utilities, and financial firms, as well as those for which the traded security is not common stock. We further remove all firm-years for which firms have a negative book value of equity. The resulting sample consists of 7,837 firm-years. We then manually collect the insider (and CEO) ownership data for these firms from either the proxy statement, 10K, or IPO prospectus preceding the identified fiscal year end. We were unable to obtain ownership data for 131 firm-years.⁹ Firm value is measured at the end of the fiscal year. The manual data collection helps to reduce errors (e.g., data entry, double counting, backfilling, etc.) in commercially available databases.¹⁰ We define insider

⁸ We randomly begin with 2004 as it is a relatively recent year without significant unusual events, and then consider every fifth year (i.e. 2009 and 2014). This approach has the advantage of not including unusual years such as 2000 and 2007. While the absence of a longer time series of ownership data is not ideal, the need to have a reliable and comprehensive sample required us to hand-collect the ownership data and thus limited the number of years that we included in this study.

⁹ For 41 firms, ownership data was not available within a year preceding the fiscal year end. In 14 firm-years, the firm's industry or country of incorporation were misclassified in either of the two databases. Finally, we also excluded 76 firm-years where common shares represented limited liability company (LLC) or limited partnership (LP) interests.

¹⁰ Dlugosz, Fahlenbrach, Gompers, and Metrick (2006) note that misreporting of ownership data in Compact Disclosure can result in significant errors-in-variables biases when ownership data is used as an independent variable. Likewise, Gillan, Hartzell, Koch, and Starks (2018) report that the backfilling bias in ExecuComp can result in misestimation of statistical and economic magnitude of the OFV relationship and also result in misinterpretation of the correct functional form of the relationship.

ownership as the voting rights of all officers and directors as a group. Unreported results using CEO ownership, another frequently used measure of insider ownership, are qualitatively similar to those reported in the paper. Our final ownership sample consists of 3,313 firms in 2004, 2,580 firms in 2009, and 1,813 firms in 2014, for a total of 7,706 firm-years and represents 98.3% of the CRSP/Compustat firms meeting the above selection criteria.

We then create a panel data set by merging each year of ownership data with the accounting and stock price data for the preceding, concurrent, and following fiscal years. The use of multiple years of financial data is motivated by the relatively short time-series dimension of our ownership data, which makes the findings potentially vulnerable to market-wide movements in prices or firm profitability in those particular years. However, as noted by Fahlenbrach and Stulz (2009), ownership is relatively stable from year to year. Consequently, the observed insider ownership is a good approximation of their ownership in the previous and subsequent years. Definitions and relevant summary statistics of our data are reported in Table 2.

[Table 2 here]

3. An empirical perspective on prior literature

Our understanding of the ownership-firm value relationship is shaped, to a great extent, by some of the early findings on the topic. Specifically, Morck, Shleifer, and Vishny (1988), McConnell and Servaes (1990), Himmelberg, Hubbard, and Palia (1999), and Agrawal and Knoeber (1996) stand out in terms of their (citation) impact.¹¹ In this section, we ask to what degree their results generalize. We replicate the results from each of these studies using their specifications – first with our best approximation of the data

¹¹ As shown in Table 1, these are amongst the most widely cited insider ownership papers in the literature, each having over 3,000 citations on Google Scholar as of May 2020. Their samples have been widely discussed and used in the literature. There are three other relevant papers on the topic that have more cites than does the last paper on our list. Two of these, Anderson and Reeb (2003) and Villalonga and Amit (2006), deal with the narrower topic of family ownership rather than insider ownership. In addition, their samples are very close to that of Morck, Shleifer, and Vishny (1988), a far more cited paper. For the third, Bebchuk, Cohen, and Ferrell (2009), insider ownership (as well as its square) acts merely as a control variable in one table and so is a peripheral issue for them.

used by them and then with our data. Unfortunately, a perfect replication is not possible. First, Morck, Shleifer, and Vishny (1988) and McConnell and Servaes (1990) use the replacement costs of assets as a control variable (and as a denominator in calculations of Tobin's Q). The algorithms used by these studies cannot be implemented as the data required for implementation (Cummins, Hall, and Laderman, 1982) is no longer available or is substantially different.¹² We therefore use book value of net assets in place of replacement cost as a control variable and Tobin's Q as defined in Table 2 as the dependent variable.¹³ The results are summarized in Table 3 and Figure 2.¹⁴

[Table 3 here]

[Figure 2 here]

3.1. Morck, Shleifer, and Vishny (1988)

Morck, Shleifer, and Vishny (1988) find that firm values increase as ownership increases until 5%, decrease for ownership levels between 5% and 25%, and increase thereafter. To facilitate comparison, we have reported their results in column 1 of Table 3. We replicate their study using firms listed in the Fortune 500 index at the end of 2003. As can be seen in column 2 of Table 3, we are unable to replicate their results. We find an insignificant relationship for ownership levels below 25% and a significant negative relationship above that point.

McConnell and Servaes (1990) also attempt to replicate the Morck, Shleifer, and Vishny (1988) results and are unable to do so, finding instead a significant positive relationship for both segments of

¹² The procedure of Lindenberg and Ross (1981) requires the availability of a starting replacement cost that is no longer reported after 1986 due to the lapsing of FAS 33. In the absence of this amount, the procedure requires a long time series of book values, something that Fama and French (2004) imply has changed substantially over the years.

¹³ The use of replacement cost of assets calculated using the Lewellen and Badrinath (1997) algorithm as augmented by Lee and Tompkins (1999) leads to qualitatively similar but noisier results. Using the original data of Morck, Shleifer, and Vishny (1988), we confirm that our alternative proxies for Tobin's Q and firm size yield qualitatively similar results. These results are further described in Appendix A.

¹⁴ In most cases, the papers do not disclose how they have dealt with outliers. In the replications, we consistently winsorize all control variables that do not naturally have an upper bound (e.g., various ratios of the total assets) at the 99th percentile. Further, to replicate the prior studies as closely as possible, winsorization for various replication subsamples are done for that particular subsample (rather than the full sample).

insider ownership below 25% and an insignificant relationship above that point. Our results do agree with these replications by McConnell and Servaes (1990) insofar as we too find an inverted V-shaped relationship.

However, the shape of the relationship changes entirely when we repeat the piecewise tests using our full sample of firms. As reported in column 3 of Table 3, the relationship is significantly negative for ownership levels below 25% and insignificant for levels above 25%. The difference is summarized in Panel A of Figure 2. Overall, we find the same pattern as in Table 1. Samples of large firms tend to reveal an inverted-V shape while those that include a significant number of small firms tend to result in a V-shaped relationship.

3.2. McConnell and Servaes (1990)

We replicate their sample by first collecting the names of the entire list of firms in the Value Line Investment Survey of 2003, applying the sample selection criteria of McConnell and Servaes (1990), and then matching them with our sample data.¹⁵ We use the resulting sample to replicate the main results reported by McConnell and Servaes (1990) in Table 2 of their paper (provided in column 4 of Table 3). As reported in column 5 of Table 3, the relationship loosely resembles the inverted V-shape described by McConnell and Servaes (1990), but the initial positive term is small in magnitude and statistically insignificant. When we repeat this exercise with our full sample of firms, we find that both terms are small and insignificant (see column 6 of Table 3). The two results are shown in Panel B of Figure 2. Overall, our conjecture that samples of larger firms result in more concave shapes holds, but we are unable to see a V-shape for the full sample or a clear inverted V-shape for the Value Line sample.

A further investigation reveals that the main reason for the low magnitudes of the coefficient estimates (and the levels of significance) is the specification of firm size in terms of dollar value. Similar to more recent papers (see, e.g., Duru, Wang, and Zhao, 2013; Masulis and Mobbs, 2014; Francis, Hasan,

¹⁵ We collect the sample of the firms from Value Line (2003) and rely on firm names and tickers provided by Value Line to manually identify matching information on CRSP and Compustat.

and Wu, 2015), we use the natural logarithm, rather than the dollar value, of assets and repeat our analysis. The results are reported in columns 7 and 8 of Table 3 and depicted in Panel C of Figure 2. The relationships are clearer with this alternative specification of firm size – the Value Line sample results in an inverted-V shape, and the full sample results in a V-shaped OFV relationship.

3.3. Agrawal and Knoeber (1996)

Our counterpart to the quadratic specification results (provided in column 9 of Table 3) from Table 2 of Agrawal and Knoeber (1996) is reported in column 10 of Table 3.¹⁶ Similar to their findings, we report an inverted V-shape with one of the two coefficient estimates being significant. When we replicate their test using our full sample of firms, the resultant estimates are significant and indicate a V-shaped relationship (column 11 of Table 3). The implied OFV relationship is shown in Panel D of Figure 2. It clearly shows the transition from an inverted V-shaped relationship for larger firms to a V-shaped one for the full sample.

3.4. Himmelberg, Hubbard, and Palia (1999)

Himmelberg, Hubbard, and Palia (1999) run their tests on a panel data set constructed using a random sample of 600 firms from Compustat. Relevant information on ownership, however, is only available for 398 of these firms. As mentioned by the authors, ownership data was primarily unavailable for the small firms.¹⁷ We replicate the results of Himmelberg, Hubbard, and Palia (1999) as follows. We eliminate the smallest third of our sample (to roughly correspond to the sample lost because of unavailable ownership data) and then draw 1,000 random samples of 398 firms each. These firms are then merged with our dataset, resulting in several firm-year observations per firm. Finally, we run the quadratic specification

¹⁶ Since we were not able to obtain the list of Forbes 800 firms for the end of 2003, we have used those on the Forbes 500 list as of the same date.

¹⁷ Himmelberg, Hubbard, and Palia (1999) note that “because smaller firms (in terms of the number of shareholders) are not required to file proxies with the Securities and Exchange Commission, we are unable to obtain proxy information for all firms.” (p. 360)

as reported in Table 5 of Himmelberg, Hubbard, and Palia (1999). We find that in about 63% of cases, both coefficient estimates (linear and quadratic) are insignificant, consistent with the insignificant OFV relationship reported by Himmelberg, Hubbard, and Palia (1999).

We then use our full sample of firms and the Himmelberg, Hubbard, and Palia (1999) regression specifications to examine if their findings (presented in column 12 of our Table 3) hold true with a more comprehensive sample. The results, reported in column 13 of Table 3, indicate the V-shaped OFV relationship that we conjecture for a broad sample of firms.¹⁸ The corresponding graph is reported in Panel E of Figure 2.¹⁹

3.5. Summary of the prior literature replications

The common theme that emerges from each of these analyses is that the accepted foundational results of this literature are largely the product of the limited data that was then available to researchers.²⁰ The consensus around the inverted V-shaped relationship appears to be entirely dependent on the choice of either large or index-listed firms. This finding is not replicable in samples that have significant representation of smaller firms, and there appears to be a reasonably robust V-shaped relationship for our full sample of firms. The most stable result appears to be the one indicated by the grouping of papers in Table 1 – samples of large, index-listed firms tend to yield an inverted V-shaped OFV relationship while broader samples or samples of smaller firms tend to yield a V-shaped one. We explore these findings more systematically in the following section.

4. Empirical tests and results

¹⁸ In unreported results, we also remove the bottom third (based on firm size) of the full sample to mimic the loss of small firms in the Himmelberg, Hubbard, and Palia (1999) sample and repeat the exercise of Column 13 of Table 3. We obtain qualitatively similar findings to those using the full sample.

¹⁹ Himmelberg, Hubbard, and Palia (1999) also use the piecewise approach of Morck, Shleifer, and Vishny (1988) as an alternative specification. In unreported results, we repeat the exercise of Column 9 of Table 3 and Panel E of Figure 2 with their piecewise specification. Our results are similar as we continue to observe the V-shaped OFV relationship.

²⁰ Additional tests using the original data of Morck, Shleifer, and Vishny (1988) and Agrawal and Knoeber (1996) are reported in Appendix A and further confirm that the observed shape of the OFV relationship depends on the choice of sample.

4.1. Non-parametric results

4.1.1. Full sample results

Before we discuss our results, it is worth pointing out that our interpretations of the figures below are, to some extent, subjective. A source of confusion in the prior literature has been the use of a bewildering variety of specifications, including, but not limited to, the commonly used linear, piecewise linear, and quadratic functional forms that have been estimated using various methodological approaches that include ordinary least squares as well as methods that attempt to correct for endogeneity. Instead, we use a locally estimated scatterplot smoothing (LOESS) that is less dependent on any particular functional form. It will allow the reader to make her own informed judgement.²¹

We begin with the OFV relationship for the full sample of firms in Figure 3. The overall pattern appears similar to the one described by Morck, Shleifer, and Vishny (1988). However, the turning points are markedly different. Morck, Shleifer and Vishny (1988) find that the initial increasing relationship holds for ownership levels between 0% and 5%. In contrast, Figure 3 shows an increasing relationship that persists until insider ownership reaches about 20%. Likewise, the subsequent declining relationship persists until insider ownership reaches about 85%. In contrast, Morck, Shleifer, and Vishny (1988) report an increasing relationship once insider ownership crosses 25%. Nor does the first turning point match the turning points in McConnell and Servaes (1990), who suggest that the relationship is increasing until ownership reaches between 40% and 50%. In sum, although we do find an overall inverted V-shaped relationship for the full sample, the turning points appear so different that it seems odd to describe the evidence as being in agreement.

[Figure 3 here]

4.1.2. Firm characteristics

²¹ Using a kernel density estimator gives us qualitatively similar results. Further, small changes in the parameters of LOESS and kernel density do not affect our conclusions.

Even the inverted V-shape breaks down in subsamples. We begin with subsamples based on standard firm characteristics of size and age. Figure 4 shows the results for separate subsamples of the largest, smallest, and middle tercile firms based on firm size (as measured by the book value of assets). Interestingly, none of the OFV relationships for the three subsamples resemble the overall one in Figure 3. For both large and small firms, it is largely a decreasing relationship, while for firms of intermediate size, it is largely an increasing one. The key to the way in which these three groups converge to generate the overall picture appears to lie in the constitution of the overall sample. Large firms are typically associated with low levels of both ownership and Tobin's Q and the first part of the overall graph in Figure 3 is dominated by these firms.²² As we move along the ownership axis in Figure 3, our sample is increasingly comprised of mid-sized firms that, for the most part, exhibit a higher Tobin's Q than do the large ones. Combined, these two observations lead to the upward slope at intermediate levels of ownership (until approximately 20%) for Figure 3. At high levels of ownership, the sample composition changes to the smallest firms and, in this range of ownership, these firms exhibit a declining trend in Tobin's Q with absolute levels falling below those of mid-sized firms. Similar arguments can be made for all the other subsample results reported in this paper.

