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Abstract

Institutional investors' ownership in public firms has become increasingly concentrated in the last decades. We study the heterogeneous effects of large versus more dispersed institutional owners on firms' innovation strategies and their innovation output. We find that large institutional investors induce managers to increase spending in internal R&D by reducing short-term pressure. However, to avoid empire building and dilution, large institutional investors prevent acquisitions, which reduces firms' investment in external innovation. The overall effect on firms' future patents and citations is negative. By acquiring less innovation from external sources, firms reduce the returns of their investment in internal R&D, jeopardizing their total innovation output. We use the mergers of financial institutions as exogenous shocks on firms' institutional ownership concentration. Our findings complement the previously found positive effects of institutional ownership on firm innovation and indicate that the effects become negative when institutional investors become large owners.

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1 Introduction

The ownership of public firms has changed dramatically in the last 40 years. Institutional investors are the main actors responsible for this change. While in 1980, institutional investors owned approximately 20 to 30% of US equities, by 2010, the average US firm had over 65% institutional ownership (Blume and Keim, 2017; Borochin and Yang, 2017). As a result, recent literature has focused on studying the role of institutional owners on important corporate decisions, such as acquisitions (Fich, Harford, and Tran, 2015), corporate governance (Pedersen, 2014), innovation (Aghion, Van Reenen, and Zingales, 2013), and firm valuation and performance (Brav, Jiang, Partnoy, and Thomas, 2008; Borochin and Yang, 2017).

Most of the studies assume that institutional owners have homogeneous preferences and, therefore, influence firms' decisions and market outcomes in the same way. However, it is well known that institutional owners are heterogeneous along several dimensions, and these differences lead them to vary greatly in their involvement in firms' supervision, voting, and decision-making in general.[1] One fundamental dimension institutional owners differ in is the concentration of their portfolios. While some institutions tend to hold small ownership stakes in several firms, blockholder investors hold larger stakes in firms. Following the literature, we define *institutional blockholders* as those institutional shareholders with more than 5% ownership in a given company (Holderness, 2009; Edmans, 2014; Fich et al., 2015). Figure 1 shows the evolution of total institutional ownership and blockholder institutional ownership in our sample of US firms. The figure shows an 86% increase in total institutional ownership from 1990 to 2012 (from 38.3% to 71.3%). Interestingly, it also highlights an even larger increase in blockholder ownership from 9.9% to 24.8% over the same period, i.e., an increase of 150%. Such a sharp increase in the concentration of institutional investors' holdings in the last decades makes an investigation of the effects of blockholders relative to the rest of institutional investors particularly relevant.

[Figure 1 about here.]

In this paper, we study the impact of large institutional investors, i.e., blockholders, on firms' decisions to invest in innovation and on firms' final innovation outcome. Innovation and technological progress are the most important engines of economic growth and development.[2] However, free-riding problems and market pressure in widely-held public companies may lead managers to invest in innovation inefficiently.[3] The presence of large shareholders in public companies has

[1] Iliev and Lowry (2015); Corum, Malenko, and Malenko (2021).

[2] Schumpeter (1911, 1942); Arrow (1962); Grossman and Helpman (1991); Aghion and Howitt (1992).

[3] Examples of these problems are the career concerns of risk-averse managers that fear being fired if a research project fails (Kaplan and Minton, 2006; Aghion et al., 2013), the obligation to publish quarterly results (Porter, 1992), or the pressure to meet periodically the earnings forecasts issued by financial analysts (Stein, 1988; He and Tian, 2013; Guo, Pérez-Castrillo, and Toldrà-Simats, 2019).

been recognized as a possible solution to free-rider problems and agency conflicts (Shleifer and Vishny, 1986). We aim to study whether the recent trend in institutional investors' ownership concentration has implications for corporate innovation.

We use a sample of US public firms that are constituents of the Russell 3000 index from 1990 to 2012. We use two different measures to capture firms' investment in innovation inputs. The first measure is firms' spending on Research and Development (R&D), which allows firms to produce innovation internally by exploiting their own resources. The second is firms' acquisitions of other innovative firms, which enables acquirers to enlarge their technological base by obtaining patents and know-how developed by other companies. Indeed, as the studies by Sevilir and Tian (2012) and Bena and Li (2014) show, firms that acquire other innovative companies with existing patents generate a higher future patent outcome. We first confirm that these two channels, i.e., R&D and the acquisition of innovation, are essential determinants of firms' future innovation output in our sample. Following the literature, we use firms' future number of patents and citations to measure innovation output.