[Figure 4 here]

The broad conclusion from Figure 4 – that the results for the full sample are very different from any of the constituents and are better understood as a patchwork of the subparts of each subsample – applies to Figure 5 as well, where we group the firms by the time since IPO. As before, the initial upward slope for the full sample in Figure 3 corresponds to a shift in the sample from older firms with lower levels of Tobin's Q to younger firms with higher levels of Tobin's Q. At higher levels of insider ownership, the graph is fairly flat for the (at that point) more numerous younger firms and downward sloping for the older ones.

²² As noted in Table 4, 60% of the largest third of firms have a level of insider ownership lower than 5% while the corresponding number for the smallest third of firms is 7.5%. Likewise, 34.1% of these smaller firms have a level of insider ownership greater than 30% while only 12% of the largest firms do so.

Together, they result in the relatively less steep downward slope observed in Figure 3 for higher levels of insider ownership. The net result is a picture painted in Figure 3 that is not representative of any of the subgroups in Figures 4 and 5. Rather, the consistent pattern that emerges is that of an overall relationship that is reconstituted from individual subsamples dominating at different segments of the graph.

[Figure 5 here]

4.1.3. Index listing

We now partition the full sample based on the index-listing status of the firms (either large cap indexes, such as S&P500 or Fortune 500, or those covered by the ExecuComp database). As reported in Table 1, these firms have been the focus of most studies on the OFV relationship. In Figure 6, we separate our sample of firms into off-index firms and those listed in any of the three main S&P indexes [S&P 500 (large cap), S&P 400 (mid cap), and S&P 600 (small cap)] at the end of each fiscal year. The combination of these three indexes is roughly equivalent to the widely used ExecuComp database.²³ The results are broadly in line with the similarities observed in Table 1. For index-listed firms with insider ownership levels of approximately 2% and higher, we observe the familiar inverted-V pattern, with firm value reaching a maximum at a level of insider ownership between 20% and 30%.

[Figure 6 here]

For off-index firms, however, the inverted V-shape is not as clear. Firm value increases with ownership at insider ownership levels below 20%. Thereafter, firm value declines with increasing insider ownership between about 20% and 70% and then increases at even higher levels of ownership. As reported in Panel C of Table 4, only 5.5% of the index-listed subsample has insider ownership levels higher than 40%, while the same is true for about 22.5% of the firms in the off-index subsample. As described in Table

²³ The main difference between our subsample and that of ExecuComp is due to backfilling present in the latter. Gillan, Hartzell, Koch, and Starks (2018) have documented that backfilling has a significant influence on the observed OFV relationship for the ExecuComp sample.

1, this could result in studies using index-listed firms concluding that the OFV relationship is a strongly increasing one at lower ownership levels with a less prominent decreasing relationship at higher levels, while studies using other samples may draw dissimilar conclusions. Our results are therefore consistent with the perspective of Table 1 that the choice of index-listed, off-index, or a random sample of firms is a potential explanation for the disagreement in the literature on the shape of the OFV relationship.²⁴

[Table 4 here]

4.1.4. Institutional ownership

An interesting feature of the ownership structure of firms in the past several decades has been the increasing prominence of institutional investors. As shown by Chung and Zhang (2011) and Aghion, Van Reenen, and Zingales (2013), among others, institutional ownership is connected to the governance of the firm and, therefore, we could reasonably expect the OFV relationship to depend on the level of institutional ownership. We examine this further using data on the ownership of institutional investors as described in the Thomson Reuters 13F database, and we split our sample into (annual) terciles based on the reported level of total institutional ownership. As described in Table 4, there is a clear link between the level of institutional ownership and insider ownership. Over 54% of firms with a high level of institutional investor ownership have insider ownership below 5%, while less than 13.3% of firms with low institutional ownership do so.

The patterns in the OFV relationship for firms with different levels of institutional ownership are shown in Figure 7. The OFV relationship for firms with high levels of institutional ownership is roughly an inverted V-shaped one, with firm value increasing until ownership reaches about 25% and declining

²⁴ In unreported results, we find that the initial downward sloping part of the index-listed subsample in Figure 6 appears to be driven by firms in the S&P 500 index. For this index, more than three-quarters of the sample firms have insider ownership less than 5% and ownership brackets above 30% represent only 5.5% of the overall sample (see Table OA1 in the online appendix). In light of this observation, it is not clear how much credence should be given to the high ownership end of the OFV relationships estimated for S&P 500 samples. While the sample distributions are less skewed for midcap and small cap indexes, more than half (a third) of firms in the S&P 400 (S&P 600) index fall into the 0-5% ownership bracket.

thereafter. The pattern does not hold for firms with low levels of institutional ownership. For this last group of firms, firm value increases with insider ownership until ownership reaches approximately 15%. Thereafter, it falls until insider ownership reaches approximately 60%, and subsequently increases with insider ownership. These patterns are remarkably similar to the ones that emerge for different time periods (shown in Figure OA8 in the online appendix). Firms with low institutional ownership exhibit a pattern similar to firms in 2004, while the relationship for firms with high institutional ownership resembles that for firms in 2014. Overall, our findings suggest that the increase in institutional ownership and the decline in insider ownership over time reflect changes in the contracting environment, and, consequently, changes in the relationship between insider ownership and firm value.

[Figure 7 here]

In summary, our nonparametric results indicate that there is no unique relationship between insider ownership and firm value that applies consistently across most subsamples. Rather, the relationship observed by any specific study appears to be strongly influenced by the choice of the sample. At this point, we have two key observations. First, partitions of the full sample by firm characteristics, index listing, and institutional ownership are by no means mutually exclusive. For example, the OFV relationship that we observe for dual-class firms (reported in Figure OA10 in the online appendix) appears quite similar to that of firms having low institutional ownership (Figure 7), in line with the finding of Li, Ortiz-Molina, and Zhao (2008) that institutions are much less likely to be present in firms having dual-class structures. Similarly, as mentioned earlier, the prevalence of institutional and individual investors has changed over time and thus, the calendar time period and the presence of institutional versus individual investors, to some extent, proxy for each other. Further research is required to determine the underlying mechanism driving these similarities and differences. Second, up to now, we have not touched upon the role of control variables. Moreover, even our basic result in Figure 3 differs from the relationships found by Morck, Shleifer, and Vishny (1988) and McConnell and Servaes (1990). The use of control variables could potentially change this conclusion, and we thus address this important issue in our next section.

4.2. Semi-parametric results

In order to maintain our agnostic approach with respect to estimation method, we use Robinson's semi-parametric regression estimator. The nonparametric estimator used is an Epanechnikov kernel-weighted local polynomial fit. In choosing control variables, we considered those most frequently used in the OFV literature and found that the most influential is firm size (as documented in Section OA3).²⁵ Consequently, we report our results controlling for a quadratic effect of firm size as captured by the natural log of net assets and its square.²⁶ The results obtained controlling for all of the most commonly used firm characteristics are reported in the online appendix to this paper (see Section OA2 thereof for further details).

4.2.1. Full sample results

Figure 8 presents the semi-parametric results for the full sample. A comparison with Figure 3 indicates, essentially, a complete reversal of the earlier conclusions. Firm value now decreases with ownership until insider ownership reaches approximately 65% and increases thereafter. Despite these significant changes, the graph does not match the conclusions of either Morck, Shleifer, and Vishny (1988) or McConnell and Servaes (1990).

[Figure 8 here]

4.2.2. Subsample results

Figures 9 to 12 depict multivariate relationships for the same subsamples as those depicted in Figures 4 to 7. For the sake of brevity, we do not provide a detailed description of each figure. Instead, we summarize our main conclusions. First, the general conclusions from the non-parametric results for the most part continue to hold. The full sample graph in Figure 8 is best described as a combination of pieces

²⁵ For the list of variables, please refer to Section OA2 of the online appendix.

²⁶ We thank the Editor for suggesting this simplified approach. In unreported results, we have re-estimated all the multivariate results using sales as a measure of firm size (see, e.g., Kim and Lu, 2011). Our conclusions remain unchanged using this alternative measure.

from each of the subsamples with specific subsamples having a disproportionate influence when a particular insider ownership level is over-represented for that subsample. However, in contrast to the non-parametric results, the full sample results somewhat resemble those for off-index firms (Figure 11) and firms with low institutional ownership (Figure 12). A possible interpretation is that when considering the full spectrum of public firms, these two particular groups are relatively numerous and the contractual environment they face is more representative of that of the average firm than that of large, index-listed firms or those with high institutional ownership. Second, some aspects of the non-parametric analysis are now clearer as controlling for firm size and its square reduces noise, providing an improved view of the relationship between insider ownership and firm value. For example, Figures 11 and 12 now capture the dispersion in the literature due to index listing far more clearly. As shown in Figure 11 (and as implied by Table 1), an approximate inverted V-shaped relationship can be seen for index-listed firms while a clear V-shaped one is visible for off-index firms.

[Figures 9, 10, 11, and 12 here]

4.2.3. Our findings and the literature

An overall summary of our non-parametric and semi-parametric OFV findings is provided in Table 5. While the individual patterns for our non-parametric tests are less clear, our semi-parametric results tend to find clear V-shaped patterns for the overall sample as well as for most subsamples. The exceptions are subsamples composed of the largest or oldest firms or those that are index-listed or with significant institutional ownership. To the extent that these characteristics are correlated, our results suggest that the observed OFV relationship differs for two broad groups of firms that constitute the universe of public firms. Smaller and younger firms that are not listed in any major stock index and have relatively low levels of institutional ownership are associated with a V-shaped OFV relationship. In contrast, older and larger firms that are constituents of major stock indexes and have significant institutional ownership do not exhibit a V-shaped OFV relationship and may instead be associated with an inverted V-shaped one.

[Table 5 here]

The second-last column of Table 1 links the sample used in each study with the closest of our subsamples. As previously illustrated in Table 3, the observed inverse V-shaped OFV relationship in the most prominent studies can be attributed to the use of a sample of large, index-listed firms. Since many of the previous studies have used similar samples of (index-listed) firms, perhaps it is not surprising that there is a clustering in the literature with regard to the observed relationship (namely, inverse V-shape). Conversely, studies using samples of off-index firms can more often find a V-shaped or flat relationship. Undoubtedly, the link between the subsamples in our study and the samples used in each of the examined studies, while generally consistent, is an imperfect one, given the differing time periods and control variables (discussed earlier). However, the linking does ultimately suggest that the relationship observed by any study is a function of the characteristics of the underlying sample and thus expecting only one particular OFV shape for the widely heterogeneous universe of firms is doing the literature a disservice.

5. Conclusion

In this paper, we explore the role of sample selection in the observed relationship between insider ownership and firm value. We remain agnostic regarding what the relationship should look like by employing both non-parametric and semi-parametric approaches to analyze a complete cross-section (as well as pertinent subsamples) of all firms in the joint CRSP and Compustat universe. In both sets of tests, we partition the sample by size, age, index listing status, and institutional ownership. Overall, we find that there is no unique relationship existing between insider ownership and firm value that can be observed consistently across all of our subsamples. The relationship observed by any particular study instead appears to be significantly influenced by the sample of firms chosen. Additionally, we replicate four of the most influential papers in this literature and find that their conclusions are dependent on the choice of sample. The findings of our study highlight the need for caution when attempting to extrapolate the results of a

single study employing only a subset of the universe of firms – the results are not necessarily generalizable to a different subset of firms nor to a much wider population.

Our reconciliation herein of *what* has been observed in the literature naturally precipitates the need for research examining the mechanisms behind *why* we observe what we do. Coles, Lemmon, and Meschke (2012) make a valuable attempt by offering an explanation of the ownership-performance relationship in which any shape can be conceivable in equilibrium. Another recent and noteworthy study in this regard is Fabisik, Fahlenbrach, Stulz, and Taillard (2020), who find that differences in liquidity play a significant role in shaping the relationship between ownership and firm value. We look forward to further research that explores the theoretical background underlying the differing observed shapes of the ownership-firm value relationship.

References

- Adams, R. B., H. Almeida, and D. Ferreira. 2005. Powerful CEOs and their impact on corporate performance. *Review of Financial Studies*, 18(4), 1403–1432.
- Aghion, P., J. Van Reenen, and L. Zingales. 2013. Innovation and institutional ownership. *American Economic Review*, 103(1), 277–304.
- Agrawal, A. and C. R. Knoeber. 1996. Firm performance and mechanisms to control agency problems between managers and shareholders. *Journal of Financial and Quantitative Analysis*, 31(3), 377–397.
- Ahn, S. and K. Shrestha. 2013. The differential effects of classified boards on firm value. *Journal of Banking & Finance*, 37(11), 3993–4013.
- Anderson, R. C., A. Duru, and D. M. Reeb. 2009. Founders, heirs, and corporate opacity in the United States. *Journal of Financial Economics*, 92(2), 205–222.
- Anderson, R. C., A. Duru, and D. M. Reeb. 2012. Investment policy in family controlled firms. *Journal of Banking & Finance*, 36(6), 1744–1758.
- Anderson, R. C., and D. S. Lee. 1997. Ownership studies: The data source does matter. *Journal of Financial and Quantitative Analysis*, 32(3), 311–329.
- Anderson, R. and D. M. Reeb. 2003. Founding-family ownership and firm performance: evidence from the S&P 500. *Journal of Finance*, 58(3), 1301–1328.
- Basu, N., I. Paeglis, and M. Toffanin. 2017. Reading between the blocks. *Journal of Corporate Finance*, 45, 294–317.
- Bebchuk, L. A. and A. Cohen. 2005. The costs of entrenched boards. *Journal of Financial Economics*, 78(2), 409–433.
- Bebchuk, L. A., A. Cohen, and A. Ferrell. 2009. What matters in corporate governance?. *Review of Financial Studies*, 22(2), 783–827.
- Bebchuk, L. A., K. M. Cremers, U. C. Peyer. 2011. The CEO pay slice. *Journal of Financial Economics*, 102(1), 199–221.
- Brookman, J. and P. D. Thistle, 2009. CEO tenure, the risk of termination and firm value. *Journal of Corporate Finance*, 15(3), 331–344.
- Callahan, W. T., J. A. Millar, and C. Schulman, 2003. An analysis of the effect of management participation in director selection on the long-term performance of the firm. *Journal of Corporate Finance*, 9(2), 169–181.
- Cheung, W. A. and K. J. Wei .2006. Insider ownership and corporate performance: Evidence from the adjustment cost approach. *Journal of Corporate Finance*, 12(5), 906–925.
- Cho, M. H. 1998. Ownership structure, investment, and the corporate value: an empirical analysis. *Journal of Financial Economics*, 47(1), 103–121.
- Chung, K. H. and H. Zhang. 2011. Corporate governance and institutional ownership. *Journal of Financial and Quantitative Analysis*, 46(1), 247–273.
- Coles, J.L., M. L. Lemmon, and J. F. Meschke. 2012. Structural models and endogeneity in corporate finance: The link between managerial ownership and corporate performance. *Journal of Financial Economics*, 103(1), 149–168.
- Cui, H. and Y. T. Mak. 2002. The relationship between managerial ownership and firm performance in high R&D firms. *Journal of Corporate Finance*, 8(4), 313–336.
- Cummins, C., R. Hall, and E. Laderman. 1982, *The R&D masters file: Documentation*, Unpublished manuscript (National Bureau of Economic Research, Cambridge, MA).
- Daines, R. 2001. Does Delaware law improve firm value?. *Journal of Financial Economics*, 62(3), 525–558.
- Davies, J. R., D. Hillier, and P. McColgan. 2005. Ownership structure, managerial behavior and corporate value. *Journal of Corporate Finance*, 11(4), 645–660.
- Demsetz, H. and K. Lehn. 1985. The structure of corporate ownership: causes and consequences. *Journal of Political Economy*, 93(6), 1155–1177.

- Demsetz, H. and B. Villalonga. 2001. Ownership structure and corporate performance. *Journal of Corporate Finance*, 7(3), 209–233.
- Devos, E., A. Prevost, and J. Puthenpurackal. 2009. Are interlocked directors effective monitors? *Financial Management*, 38(4), 861–887.
- Dlugosz, J., R. Fahlenbrach, P. Gompers, and A. Metrick. 2006. Large blocks of stock: prevalence, size, and measurement. *Journal of Corporate Finance*, 12(3), 594–618.
- Duru, A., D. Wang, and Y. Zhao. 2013. Staggered boards, corporate opacity and firm value. *Journal of Banking & Finance*, 37(2), 341–360.
- Fabisik, K., R. Fahlenbrach, R. M. Stulz, and J. Taillard. 2020. Why are firms with more managerial ownership worth less?. *Journal of Financial Economics*, Forthcoming.
- Fahlenbrach, R., and R. Stulz. 2009. Managerial ownership dynamics and firm value. *Journal of Financial Economics*, 92(3), 342–361.
- Faleye, O., V. Mehrotra, and R. Morck. 2006. When labor has a voice in corporate governance. *Journal of Financial and Quantitative Analysis*, 41(3), 489–510.
- Fama, E. F., and K. R. French. 2004. New lists: Fundamentals and survival rates. *Journal of Financial Economics*, 73(2), 229–269.
- Fauver, L., and A. Naranjo. 2010. Derivative usage and firm value: The influence of agency costs and monitoring problems. *Journal of Corporate Finance*, 16(5), 719–735.
- Francis, B., I. Hasan, and Q. Wu. 2015. Professors in the boardroom and their impact on corporate governance and firm performance. *Financial Management*, 44(3), 547–581.
- Gillan, S. L., J. C. Hartzell, A. Koch, and L. T. Starks. 2018. Getting the incentives right: Backfilling and biases in executive compensation data. *Review of Financial Studies*, 31(4), 1460–1498.
- Gompers, P., J. Ishii, and A. Metrick. 2010. Extreme governance: an analysis of dual-class firms in the United States. *Review of Financial Studies*, 23(3), 1051–1088.
- Gugler, K., D. C. Mueller, and B. B. Yurtoglu. 2008. Insider ownership, ownership concentration and investment performance: An international comparison. *Journal of Corporate Finance*, 14(5), 688–705.
- Habib, M. A. and A. Ljungqvist. 2005. Firm value and managerial incentives: a stochastic frontier approach. *Journal of Business*, 78(6), 2053–2094.
- Hermalin, B. E., and M. S. Weisbach. 1991. The effects of board composition and direct incentives on firm performance. *Financial Management*, 20(4), 101–112.
- Himmelberg, C. P., R. G. Hubbard, and D. Palia. 1999. Understanding the determinants of managerial ownership and the link between ownership and performance. *Journal of Financial Economics*, 53(3), 353–384.
- Holderness, C. G., R. S. Kroszner, and D. P. Sheehan. 1999. Were the good old days that good? Changes in managerial stock ownership since the great depression. *Journal of Finance*, 54(2), 435–469.
- Jiao, Y. 2010. Stakeholder welfare and firm value. *Journal of Banking & Finance*, 34(10), 2549–2561.
- Kim, E. H., and Y. Lu. 2011. CEO ownership, external governance, and risk-taking. *Journal of Financial Economics*, 102(2), 272–292.
- Kole, S. R. 1995. Measuring managerial equity ownership: a comparison of sources of ownership data. *Journal of Corporate Finance*, 1(3), 413–435.
- Konijn, S., R. Kraussl, and A. Lucas. 2011. Blockholder dispersion and firm value. *Journal of Corporate Finance*, 17(5), 1330–1339.
- Lee, D. E., and J. G. Tompkins. 1999. A modified version of the Lewellen and Badrinath measure of Tobin's q. *Financial Management*, 28(1), 20–31.
- Lewellen, W. G., and S. G. Badrinath. 1997. On the measurement of Tobin's q. *Journal of Financial Economics*, 44(1), 77–122.
- Li, K., H. Ortiz- Molina, and X. Zhao. 2008. Do voting rights affect institutional investment decisions? Evidence from dual- class firms. *Financial Management*, 37(4) 713–745.
- Lindenberg, E. B., and S. A. Ross. 1981. Tobin's q Ratio and Industrial Organization. *Journal of Business*, 54(1), 1–32.

- Loderer, C., and K. Martin. 1990. Corporate acquisitions by listed firms: The experience of a comprehensive sample. *Financial Management*, 19(4), 17–33.
- Loderer, C., and K. Martin. 1997. Executive stock ownership and performance tracking faint traces. *Journal of Financial Economics*, 45(2), 223–255.
- Martin, K., and J. McConnell. 1991. Corporate performance, corporate takeovers, and management turnover. *Journal of Finance*, 46(2), 671–687.
- Masulis, R. W., and S. Mobbs. 2011. Are all inside directors the same? Evidence from the external directorship market. *Journal of Finance*, 66(3), 823–872.
- Masulis, R. W., and S. Mobbs. 2014. Independent director incentives: Where do talented directors spend their limited time and energy?. *Journal of Financial Economics*, 111(2), 406–429.
- McConnell, J. J., and H. Servaes. 1990. Additional evidence on equity ownership and corporate value. *Journal of Financial Economics*, 27(2), 595–612.
- McConnell, J. J., and H. Servaes. 1995. Equity ownership and the two faces of debt. *Journal of Financial Economics*, 39(1), 131–157.
- Mehran, H. 1995. Executive compensation structure, ownership, and firm performance. *Journal of Financial Economics*, 38(2), 163–184.
- Miller, D., I. Le Breton-Miller, R. H. Lester, and A. A. Cannella. 2007. Are family firms really superior performers?. *Journal of Corporate Finance*, 13(5), 829–858.
- Morck, R., A. Shleifer, and R. Vishny. 1988. Management ownership and market valuation: an empirical analysis. *Journal of Financial Economics*, 20, 293–315.
- Paeglis, I. and P. Veeren. 2013. Speed and consequences of venture capitalist post-IPO exit. *Journal of Corporate Finance*, 22, 104–123.
- Palia, D. 2001. The endogeneity of managerial compensation in firm valuation: A solution. *Review of Financial Studies*, 14(3), 735–764.
- Rose, M. J. 2009. Heterogeneous impacts of staggered boards by ownership concentration. *Journal of Corporate Finance*, 15(1), 113–128.
- Tong, Z. 2008. Deviations from optimal CEO ownership and firm value. *Journal of Banking & Finance*, 32(11), 2462–2470.
- Vafeas, N. 1999. Board meeting frequency and firm performance. *Journal of Financial Economics*, 53(1), 113–142.
- Value Line, 2003. Value Line Investment Survey, Volume LVIII, Number 18, Issue 5
- Villalonga, B., and R. Amit. 2006. How do family ownership, control and management affect firm value? *Journal of Financial Economics*, 80(2), 385–417.
- Villalonga, B., and R. Amit. 2009. How are US family firms controlled?. *Review of Financial Studies*, 22(8), 3047–3091.

Appendix A – Replications using the original data of Morck, Shleifer, and Vishny (1988) and Agrawal and Knoeber (1996)

A.1 Morck, Shleifer, and Vishny (1988)

To replicate the results of Morck, Shleifer, and Vishny (1988, hereafter referred to as MSV), we first match their original sample of firms to Compustat data in 1980.²⁷ Of the 371 firms they used, we are able to identify and match 331. Due to a combination of mergers, restructuring, and other major corporate changes, the remaining 40 firms cannot be identified.

We first replicate the main result in Column 2, Table 5 of their paper using these 331 firms. The results are shown in Table A1. In Columns (1) and (2), we use their same specifications with the only difference being the loss of 40 firms from their sample. The results are largely consistent. For example, in Column (1), officer ownership between 0% and 5%, which was marginally significant at the 10% level in their results, moves to marginal insignificance with the coefficient estimate changing from 3.98 to 3.58. Similarly, the coefficient estimate for officer ownership between 5% and 25% changes from -1.56 to -1.47 and the corresponding statistical significance is also reduced. The coefficient estimate for officer ownership over 25% remains insignificant and positive. The results are consistent with a reduction in sample size of just over 10% – qualitatively similar and marginally less significant.

As discussed in the main text above, we are unable to replicate MSV's measure of replacement cost of assets and the derived measure of Tobin's Q due to the unavailability of underlying data. We thus use book value of net assets in place of replacement cost as a control variable and Tobin's Q as defined in Table 2 as the dependent variable. The results of unreported tests for the impact of these main differences in our variables indicate that differences in the measurement of assets or Tobin's Q are not the major drivers of any potential differences between our findings and their own.²⁸

²⁷ We thank Randall Morck for providing us with the original data sample from MSV.

²⁸ We test for the impact of these differences in our variables by rerunning the same regressions as in columns 1 and 2 of Table A1, replacing their measures of Tobin's Q and assets (both individually and combined) with ours. The results, available upon request, show that although the magnitude of the coefficient estimate for officer ownership less than 5% is somewhat reduced, the significance remains comparable, and the remaining estimates are largely unchanged. Controlling (or not) for the ownership of board members that are not officers leaves this conclusion unchanged.

An additional source of potential differences arises as MSV control for the (piecewise) ownership of board members who are not officers while we do not. We redo the results of Column (1) after dropping these control variables. Similar to their original findings, we find that the corresponding results, presented in Column (2), are qualitatively similar. Overall, it appears that the differences between their proxies and control variables and ours do not appreciably alter the conclusions.

In additional analyses, we merge the firms in the MSV sample with our dataset. Of the 331 firms, 140 survived until 2003 and are part of our sample. We then redo the estimations using this subsample and the same specifications as reported in column 2 of Table 3 (of our paper). The results are reported in Column 3 of Table A1. We find that the coefficient estimates for officer ownership are much smaller in magnitude and are no longer significant. Comparable results for the sample of 191 firms that did not survive are reported in Column (4). In contrast to the result reported in Column (3), the magnitude of the coefficient estimates for officer ownership are larger than those in Columns (1) and (2), while the corresponding t-statistics, though insignificant, are also closer to the ones reported in Columns (1) and (2). Assuming that some part of the lack of statistical significance arises from the smaller sample size, it appears that the main results of MSV are primarily driven by the firms that would not survive the next 23 years.

[Table A1 here]

A.2 Agrawal and Knoeber (1996)

As in the case of MSV, we also replicate the results reported by Agrawal and Knoeber (1996) in Column 8 of Table 2 of their paper, using the 163 firms (of the original 383) in their sample that survived until 2003 and the ownership and firm characteristics from our sample.²⁹ The results are reported in Column (1) of Table A2. We find that the surviving firms exhibit a statistically significant V-shaped OFV relationship. We further explore this by splitting the original Agrawal and Knoeber (1996) sample into those that survived until 2003 and those that did not. The results are reported in Columns (2) and (3) of

²⁹ We thank Anup Agrawal for providing us with the original data sample from Agrawal and Knoeber (1996).

Table A2, respectively. We find that even in the original sample, the firms that survived until 2003 exhibit a V-shaped OFV relationship, while the non-survivors exhibit an inverse-V shaped one.

[Table A2 here]

Conclusion

Taken altogether, these replication results reinforce our study's overall conclusion that there are significant differences in the OFV relationships across different groups of firms. The historical perspective provided by the original data of Morck, Shleifer, and Vishny (1988) and Agrawal and Knoeber (1996) indicate the intriguing possibility that these differences in the OFV relationship are also linked to firm survival. We conjecture that the results in Tables A1 and A2 indicate that wide variations in observed OFV relationships possibly stem from fundamental dissimilarities in the underlying contracting environments, leading additionally to variations in firm values and survival rates. Our findings emphasize the need for further development of theory that may help us move from such conjecture to a more reliable understanding of the mechanisms through which insider ownership affects firm value in various contracting environments.

Table A1: Replication of results for Morck, Shleifer, and Vishny (1988)

Columns (1) and (2) replicate their results using the smaller sample of 331 firms that we are able to identify. The data are from 1980. Columns (3) and (4) split the sample into survivors and non-survivors (by their status in 2003) but continue to use firm characteristics data from 1980. Column (5) uses ownership and firm characteristics from our sample (2003 – 2005 and 2008 – 2010) to rerun the results for the survivor sample. Robust t-statistics are in parentheses and ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively.