We argue that firms use different channels to invest in innovation depending on the proportion of institutional ownership in the hands of blockholders. Accordingly, the type of institutional owners affects firms' final innovation outcome. Our arguments are the following. First, we build on the work of Bushee (1998, 2001) to develop our hypothesis regarding the effect of institutional blockholders on firms' investment in internal R&D. The author finds that institutional investors with low concentration and high turnover holdings ("transient investors") lead managers to invest myopically and reduce R&D. The reason is that these investors put pressure on managers to deliver short-term earnings and a reduction in R&D spending is immediately translated into an earnings increase. We argue that investors with large shareholdings alleviate short-term pressure on managers because they may trade less often and have a longer-term focus relative to more dispersed institutional investors. We predict that increases in institutional blockholder ownership relative to more dispersed institutional ownership lead firms to increase internal R&D.

Second, concerning firms' decisions to invest in external innovation, we argue that institutional blockholders may induce firms to reduce the number of acquisitions and the acquisition of external innovation for at least two reasons. The first reason is to prevent value-destroying acquisitions.[4] Entrenched managers have incentives to propose privately beneficial investments to extract rents at the expense of shareholders.[5] Anticipating such behavior from managers, blockholders may have pessimistic beliefs about the type of investments that managers submit and use their voices to influence the outcome of such proposals by voting against them. Indeed, institutional investors that

[4] Moeller, Schlingemann, and Stulz (2003) show that shareholders of large public firms lose money on average when acquiring other firms.

[5] Jensen (1986) argues that managers realize large personal gains from empire building. See also Morck, Shleifer, and Vishny (1990) and Lang, Stulz, and Walkling (1991).

hold large blocks of a company's stock can influence corporate strategy by overturning decisions through voting (Do, García-Osma, Toldrà-Simats, and Zhu, 2023). Alternatively, the mere threat of blockholder intervention may reduce managers' incentives to search for targets that maximize their private benefits rather than the firm's value (Burkart, Gromb, and Panunzi, 1997; Pagano and Röell, 1998). The reason is that the dissent of even a relatively small fraction of shareholders towards management proposals can affect managers' reputation and their career prospects.[6] Hence, either through voting or due to the mere threat of dissent, large shareholders have the power to affect managerial decision-making. Our hypothesis is that firms with more blockholder institutional ownership are less likely to undertake investments, such as mergers and acquisitions (M&A), which require voting consent.

The second reason why institutional blockholders may influence acquisition decisions is that investors holding large blocks of ownership may prefer their power not to be diluted (Martin, 1996; Faccio and Masulis, 2005). When acquiring another company, a firm usually has limited cash, and hence, it must decide whether to issue equity or debt to finance the acquisition. Since debt raises the probability and the cost of financial distress, firms often pay target investors in M&A deals issuing additional shares. As a result, acquiring firms' shareholders' ownership might be diluted after the deals.[7] Our hypothesis is that blockholders might oppose M&A deals to avoid dilution and maintain their existing control of the firm.

Both previous arguments suggest that, relative to dispersed institutional investors, the larger the percentage of shares in the hands of institutional blockholders, the fewer acquisitions the firm will make. With fewer acquisitions, firms' adoption of external innovation and know-how may also be reduced. Hence, we predict that increases in institutional blockholder ownership reduce firms' acquisitions and, in particular, the acquisition of innovation.

We test the above hypotheses taking into account the potential endogenous nature of companies' shareholder composition. Indeed, firms' institutional investor heterogeneity may depend on firm characteristics that also determine firms' innovation ability. Alternatively, more innovative firms may attract a specific type of institutional owners. To address these issues that compromise identification, we exploit a quasi-natural experiment by taking advantage of financial institutions' mergers. Financial institutions' mergers exogenously increase the concentration of institutional ownership in firms. The idea is that when two institutional investors merge, and the two investors

[6] Conyon (2015) shows that shareholder votes against management in "say-on-pay" proposals affect CEO pay negatively. Aggarwal, Dahiya, and Prabhala (2019) find that voting against directors in uncontested elections makes those directors more likely to leave the board or take less prominent positions if they stay. They also present evidence that these directors face reduced opportunities in the market for directors.

[7] Martin (1996) presents a sample in which around one-third of deals are equity deals, and around 50% are either equity or mixed equity and cash deals. In 1998, in the middle of our sample period, 50% of the value of all large deals was paid for entirely in stock, and only 17% was paid for entirely in cash (Rappaport and Sirower, 1999).

are investing in a given company before the merger, the merger event increases the probability that the resulting merged institution becomes a blockholder, i.e., that the merged institutional owner holds more than 5% in the company. Using a difference-in-differences strategy, we exploit this source of exogenous variation to identify the causal effect of blockholder ownership on firms' innovation activity and their innovation outcome.[8] Moreover, to avoid the concerns raised by the recent econometrics literature regarding the use of two-way fixed effects estimation in difference-in-difference settings with multiple events (de Chaisemartin and D'Haultfoeuille, 2020; Callaway and Sant'Anna, 2021; Goodman-Bacon, 2021; Sun and Abraham, 2021), we adopt a stacked-by-event design following Cengiz, Dube, Lindner, and Zipperer (2019).