	(1) MSV	(2) MSV	(3) MSV Survivors	(4) MSV Non- Survivors	(5) Survivors, Our Sample
RD/A	9.591 (3.60)***	9.838 (3.56)***	9.540 (2.72)***	10.350 (1.80)*	8.492 (4.06)***
ADV/A	0.002 (0.00)	-0.053 (0.06)	-0.209 (0.24)	1.088 (0.50)	11.494 (7.08)***
D/A	-0.962 (2.06)**	-0.766 (1.71)*	0.120 (0.14)	-1.449 (1.85)*	-1.013 (4.15)***
A	-6.11e-06 (1.29)	-1.05e-05 (2.18)**	-6.64e-06 (0.72)	1.68e-06 (0.14)	-1.43e-06 (3.91)***
OFF.0to5	3.578 (1.36)	4.065 (1.50)	0.221 (0.04)	6.381 (1.20)	-1.893 (1.10)
OFF.5to25	-1.465 (1.80)*	-1.772 (2.14)**	-0.376 (0.19)	-2.127 (1.25)	1.061 (1.55)
OFF.OVER25	0.127 (0.30)	0.119 (0.26)	-0.238 (0.13)	0.492 (0.68)	-0.363 (1.27)
OUT.0to5	7.334 (2.60)***		14.228 (2.18)**	8.239 (1.84)*	
OUT.5to25	-2.368 (2.30)**		-2.624 (0.97)	-2.041 (1.32)	
OUT.OVER25	1.156 (0.80)		1.752 (0.63)	-0.141 (0.11)	
Constant	-0.090 (0.72)	0.215 (3.77)***	0.766 (2.72)***	-0.082 (0.48)	1.787 (19.51)***
SIC3 Dummies	YES	YES	YES	YES	YES
N	331	331	140	191	944
R ²	0.629	0.611	0.761	0.645	0.670

Table A2: Replication of results for Agrawal and Knoeber (1996)














Column (1) replicates their results using ownership and firm characteristics from our sample (2003 – 2005 and 2008 – 2010) for the 163 firms (of the original 383) in the Agrawal and Knoeber (1996) sample that survived until 2003. Columns (2) and (3) provide the results when using the original data sample and splitting the 383 firms into those that did and did not survive until 2003, respectively. Robust t-statistics are in parentheses and ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively.

	AK Survivors, Our Sample	AK Survivors	AK Non-Survivors
POD	-3.929 (3.85)***	-0.015 (1.40)	0.022 (2.51)**
POD ²	5.270 (2.52)**	0.000 (2.11)**	-0.000 (2.20)**
RDA	4.610 (8.27)***	3.001 (2.29)**	6.055 (4.25)***
ADVA	8.591 (11.33)***	4.608 (4.70)***	2.739 (2.04)**
LASSET	-0.072 (2.67)***	-0.152 (3.62)***	-0.299 (6.56)***
FIN		0.125 (0.23)	-0.287 (1.57)
Constant	1.981 (6.79)***	2.270 (6.36)***	3.225 (8.47)***
N	1,094	163	220
R ²	0.210	0.240	0.390

Table 1**Summary of the literature**

















The journals surveyed include The Review of Financial Studies, The Journal of Finance, Journal of Financial Economics, Journal of Financial and Quantitative Analysis, Journal of Banking and Finance, Journal of Corporate Finance, Financial Management, Journal of Business (publication ceased in 2006), The American Economic Review, The Quarterly Journal of Economics, and The Journal of Political Economy. Panel A summarizes the results for papers that regress Tobin's Q on some measure of insider ownership, either in a linear or piecewise specification. Panel B summarizes the results for papers that regress Tobin's Q on some measure of insider ownership and its square. The "Own." column reports the type of ownership being considered in the paper, where "I" is for insider ownership, "Bd" is for board ownership, "C" is for CEO ownership, and "Fam" is for family ownership. In both panels, we report the sign and significance of the results. The second-last column of each panel provides the link between the sample used in each study and the closest of our subsamples if such exists or marks it as not applicable if the study employs a unique sample that cannot be classified as one of our subsamples or if there is insufficient information regarding the data sample to link it with our own. Cites are the total citations in Google Scholar as of September 17, 2020.

Panel A: Linear and piecewise linear specifications with Tobin's Q as the dependent variable. Sign, significance, and range refer to the sign of each piecewise (or one if linear) coefficient, followed by * if the coefficient estimate is significant at 10% or better, and the range of the corresponding piece in the piecewise regressions.

No.	Authors	Journal & Year	Sample	Own.	Relation	Sign, significance, and range	Link Fig(s)	Cites
1	Morck, Shleifer, Vishny	JFE 1988	F500	Bd		+ * (0-5), - * (5-25), + * (>25)	OA6 - SP500	10,424
2	Hermalin, Weisbach	FM 1991	Forbes 500 subsample	C		+ * (0-1), - (1-5), + (5-20), - * (>20)	5, 10, OA5 - index	3,308
3	Kole	JCF 1995	From Morck et al. (1988)	I		+ * (0-5), - * (5-25), + (>25)	OA6 - SP500	296
4	Mehran	JFE 1995	Random mfg. firms	C		+ * (linear)	OA9	3,145
5	Cho	JFE 1998	F500	I		+ * (0-7), - * (7-38); + (>38)	OA6 - SP500	1,627
6	Holderness, Kroszner, Sheehan	JF 1999	Compact D	I		+ * (0-5), - (5-25), + (>25)	2, 7, OA1	976
7	Demsetz, Villalonga	JCF 2001	Random	I	N.A. (descriptive)	-, +, -	OA6 - SP500	3,176
8	Faleye, Mehrotra, Morck	JFQA 2006	SEC/Compustat	I		+ (0-5), - * (5-25), + (>25)	2, 7, OA1	382
9	Villalonga, Amit	JFE 2006	F500	Fam		+ * (linear)	OA6 - SP500	4,231
10	Fahlenbrach, Stulz	JFE 2009	Compact D	Chg. in I	N.A.	+ * (linear)	OA10 - single	254
11	Villalonga, Amit	RFS 2009	F500	Fam		+ (linear)	OA6 - SP500	523
12	Anderson, Duru, Reeb	JFE 2009	2,000 largest industrial firms	Founder		+ * (linear)	3, 8 - large	558
13	Konijn, Kräussl, Lucas	JCF 2011	IRRC	I blocks		+ * (linear)	5, 10, OA5 - index	173
14	Anderson, Duru, Reeb	JBF 2012	2,000 largest industrials	Fam		+ * (linear)	3, 8 - large	271
15	Duru, Wang, Zhao	JBF 2013	RiskMetrics/ExecuComp	I		- * (0-5), + (5-25), + (>25)	5, 10, OA5 - index	38

Panel B: Quadratic specifications with Tobin's Q as the dependent variable

Sign and significance refer to the sign of the linear and quadratic coefficients in that order, followed by * if the coefficient estimate is significant at 10% or better. A "+ *; - *" is indicative of a concave ownership-firm value relationship, while a "- *; + *" is indicative of a convex one. A turning point is indicated if one exists between 0 and 1 (increasing or decreasing otherwise).

No.	Authors	Journal & Year	Sample	Own.	Relation	Sign, significance, turning point	Link Fig(s)	Cites
16	McConnell, Servaes	JFE 1990	Value Line	I		+ *, - *, 42%	5, 10, OA5 - index	6,106
17	McConnell, Servaes	JFE 1995	Value Line	I		+ *, - *, 33%	5, 10, OA5 - index	1,348
18	Agrawal, Knoeber	JFQA 1996	Forbes 800 subsample	I		+ *, -, Increasing	OA6 - SP500	4,365
19	Loderer, Martin	JFE 1997	Loderer & Martin (1990) + Martin & McConnell (1991) tender offers + domestic acquisitions 1985-1988	I		- *; +, Decreasing	N.A.	742
20	Anderson, Lee	JFQA 1997	QFile, Corp. Txt, Value Line, & Compact D	I		+ *, - *, 40%	5, 10, OA5 - index	136
21	Himmelberg, Hubbard, Palia	JFE 1999	Random Compustat	I		- , - , Decreasing	3, 8 - combo of small, medium, and large	3,568
22	Vafeas	JFE 1999	Largest 350 firms listed in Forbes	I		+ *, - *, Increasing	OA6 - SP500	2,267
23	Daines	JFE 2001	F500	I		- , + , 20%	OA6 - SP500	827
24	Palia	RFS 2001	Hall & Liebman (1998)	C		+ *, - *, 44%	OA6 - SP500	576
25	Cui, Mak	JCF 2002	High R&D Compustat firms	I		- *; + *, Decreasing	OA9 - combo of pharma (13), computers (35), electronic equip. (36), medical equip. (12)	333
26	Callahan, Millar, Schulman	JCF 2003	F1000 subsample	I		+ *, - *, 38%	OA6 - SP500	115
27	Anderson, Reeb	JF 2003	SP500	Fam		+ *, - *, 31%	OA6 - SP500	6,042
28	Habib, Ljungqvist	JB 2005	ExecuComp	C		+ *, - *, Increasing	5, 10, OA5 - index	312
29	Bebchuk, Cohen	JFE 2005	IRRC	I		+ *, - *, Increasing	5, 10, OA5 - index	1,407
30	Adams, Almeida, Ferreira	RFS 2005	F500/ExecuComp	C		+ *, - *, 17%	OA6 - SP500	1,575
31	Miller, Le Breton-Miller, Lester, Cannella	JCF 2007	F1000	Fam		+ *, - *, 29%	OA6 - SP500	1,310
32	Tong	JBF 2008	ExecuComp	C	N.A.	Implied + *, - *	5, 10, OA5 - index	63
















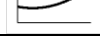

No.	Authors	Journal & Year	Sample	Own.	Relation	Sign, significance, turning point	Link Fig(s)	Cites
33	Devos, Prevost, Puthenpurackal	FM 2009	Corp. Library	I		+ , - , 38%	N.A.	99
34	Brookman, Thistle	JCF 2009	ExecuComp	I		+ , - , Increasing	5, 10, OA5 - index	152
35	Rose	JCF 2009	Dlugosz et al. (2006)/IRRC	Sum I blocks		+ * , - , Increasing	5, 10, OA5 - index	32
36	Bebchuk, Cohen, Ferrell	RFS 2009	IRRC/ExecuComp for levels	I		+ * , - * , Increasing	5, 10, OA5 - index	4,083
37	Jiao	JBF 2010	KLD social (SP500; Domini 400)/ExecuComp	I		- , + , 87%	OA6 - SP500	300
38	Fauver, Naranjo	JCF 2010	Compustat/Thomson Fin.	I		+ * , - * , 39%	3, 8 - large	130
39	Gompers, Ishii, Metrick	RFS 2010	SDC/IRRC dual-class firms	I		- * , + * , 93%	OA10 - dual	729
40	Masulis, Mobbs	JF 2011	IRRC	C		- * , + * , Decreasing	5, 10, OA5 - index	328
41	Bebchuk, Cremers, Peyer	JFE 2011	ExecuComp	I		+ , - , 33%	5, 10, OA5 - index	734
42	Kim, Lu	JFE 2011	ExecuComp	C		+ * , - * , 29%	5, 10, OA5 - index	356
43	Coles, Lemmon, Meschke	JFE 2012	ExecuComp	C		+ * , - * , 20%	5, 10, OA5 - index	499
44	Ahn, Shrestha	JBF 2013	IRRC/ExecuComp	C		- * , + * , 16%	5, 10, OA5 - index	49
45	Paeglis, Veeren	JCF 2013	VC-backed IPO firms	Founder		+ * , - * , 44%	4, 9 - young	18
46	Masulis, Mobbs	JFE 2014	RiskMetrics (S&P 1500)	C		- , + * , Decreasing	5, 10, OA5 - index	305
47	Francis, Hasan, Wu	FM 2015	ExecuComp	I		- , + , Decreasing	5, 10, OA5 - index	129
48	Basu, Paeglis, Toffanin	JCF 2017	Compustat/CRSP	Largest indiv. block		- * , + * , 39%	2, 7, OA1	5
49	Gillan, Hartzell, Koch, Starks	RFS 2018	ExecuComp	I		- , + * , 20%	5, 10, OA5 - index	27

Table 2**Summary statistics**

The variables are defined as follows. Firm value (referred to as Tobin's Q in the text of this paper) is the ratio of the market value of assets to its book value where the market value of assets is defined as the book value of assets plus the market value of equity minus the book value of equity minus deferred taxes. Insider own is the percentage of voting rights controlled by the firm's officers and directors as a group. Firm size is the book value of total assets in \$ billions. R&D is the ratio of R&D expenses to sales. Leverage is the ratio of book value of long-term debt to total assets. Total risk is defined as the standard deviation of stock returns calculated over 100 trading days ending on the day preceding the fiscal year end date (we require at least 30 observations for these calculations). Advertising is defined as the ratio of advertising expenses to sales. PPE is the ratio of total property, plant, and equipment to the book value total assets. CAPEX is the ratio of capital expenditures to sales. Industry median firm value is calculated as the median Firm value for all COMPUSTAT firms in the same year and Fama-French 48 industry group. *Firm value* is winsorized at 5. *R&D* is winsorized at 2. *Total risk*, *Advertising*, and *CAPEX* are winsorized at the 99th percentile.

	Mean	Median
Firm value	1.965	1.571
Insider own	0.186	0.099
Firm size	3.921	0.423
R&D	0.138	0.006
Leverage	0.167	0.122
Total risk	0.032	0.027
Advertising	0.012	0.000
PPE	0.233	0.153
CAPEX	0.100	0.031
Industry median firm value	1.771	1.590

Table 3**Replications of highly cited papers**

This table provides the results of replications of some of the most influential papers in the literature. The dependent variable is Tobin's Q, as defined in the respective papers, except for Morck, Shleifer, and Vishny (1988) and McConnell and Servaes (1990) where the dependent variable is as defined in Table 2. The control variables used are the same (indicated as Original) as those in the original paper (and listed in the Section OA1 of the online Appendix) and any difference from the original paper is noted. In quadratic specifications, "IO" refers to the fraction of equity ownership held by insiders; IO^2 – to its square. In piecewise linear specifications, IO05, IO525, and IO25 are the cutoffs as defined by Morck, Shleifer, and Vishny (1988). t-statistics in are parentheses, standard errors are in square brackets, and p-values are in curly brackets. *, **, and *** indicate significance at the 10, 5, and 1 percent levels, respectively.

	Morck, Shleifer, and Vishny (1988)			McConnell and Servaes (1990)					Agrawal and Knoeber (1996)			Himmelberg, Hubbard, and Palia (1999)	
	(1) Published Table	(2) Best Replic.	(3) Full Sample	(4) Published Table	(5) Best Replic.	(6) Full Sample	(7) Best Replic.	(8) Full Sample	(9) Published Table	(10) Best Replic.	(11) Full Sample	(12) Published Table	(13) Full Sample
IO				2.292 {0.00}***	0.059 (0.30)	0.150 (1.32)	0.248 (1.16)	-0.228 (1.83)*	0.012 (1.89)*	0.651 (1.28)	-1.050 (5.33)***	-0.460 [0.218]	-1.019 (6.05)***
IO^2				-2.741 {0.00}***	-0.540 (2.00)**	-0.182 (1.16)	-0.751 (2.62)***	0.229 (1.38)	-0.0001 (-1.35)	-1.407 (1.91)*	1.173 (4.26)***	-0.062 [0.304]	1.143 (4.85)***
IO05	3.98 [2.29]*	-0.805 (0.69)	-2.220 (3.78)***										
IO525	-1.56 [0.758]**	0.398 (0.85)	-0.422 (3.33)***										
IO25	0.775 [0.324]**	-0.846 (4.04)***	0.101 (1.43)										
Controls/ Table Ref.	Table 5	Original	Original	Table 2	Original	Original	Net assets in original replaced by log version	Net assets in original replaced by log version	Table 2	Original	Original	Table 5A	Original
R ²	0.60	0.59	0.28	0.15	0.13	0.19	0.14	0.19	0.31	0.24	0.13	0.13	0.15
N	371	1,964	21,009	1,093	6,660	21,009	6,660	21,009	383	2,039	21,724	2,630	21,841

Table 4**Distribution of insider ownership for various subsamples**

This table provides the distribution of insider ownership for subsamples based on firm size, age, index listing and constituency, year of observation, institutional ownership, and dual class status. In Panels A, B, and D the sample is split into equal-sized terciles (for each year). The percentages within each subsample indicate the proportion of observations in each ownership category.

<i>Own category</i>	0-5%	5-10%	10-20%	20-30%	30-40%	40-50%	50-60%	60-70%	70-80%	80-90%	>90%
<i>Panel A: Firm size</i>											
Small	7.5%	17.5%	24.3%	16.6%	11.6%	8.5%	6.7%	3.9%	1.9%	1.1%	0.4%
Medium size	24.9%	22.3%	19.7%	10.6%	7.1%	4.8%	3.6%	3.4%	2.4%	0.9%	0.4%
Large	59.9%	16.1%	8.1%	3.9%	2.7%	1.9%	1.7%	1.9%	2.3%	0.9%	0.7%
<i>Panel B: Time since IPO</i>											
Young	21.6%	16.9%	19.6%	12.5%	9.0%	6.7%	5.3%	4.1%	2.4%	1.2%	0.7%
Medium age	29.2%	22.3%	17.4%	9.8%	7.4%	4.1%	3.8%	2.6%	2.1%	0.8%	0.4%
Old	42.6%	16.8%	14.8%	8.5%	4.7%	4.2%	2.8%	2.3%	2.1%	0.9%	0.3%
<i>Panel C: Index listing status</i>											
Off-index	16.7%	16.8%	20.6%	13.6%	9.8%	7.1%	6.1%	4.3%	2.9%	1.3%	0.7%
Index	52.4%	21.4%	12.3%	5.4%	3.0%	1.9%	0.8%	1.1%	1.1%	0.4%	0.2%
<i>Panel D: Institutional ownership</i>											
Low	13.3%	15.0%	19.5%	14.1%	10.4%	8.6%	7.8%	5.6%	3.5%	1.4%	0.6%
Medium	25.0%	17.9%	21.9%	13.4%	8.7%	5.3%	3.1%	2.2%	1.6%	0.7%	0.4%
High	54.0%	23.1%	10.7%	3.6%	2.2%	1.3%	1.2%	1.3%	1.5%	0.8%	0.4%

Table 5
Summary of our findings

This table presents a summary of the results in Figures 3 to 12. Column 2 provides the relevant LOESS and semi-parametric figure number, respectively, for the set of firms used, while columns 3 and 4 provide the corresponding shape and its approximate turning points (where applicable) obtained for the relationship between ownership and firm value.

<i>Set</i>	<i>Figure</i>	<i>Non-parametric shape</i>	<i>Semi-parametric shape</i>
All	3, 8	Inverted V; 20%	V; 65%
Small	4, 9	Decreasing	V; 68%
Medium size	4, 9	Increasing	V; 52%
Large	4, 9	Decreasing	V; 80%
Young	5, 10	+ , - , + ; 15% and 75%	V; 50%
Medium age	5, 10	+ , - , + ; 8% and 80%	V; 80%
Old	5, 10	Decreasing	Decreasing
Off-index	6, 11	+ , - , + ; 20% and 70%	V; 60%
Index	6, 11	- , + , - ; 2% and 32%	No clear pattern
Low institutional	7, 12	+ , - , + ; 20% and 63%	V; 45%
Medium institutional	7, 12	- , + , - ; 4% and 42%	+ , - , + ; 52% and 81%
High institutional	7, 12	Inverted V; 25%	No clear pattern

Figure 1

Relationship between insider ownership and Tobin's Q as reported by Morck, Shleifer, and Vishny (1988), McConnell and Servaes (1990), and Himmelberg, Hubbard, and Palia (1999)

The numerical values for the coefficient estimates for insider ownership are from Table 5, column 2 for Morck, Shleifer, and Vishny (1988) (MSV), from Table 2, column 3 for McConnell and Servaes (1990) (MS), and from Table 5, column 4 for Himmelberg, Hubbard, and Palia (1999) (HHP). The graph reports Tobin's Q on the vertical axis as a function of insider ownership on the horizontal axis.

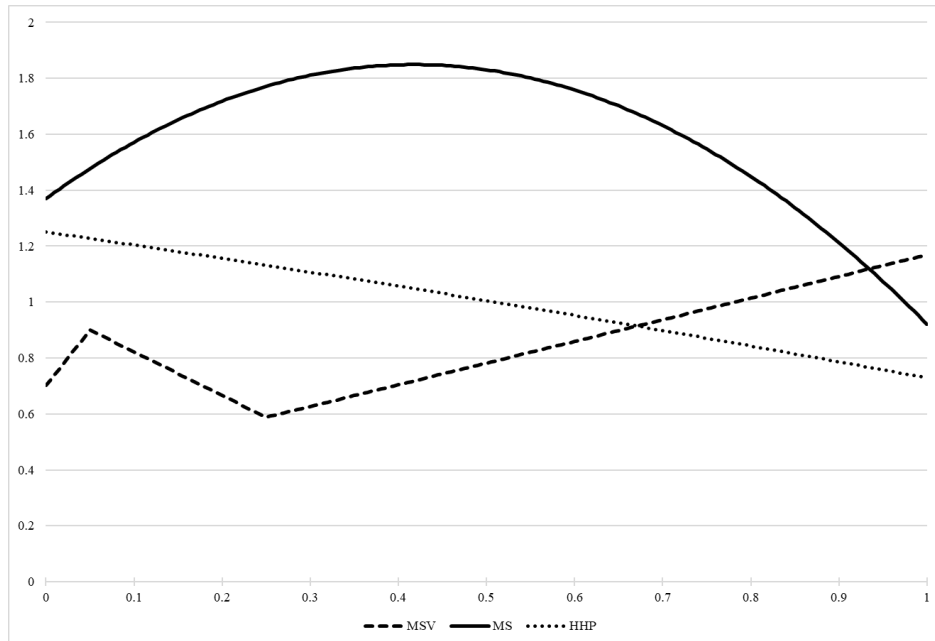


Figure 2

Replication of the relationship between insider ownership and Tobin's Q as reported by Morck, Shleifer, and Vishny (1988), McConnell and Servaes (1990), Agrawal and Knoeber (1996), and Himmelberg, Hubbard, and Palia (1999)

Tobin's Q is on the vertical axis and insider ownership on the horizontal axis. For Panels A through D, the solid lines plot the relationship implied by the estimation results in Table 3 for the authors' samples and the dotted lines for the full sample. Himmelberg, Hubbard, and Palia (1999) use a random sample and therefore in Panel E we plot only the full sample graph.

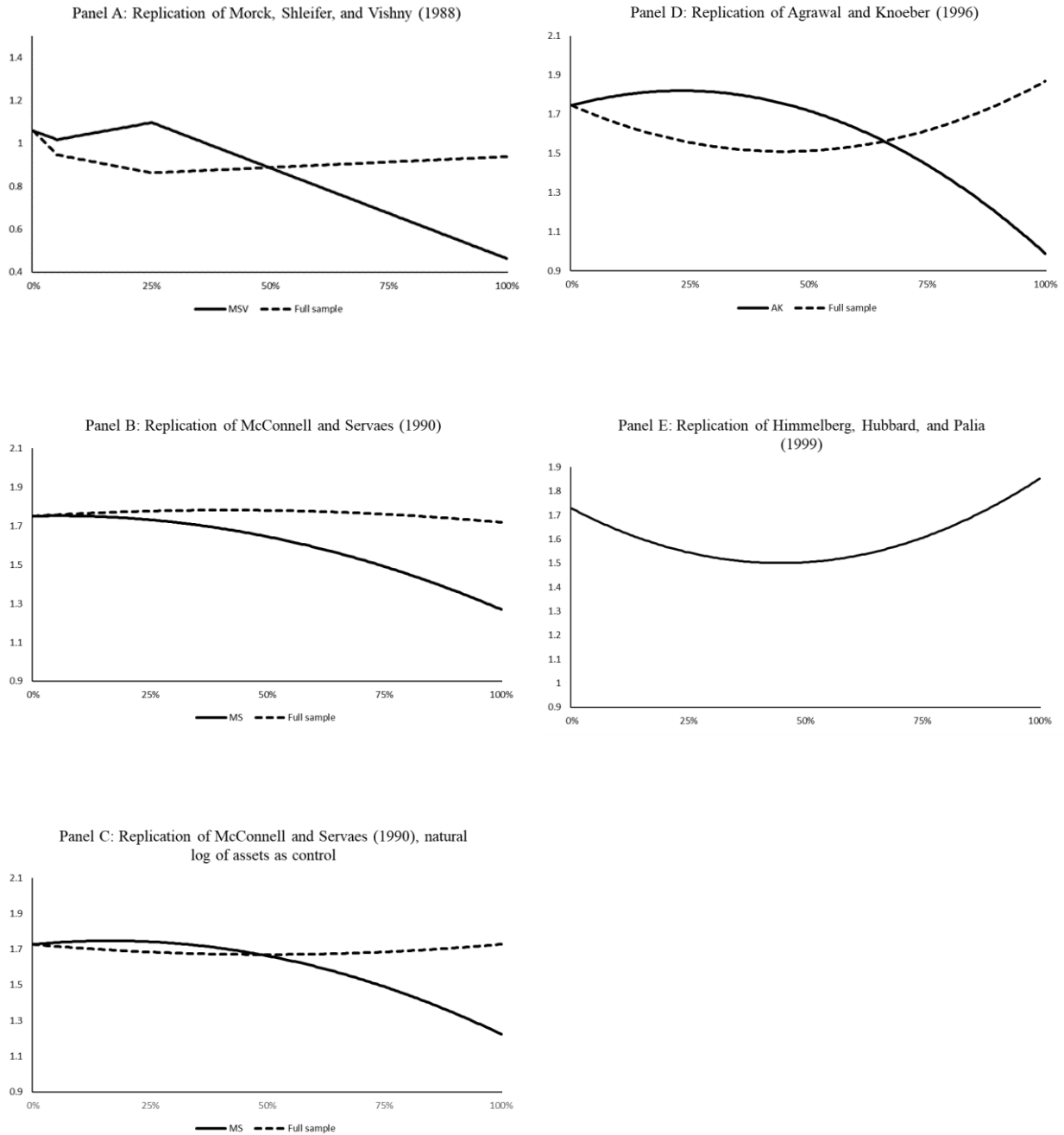


Figure 3

Non-parametric estimation of the ownership-firm value relationship for the full sample

The OFV relationship is estimated for the full sample of CRSP and Compustat firms using LOESS.

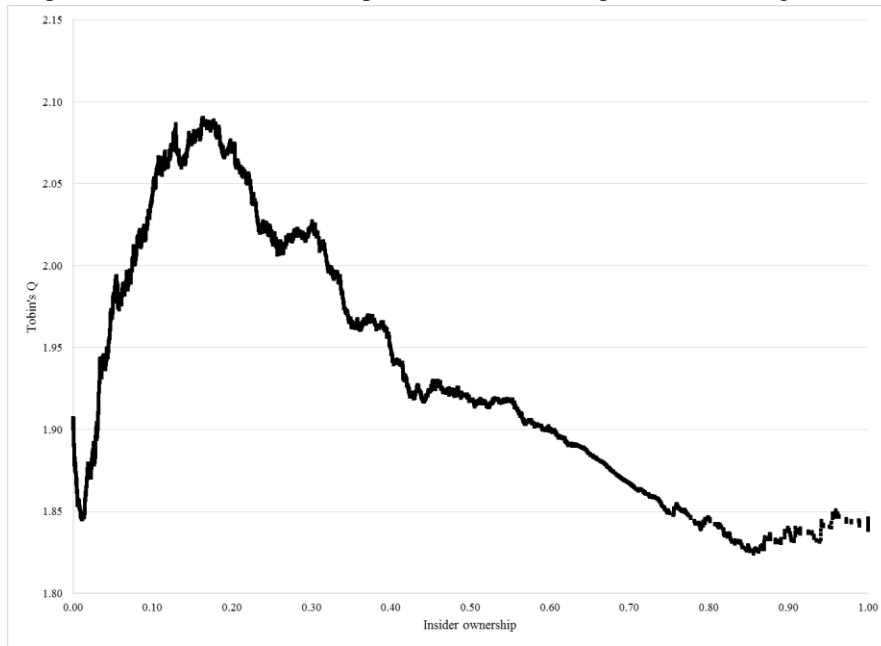


Figure 4

Non-parametric estimation of the ownership-firm value relationship for subsamples based on firm size

The OFV relationship is estimated using LOESS. Subsamples are formed by dividing the full sample into terciles based on firm size (as measured by the book value of assets)

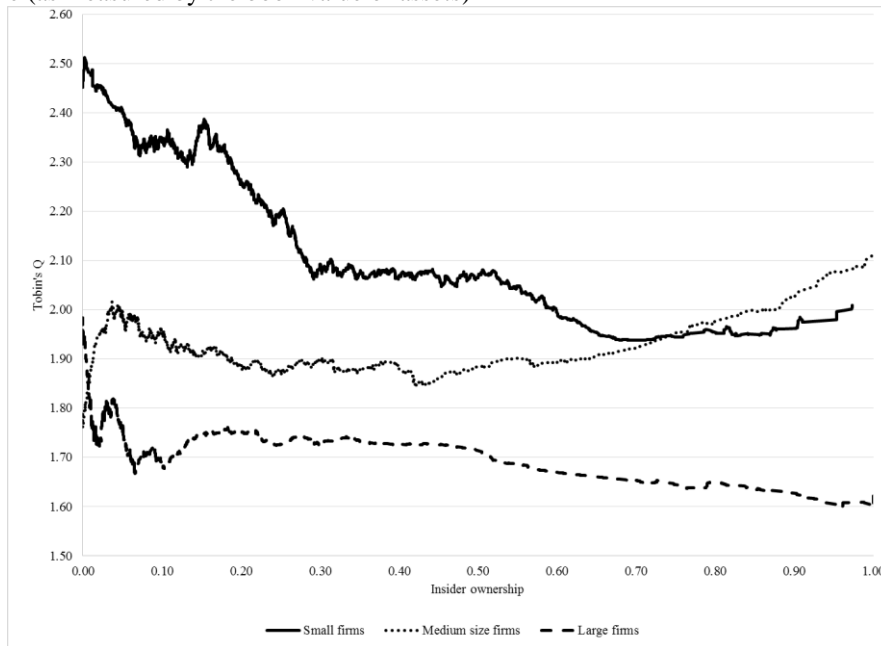


Figure 5

Non-parametric estimation of the ownership-firm value relationship for subsamples based on the time since IPO

The OFV relationship is estimated using LOESS. Subsamples are formed by dividing the full sample into terciles based on the time since the IPO.