We find evidence that firms affected by a merger of two of their institutional investors experience an increase in blockholder ownership relative to other firms in which only one of the merging investors is present. This result indicates that our source of exogenous variation significantly affects firms' blockholder ownership. Then, we study the effect of exogenous increases in blockholder ownership on firms' innovation inputs. We find that firms with higher blockholder ownership relative to more dispersed institutional ownership invest more in R&D. In contrast, firms with increased blockholder ownership are less likely to acquire other firms. These investors do not induce firms to acquire more innovation on average, either. Hence, our results suggest that firms with more blockholders tend to use more internal R&D and fewer external innovation sources.

The final effect of blockholder ownership on firms' innovation output depends on the strength of the two opposite effects of blockholders on firms' investments in innovation inputs. On the one hand, more investment in internal R&D could lead to more innovations a few years later. On the other hand, if firms acquire fewer companies, they will have a smaller stock of knowledge and patents, which could decrease their ability to develop new innovations using their internal R&D.

We test the effect of the composition of institutional ownership on firms' innovation output. We find that blockholder relative to dispersed institutional ownership negatively and significantly influences firms' future patents and citations. Hence, our results suggest that, by reducing acquisition activity and, as a consequence, the acquisition of know-how and patents that come from external sources, firms jeopardize their innovation output. Indeed, we find that internal R&D investment and the innovation acquired externally are complements in determining firms' future innovation output. Therefore, when blockholders reduce acquisitions of external innovation, they reduce firms' ability to leverage their internal R&D.[9]

We then explore the mechanisms behind the effect of blockholder ownership, relative to more

[8] He and Huang (2017) use financial institution mergers to study the effect of cross-ownership increases on product market competition.

[9] Our result is in line with previous literature suggesting that acquiring innovation externally is a way of stimulating internal innovation production (Chesbrough, 2003; Almirall and Casadesus-Masanell, 2010; Guo et al., 2019).

dispersed institutional ownership, on innovative acquisitions and R&D. Concerning firms' R&D expenditure, we find that firms with low blockholder ownership are significantly likely to cut R&D spending when they face pressure to meet or beat financial analysts' earnings forecasts. In contrast, firms with high blockholder ownership are not likely to cut R&D. These results suggest that blockholders mitigate short-term earnings pressure on managers, which may be why blockholders induce firms to increase internal R&D.

Regarding the negative effect of blockholders on the acquisition of external innovation, we find evidence of two mechanisms. First, in firms with more blockholder institutional ownership, the acquisitions that take place are less likely to dilute existing shareholders. More specifically, we find that more blockholder ownership reduces the number of new shares issued to pay for acquisitions relative to firms that make acquisitions with less concentrated institutional ownership. This result suggests that blockholders try to avoid dilution, which may be why they oppose acquisitions. Second, blockholders' negative effect on acquisitions is stronger in firms with poor corporate governance, which suggests that one of the motives for blocking acquisitions might be managerial empire-building.

Our results show that the pronounced increase in the concentration of institutional investors' shareholdings in public firms in the last decades, leading to the expansion in blockholder ownership, has sizable effects on firms' innovation strategy and output. The results indicate that this concentration may jeopardize the previously identified positive effect of institutional investors on innovation (Aghion et al., 2013). We shed light, in particular, on a (potentially unintended) effect of large shareholder ownership on innovation, which comes from blockholders' tendency to reduce acquisitions either to prevent empire-building or to avoid being diluted and losing control. Importantly, institutional blockholders have the potential to affect innovation beyond our findings: by reducing M&A activity, blockholders may not only curb the innovation output of the firms in which they invest, but they may also reduce the incentives of small firms to innovate because, in a less active acquisition market, small firms have lower chances of exit through a strategic sale to larger firms (Phillips and Zhdanov, 2013).

More generally, our results highlight the relevance of taking into account the heterogeneity among institutional investors. Specifically, we show that when institutional investors become blockholders, for example due to financial institutions' mergers, they may behave differently than when their ownership is more dispersed. Interestingly, this difference is not as a result of the classic loss-of-competition argument due to a merger but of the increase in the power of these institutions to influence management.

The rest of this paper is organized as follows. Section 2 discusses the related literature and our contribution. Section 3 presents the data and variables. Section 4 presents the baseline OLS results. Section 5 presents our identification strategy and the difference-in-differences results. Sections 6 and 7 explore the mechanisms. Section 8 concludes.