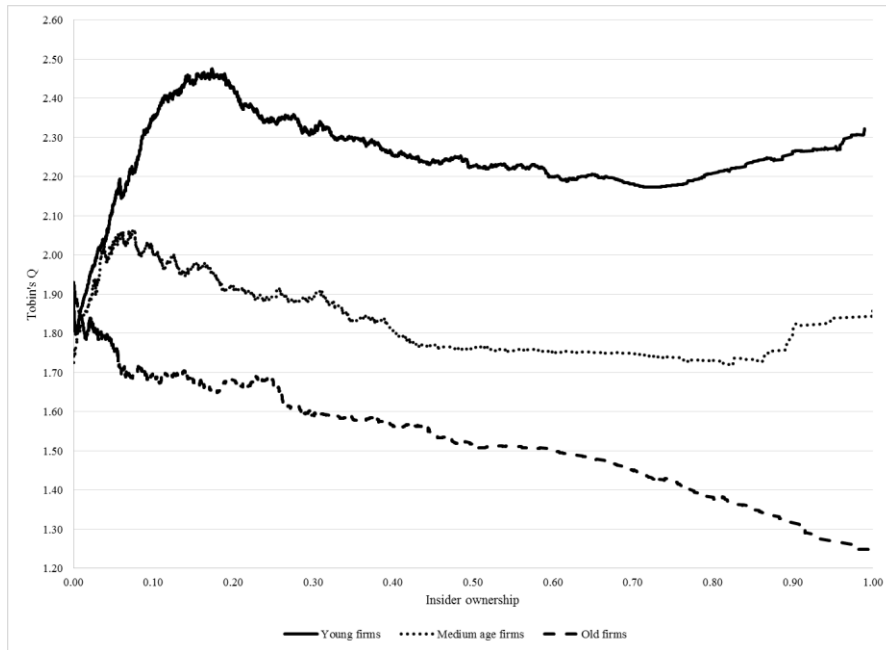


Figure 6

Non-parametric estimation of the ownership-firm value relationship for subsamples of index listed and off-index firms

The OFV relationship is estimated using LOESS. Index listed firms are those listed in any of the three main S&P indexes viz. the S&P 500 (large cap), the S&P 400 (mid cap), and S&P 600 (small cap) indexes. Off-index firms are those that appear in CRSP and Compustat but are not a member of one of these indexes.

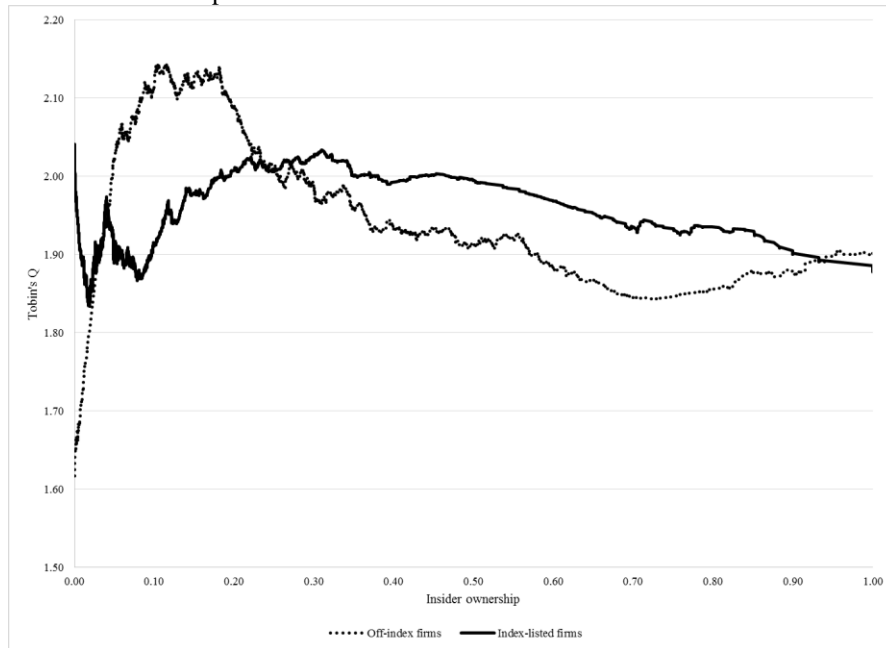


Figure 7

Non-parametric estimation of the ownership-firm value relationship for subsamples by the level of institutional ownership

The OFV relationship is estimated using LOESS. Subsamples are formed by dividing the full sample into terciles based on the level of total institutional ownership reported in the Thomson Reuters 13F database.

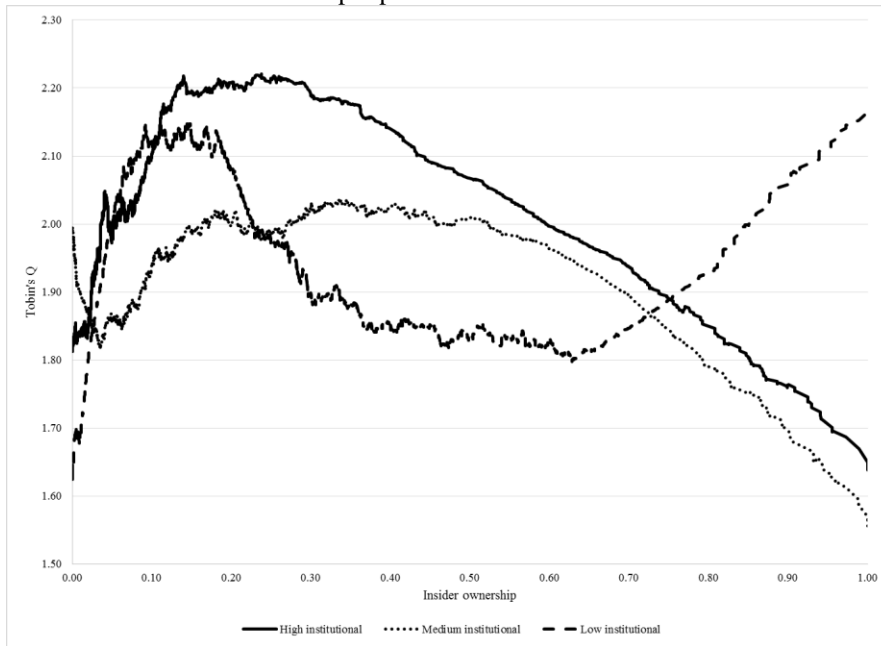


Figure 8

Semi-parametric estimation of the ownership-firm value relationship for the full sample

The OFV relationship is estimated for the full sample of firms found on CRSP and Compustat using Robinson's semi-parametric regression estimator.

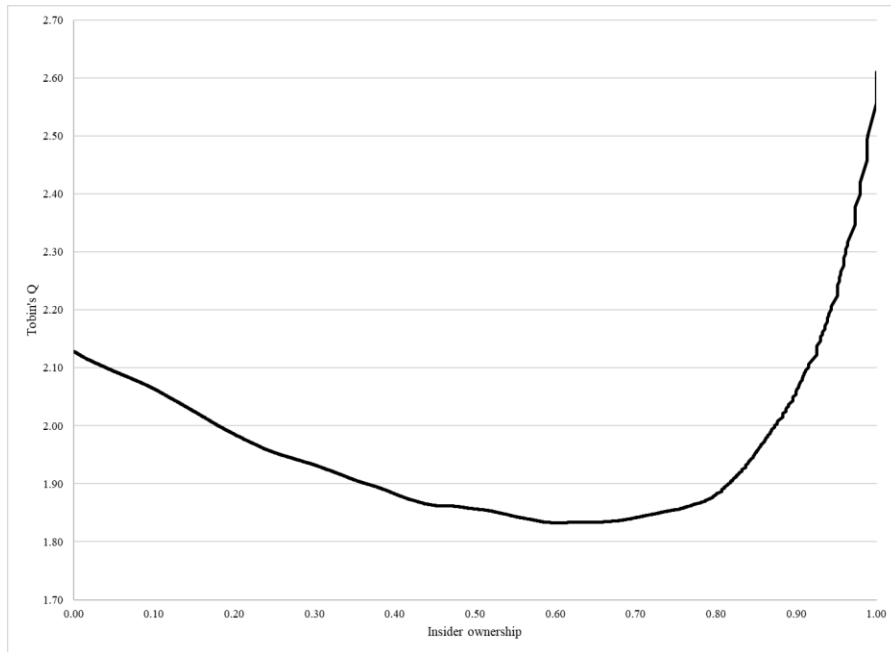


Figure 9

Semi-parametric estimation of the ownership-firm value relationship for subsamples based on firm size

The OFV relationship is estimated using Robinson's semi-parametric regression estimator. Subsamples are formed by dividing the full sample into terciles based on firm size (as measured by the book value of assets).

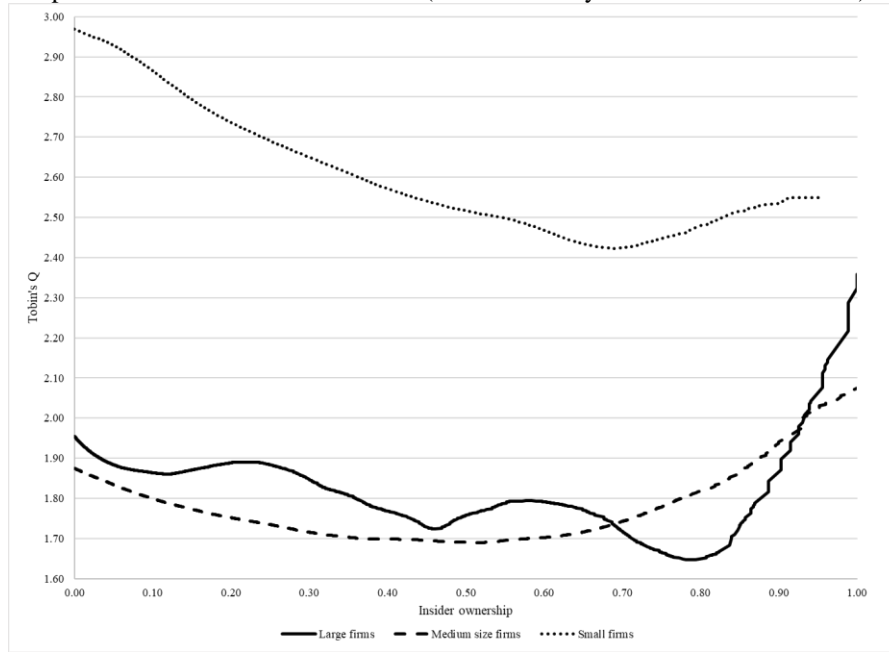


Figure 10

Semi-parametric estimation of the ownership-firm value relationship for subsamples based on time since IPO

The OFV relationship is estimated using Robinson's semi-parametric estimator. Subsamples are formed by dividing the full sample into terciles based on the time since the IPO.

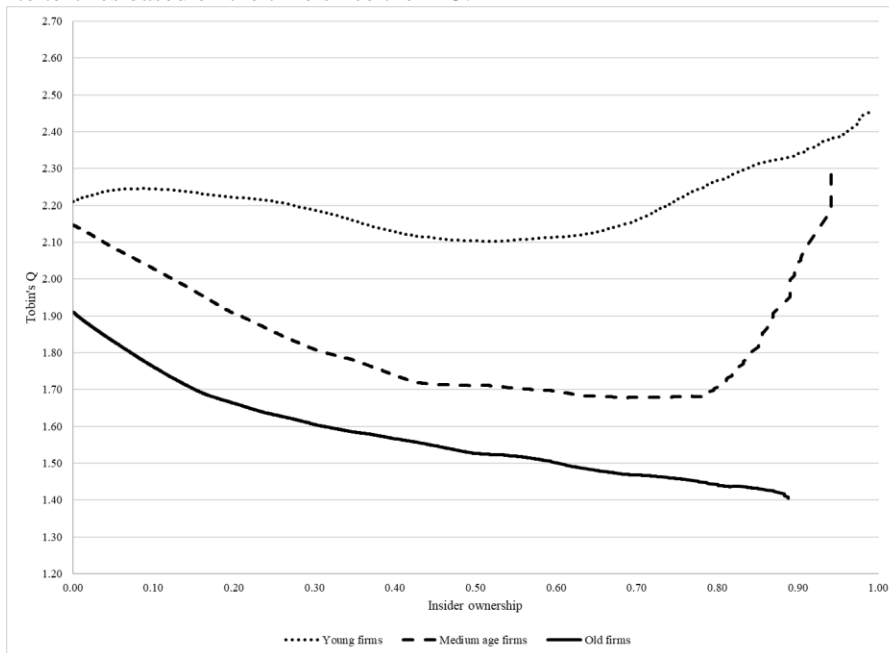


Figure 11

Semi-parametric estimation of the ownership-firm value relationship for subsamples of index-listed and off-index firms

The OFV relationship is estimated using Robinson's semi-parametric estimator. Index listed firms are firms that are listed in one of in any of the three main S&P indexes viz. the S&P 500 (large cap), the S&P 400 (mid cap), and S&P 600 (small cap) indexes. Off-index firms are those that appear in CRSP and Compustat but are not a member of one of these indexes.

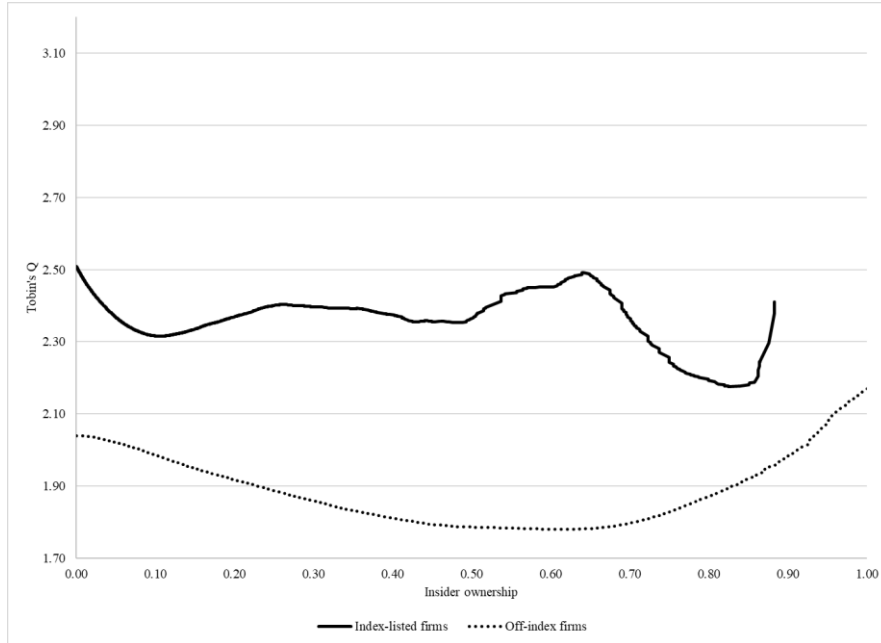
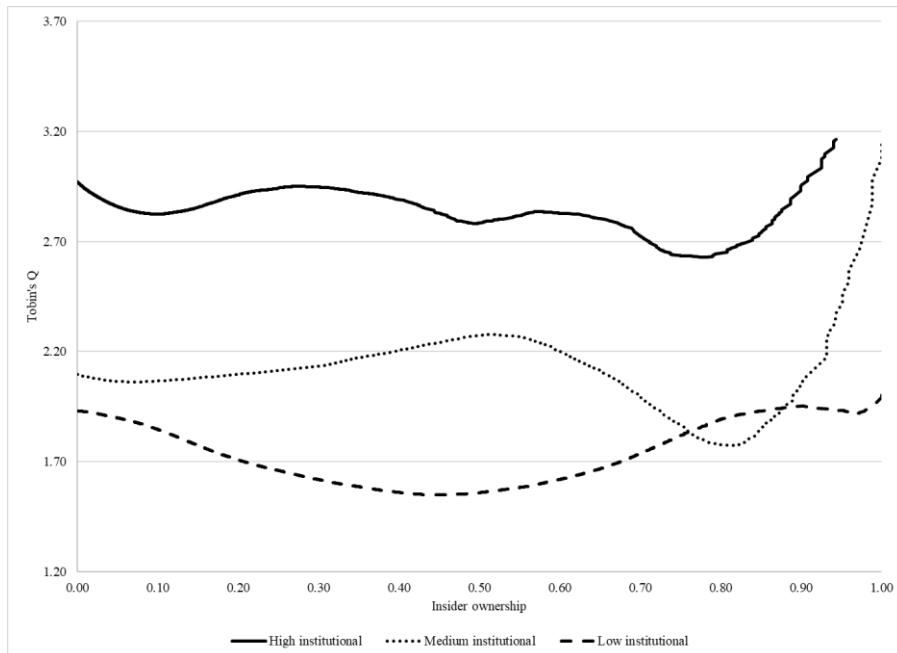


Figure 12

Semi-parametric estimation of the ownership-firm value relationship for subsamples based on the level of institutional ownership

The OFV relationship is estimated using Robinson's semi-parametric estimator. Subsamples are formed by dividing the full sample into terciles based on the level of total institutional ownership reported in the Thomson Reuters 13F database.



ONLINE APPENDIX

SECTION OA1: VARIABLE DESCRIPTIONS

VARIABLE	DESCRIPTION
<i>Dependent variable</i>	
<i>Firm value</i>	The ratio of the market value of assets to its book value where the market value of assets is defined as the book value of assets plus the market value of equity minus the book value of equity minus deferred taxes
<i>Ownership variables</i>	
<i>Insider own</i>	The percentage of voting rights controlled by the firm's officers and directors as a group
<i>Insider own05</i>	<i>Insider own</i> if less than 5%; set to 5% if <i>Insider own</i> \geq 5%
<i>Insider own525</i>	<i>Insider own</i> - 5% if 5% < <i>Insider own</i> < 25%; set to 20% if <i>Insider own</i> \geq 25%; set to 0 if <i>Insider own</i> < 5%
<i>Insider own25</i>	<i>Insider own</i> - 25% if <i>Insider own</i> \geq 25%; set to 0 if <i>Insider own</i> < 25%
<i>Control variables</i>	
<i>Ln(Firm size)</i>	The natural logarithm of the book value of total assets
<i>R&D</i>	The ratio of R&D to sales
<i>Leverage</i>	The ratio of book value of long term debt to total assets
<i>Advertising</i>	The ratio of advertising expenses to sales
<i>PPE</i>	The ratio of total property, plant, and equipment to the book value of total assets
<i>CAPEX</i>	The ratio of capital expenditures to sales
<i>Industry median firm value</i>	Median <i>Firm value</i> for all COMPUSTAT firms in the same year and Fama-French 48 industry group
<i>Additional control variables for replications</i>	
<i>Morck, Shleifer, and Vishny (1988)</i>	
<i>RD/A</i>	The ratio of R&D to the net assets
<i>ADV/A</i>	The ratio of advertising expenses to the net assets
<i>D/A</i>	The ratio of market value of long-term debt to the net assets
<i>SIC3(I)</i>	3-digit SIC code fixed effects
<i>McConnell and Servaes (1990)</i>	
<i>DEBT/RV</i>	The ratio of the market value of debt to the net assets
<i>R&D/RV</i>	The ratio of R&D expenses to the net assets
<i>ADV/RV</i>	The ratio of advertising expenses to the net assets
<i>Agrawal and Knoeber (1996)</i>	
<i>RDA</i>	The ratio of R&D expenses to total assets
<i>ADVA</i>	The ratio of advertising expenses to total assets
<i>LASSET</i>	The natural log of book value of total assets in millions of dollars

Himmelberg, Hubbard, and Palia (1999)

<i>LN(S)</i>	The natural logarithm of sales
<i>(LN(S))²</i>	The squared natural logarithm of sales
<i>K/S</i>	The ratio of total property, plant, and equipment to sales
<i>(K/S)²</i>	The squared ratio of total property, plant, and equipment to sales
<i>Y/S</i>	The ratio of operating income to sales
<i>SIGMA</i>	The standard error of the residuals from a CAPM model estimated over the 250-trading day period ending on the last trading day before the fiscal year end
<i>SIGDUM</i>	Dummy variable equal to 1 when <i>SIGMA</i> is non-missing, and 0 otherwise.
<i>R&D/K</i>	The ratio of R&D to property, plant, and equipment
<i>RDUM</i>	Dummy variable equal to 1 if <i>R&D/K</i> is missing, and 0 otherwise
<i>A/K</i>	The ratio of advertising expenses to property, plant, and equipment
<i>ADUM</i>	Dummy variable equal to 1 if <i>A/K</i> is missing, and 0 otherwise
<i>I/K</i>	The ratio of capital expenditures to property, plant, and equipment

SECTION OA2: COMPLETE SET OF RESULTS WITH ALL CONTROL VARIABLES

In Figures OA1 to OA10, we present the results of the semi-parametric estimation of the ownership-firm value relationship for the full sample of firms as well as for all subsamples using a complete set of control variables. Robinson's semi-parametric regression estimator is used for all estimations. While the semi-parametric results reported in the paper (Figures 7 to 11) include only firm size and firm size squared as control variables, for each estimation in this section, the complete set of control variables employed includes those most frequently used in the ownership-firm value literature:³⁰

- firm size (Gompers, Ishii, and Metrick, 2010; Coles et al., 2012)
- industry-median Q (Miller et al., 2007), asset tangibility (Cui and Mak, 2002)
- R&D (Demsetz and Lehn, 1985; Cui and Mak, 2002; Miller et al., 2007)
- advertising (Gompers, et al., 2010)
- capital expenditures (Demsetz and Lehn, 1985; Miller et al., 2007)
- leverage (Kim and Lu, 2011).

[Figures OA1 to OA10 here]

In this section, we also present the results of additional subsample analysis. In Table OA1, we provide the distribution of insider ownership for these additional subsamples based on firm age (using time since incorporation), index constituency, year of observation, and dual class status. Insider ownership distribution details for all other subsamples are provided in Table 3 of the paper.

[Table OA1 here]

³⁰ Prior studies have used different combinations of these variables or their variants and our unreported tests indicate that the exact choice (and definitions) of the variables is related to the conclusions. Similarly, the choice of methodology is an important consideration in its own right. While we certainly recognize the importance of these two issues, a detailed discussion of the myriad specifications and variables used in the literature is a substantial exercise that is beyond the scope of this paper.

Table OA1**Distribution of insider ownership for additional subsamples**

This table provides the distribution of insider ownership for additional subsamples based on firm age (based on time since incorporation), index constituency, year of observation, and dual class status. In Panel A, the sample is split into equal-sized terciles (for each year). The percentages within each subsample indicate the proportion of observations in each ownership category.

<i>Own category</i>	0-5%	5-10%	10-20%	20-30%	30-40%	40-50%	50-60%	60-70%	70-80%	80-90%	>90%
<i>Panel A: Time since incorporation</i>											
Young	19.2%	20.9%	21.8%	12.3%	8.8%	6.2%	4.5%	3.0%	1.9%	0.8%	0.7%
Medium age	29.4%	18.8%	17.9%	11.0%	7.4%	4.8%	4.0%	3.5%	1.7%	0.9%	0.5%
Old	44.3%	16.1%	12.2%	7.7%	5.0%	4.2%	3.5%	2.6%	3.0%	1.1%	0.3%
<i>Panel B: Index listing subcategory</i>											
S&P 500	77.1%	8.7%	6.4%	2.2%	1.2%	1.5%	0.3%	0.7%	1.2%	0.3%	0.3%
S&P 400 Midcap	54.5%	21.9%	8.0%	5.5%	3.3%	1.8%	1.3%	1.7%	1.4%	0.5%	0.0%
S&P 600 Small cap	33.8%	30.0%	19.0%	7.4%	4.1%	2.2%	0.7%	1.1%	0.9%	0.5%	0.1%
<i>Panel C: Year of observation</i>											
2004	21.6%	19.3%	19.1%	12.2%	9.0%	6.1%	5.1%	3.6%	2.2%	1.1%	0.6%
2009	31.4%	19.3%	17.9%	9.8%	6.6%	5.0%	3.7%	2.8%	2.4%	0.9%	0.3%
2014	46.9%	16.5%	13.3%	7.8%	4.4%	3.1%	2.4%	2.4%	2.0%	0.7%	0.4%
<i>Panel D: Dual class</i>											
Single	32.0%	19.7%	18.3%	10.7%	6.9%	4.9%	3.6%	2.2%	1.1%	0.4%	0.2%
Dual	13.8%	3.3%	4.8%	5.3%	9.6%	7.7%	9.6%	14.6%	17.7%	8.4%	5.2%

Figure OA1

Semi-parametric estimation of the ownership-firm value relationship for the full sample of firms

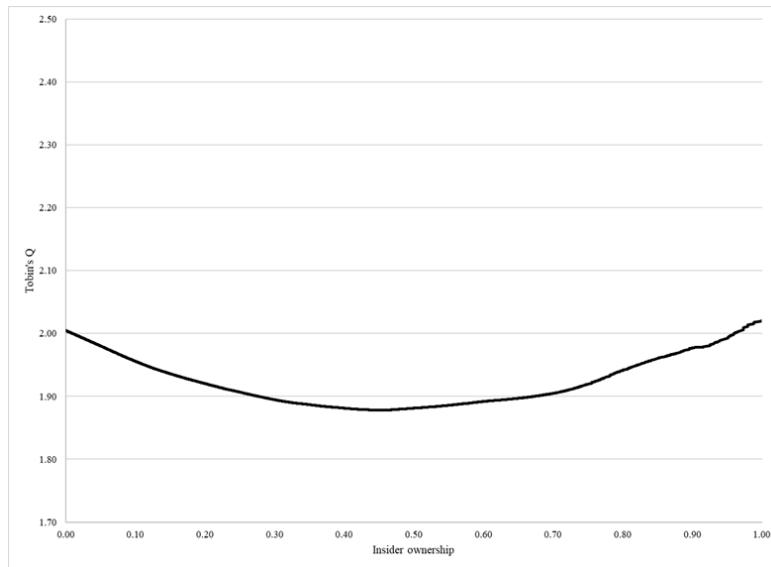


Figure OA2

Semi-parametric estimation of the ownership-firm value relationship for subsamples based on firm size

Subsamples are formed by dividing the full sample into terciles based on firm size (as measured by the book value of assets).

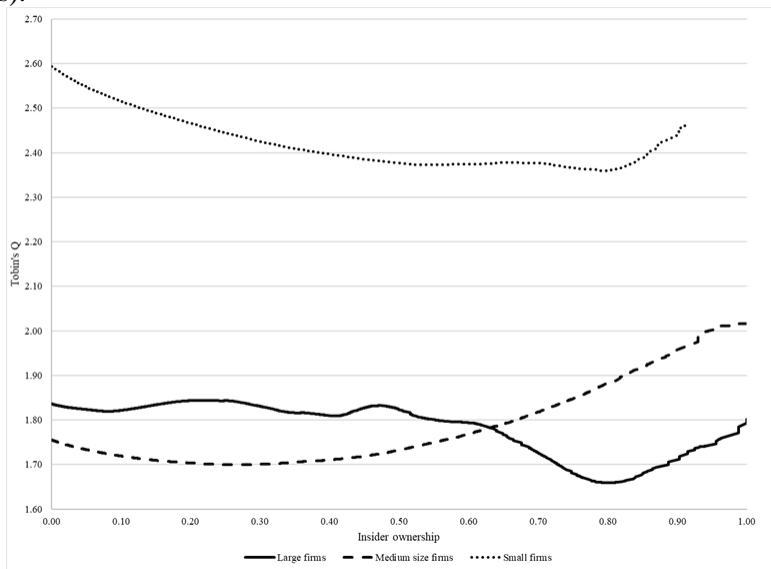


Figure OA3

Semi-parametric estimation of the ownership-firm value relationship for subsamples based on time since IPO

Subsamples are formed by dividing the full sample into terciles based on firm age (as measured by the number of years since IPO).

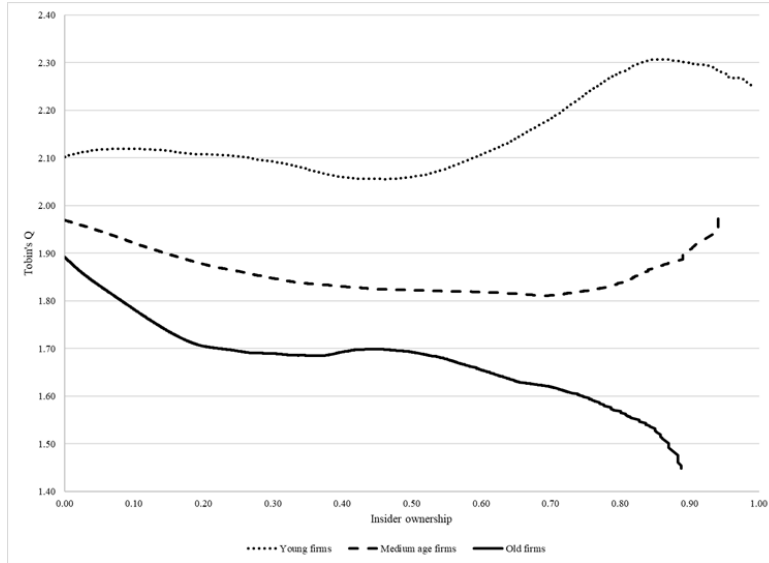


Figure OA4

Semi-parametric estimation of the ownership-firm value relationship for subsamples based on time since incorporation

Subsamples are formed by dividing the full sample into terciles based on firm age (as measured by the years since incorporation).

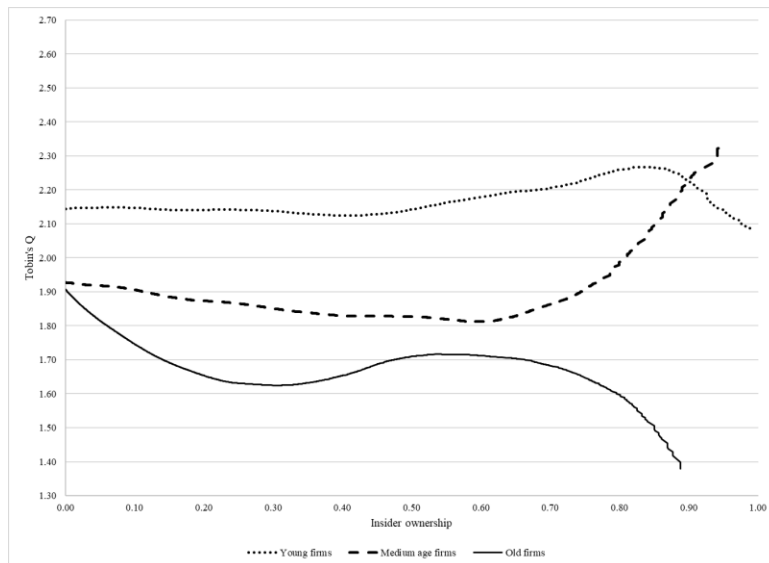


Figure OA5

Semi-parametric estimation of the ownership-firm value relationship for subsamples of index-listed and off-index firms

Index listed firms are firms that are listed in one of in any of the three main S&P indexes viz. the S&P 500 (large cap), the S&P 400 (mid cap), and S&P 600 (small cap) indexes. Off-index firms are those that appear in CRSP and Compustat but are not a member of one of these indexes.

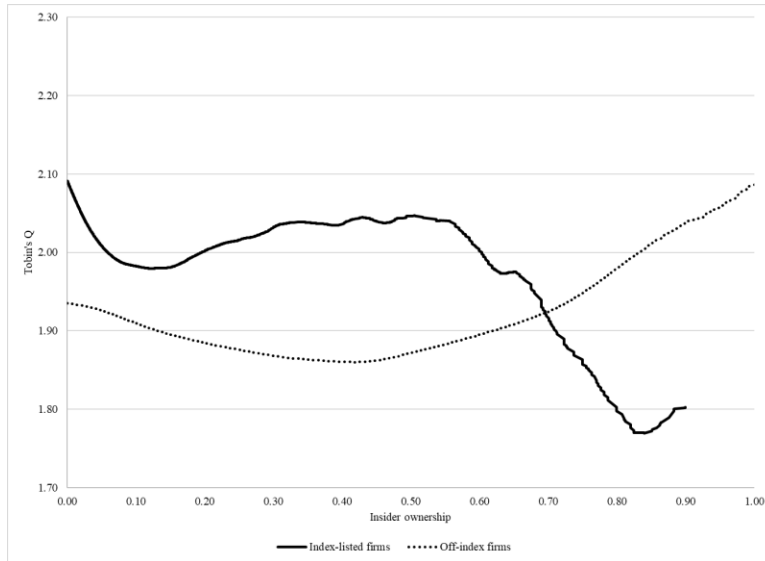


Figure OA6

Semi-parametric estimation of the ownership-firm value relationship for subsamples based on index constituency

The sample of firms used is the index-listed group from Figure 10. These are subdivided into those listed in the S&P 500 index, the S&P 400 midcap index, and the S&P 600 small cap index.

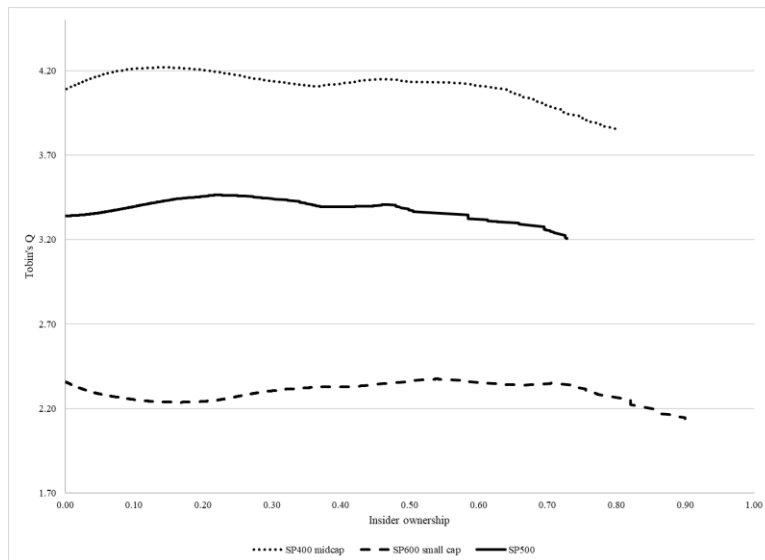


Figure OA7

Semi-parametric estimation of the ownership-firm value relationship for subsamples based on the level of institutional ownership

Subsamples are formed by dividing the full sample into terciles based on the level of total institutional ownership reported in the Thomson Reuters 13F database.

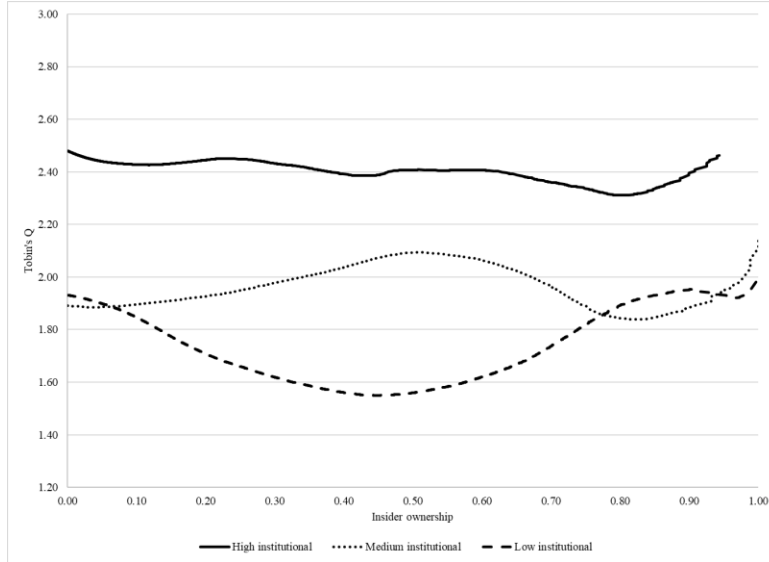


Figure OA8

Semi-parametric estimation of the ownership-firm value relationship for subsamples based on the year of observation

Subsamples are formed by the year in which the proxy statement (that provides information on ownership) is filed.

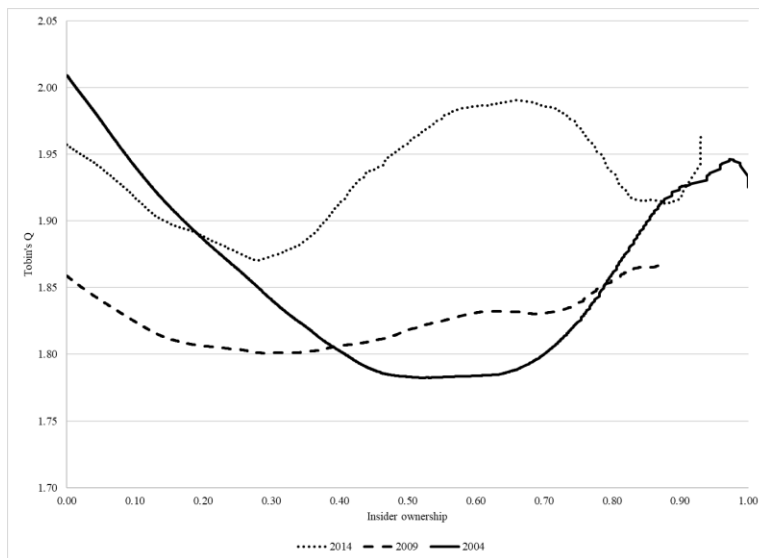


Figure OA9

Semi-parametric estimation of the ownership-firm value relationship for subsamples based on industry

Subsamples results are reported for each individual Fama-French industry for which we have more than 1,000 observations.

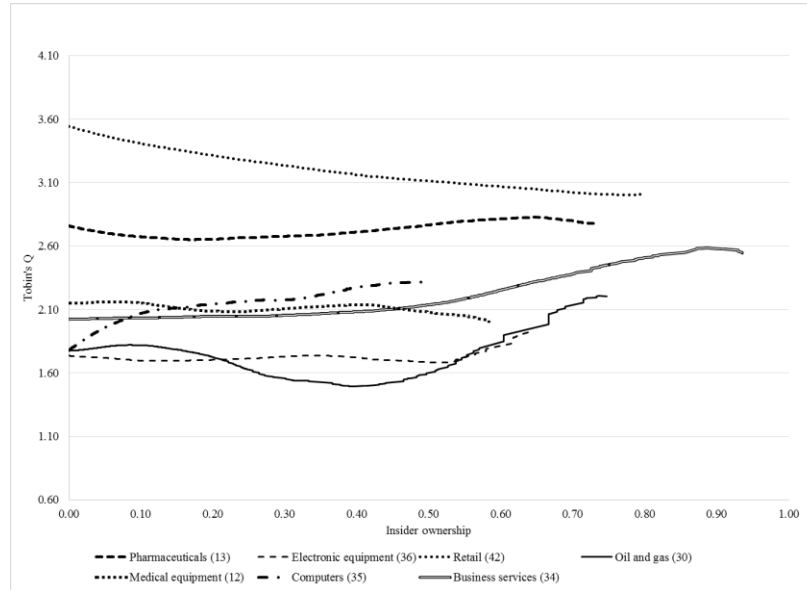
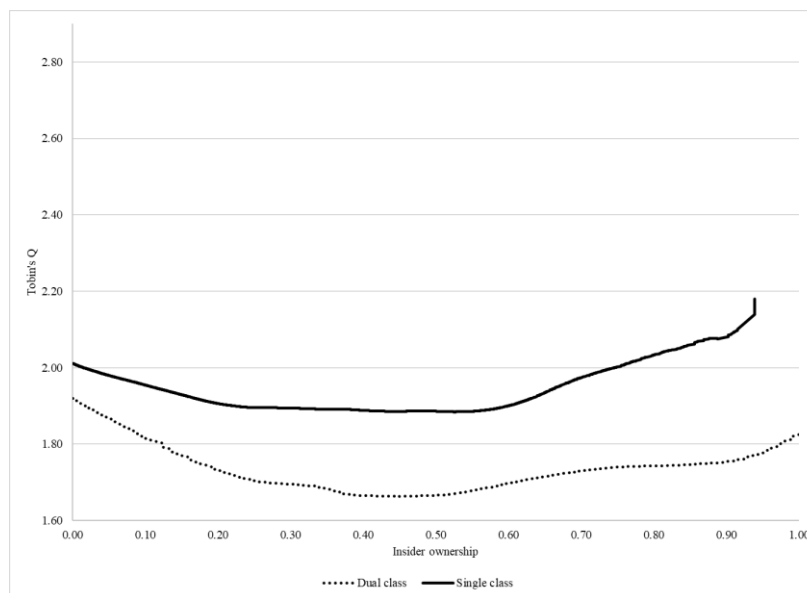


Figure OA10

Semi-parametric estimation of the ownership-firm value relationship for subsamples of single and dual-class firms

Subsamples are based on whether firms report multiple classes of stock in the description of beneficial ownership in the proxy statement (dual class) or do not do so (single class).



SECTION OA3: THE ROLE OF CONTROL VARIABLES

As part of our analyses, we attempt to identify the control variables most responsible for the significant differences in the OFV relationship we observe between Figures 2 and 7 in the paper. In particular, we replicate Figure 7 using one control variable at a time (from our starting set of control variables which include firm size, industry-median Q, asset tangibility, R&D, advertising, capital expenditures, and leverage). We find that the main control variables responsible for the observed differences between Figures 2 and 7 are firm size (at low and high levels of insider ownership) and industry controls (at high levels of insider ownership). This is clearly seen in Figure OA11, where we depict the observed OFV relationship for the full sample controlling only for firm size, for industry median Tobin's Q, and for all the other (less influential) control variables. The significant influence of the former two variables is not surprising given the evidence presented in Figures 3 and OA9. As noted above, there are differences not only in the intercept but also in the shape of the observed OFV relationship between firms of various sizes and industries.

Figure OA11

Semi-parametric estimation of the OFV relationship for the full sample with different control variables

The OFV relationship is estimated for the full sample of CRSP and Compustat firms using Robinson's semi-parametric regression estimator.