2 Related Literature

Our paper relates to three strands of literature. The first is the literature on institutional investors and innovation. The closest paper to ours is the seminal work by Aghion et al. (2013), who find that institutional owners increase innovation because they insulate managers from career concern risks. Rong, Wu, and Boeing (2017) find similar results for Chinese firms. Other related papers show that foreign institutional investors (Bena, Ferreira, Matos, and Pires, 2017; Luong, Moshirian, Nguyen, Tian, and Zhang, 2017) and hedge fund activists (Brav, Jiang, Ma, and Tian, 2018) also increase innovation output. Baysinger, Kosnik, and Turk (1991) show that institutional ownership concentration and R&D spending are positively associated. Similar to this literature, our paper also studies the effect of institutional investors on firms' innovation with two main differences. First, we focus on the heterogeneous effects of institutional investors, i.e., the impact of blockholders relative to more dispersed owners. Second, we study the impact on firms' innovation channels in addition to their final impact on firms' innovation output. In particular, in addition to studying R&D, we consider another innovation channel usually understudied in the literature, i.e., the acquisitions of external innovation. The study of these different channels together allows us to have a better idea of firms' innovation strategy.

The second strand of literature includes studies exploring the influence of different types of institutional owners on firm decisions, valuation, and performance. The seminal paper by Bushee (1998) classifies institutional owners into three groups mainly based on the concentration of their holdings and their portfolio turnover. The author finds that low-concentration-high-turnover investors encourage myopic investment behavior, negatively affecting R&D. Other papers focus on the effect of passive institutional investors, i.e., index trackers (Schmidt and Fahlenbrach, 2017; Appel, Gormley, and Keim, 2016; Crane, Michenaud, and Weston, 2016; Boone and White, 2015); on the role of activists (Aghion et al., 2013; Brav et al., 2008); or institutional investors' portfolio weights (Fich et al., 2015). We classify investors based on the relative size of their ownership share in the firm rather than their trading strategy,[10] which allows us to better identify the incentives and influence of large investors regardless of their trading strategy.

Finally, our paper is related to the extensive literature investigating the effect of large shareholders on corporate decisions, governance, and performance (see, for example, Shleifer and Vishny, 1986; Cronqvist and Fahlenbrach, 2009; Grennan, Michaely, and Vincent, 2017; Harford, Kecskés, and Mansi, 2018).[11] We contribute to this literature by studying the effect of large institutional

[10] Borochin and Yang (2017) also study the effect of large institutional ownership, but they focus on firms' misvaluation.

[11] See also Edmans (2014) for a literature review on blockholders and corporate governance.

investors relative to disperse institutional investors on firms' innovation strategy and outcome.

3 Data

3.1 Sample selection and data sources

We construct our sample based on information of US public firms that are constituents of the Russell 3000 index from 1990 to 2012.[12] We start by retrieving financial information for all the companies in Compustat during our sample period, excluding financial and utilities firms (standard industrial classification (SIC) codes between 4000 and 4999 and between 6000 and 6999). Then, we merge this data with information from several other databases, as we detail in what follows.

We use the Thomson Reuters Institutional Holdings 13F database (file s34) to obtain institutional ownership information to construct our main explanatory variables. For the last quarter of each year (reported on December 31) between 1990 and 2012, we collect information concerning the number of firms' outstanding shares, share prices, and the number of shares held by institutional investors in a given firm. File s34 of form 13F suffers from several data quality problems (Backus, Conlon, and Sinkinson, 2021). Therefore, we manually clean the data from duplicate observations and incorrectly assigned institutional holdings.[13] We also replace missing information on the end-of-quarter stock price and outstanding shares with data from the Center for Research in Security Prices (CRSP). After cleaning the data, we aggregate fund holdings at the institutional investor level.[14]

In addition to R&D expenses obtained from Compustat, we collect data to construct two additional measures of firms' innovation channels following Guo et al. (2019): firms' acquisitions and the innovativeness of the acquired targets. We get acquisition information from the Securities Data Company (SDC) Mergers and Acquisitions database.

We collect patent and citation information to construct measures of firms' innovation output. We obtain data from 1990 to 2006 from the National Bureau of Economic Research (NBER) Patent Citation database (Hall, Jaffe, and Trajtenberg, 2001). We extend the patent and citation data using the Harvard Business School (HBS) patent database, which includes patents granted and citations until 2010. We mitigate truncation problems by scaling the raw number of citations (patents) by the average number of citations (patents) in the same technology class in the same

[12] We intentionally pick this sample period to study a period of years consistent with our patents and citations data, which spans from 1990 to 2010, and with our identification strategy, which uses mergers of financial institutions for the period 1992 to 2009.

[13] The dataset contains duplicates of manager-stock-quarter observations. These duplicates are often followed by missing observations in subsequent quarters for the same manager-stock pair. We correct these erroneously dated observations.

[14] Some large institutional investors, such as BlackRock, report their holdings further disaggregated at the asset manager level. Following Gilje, Gormley, and Levit (2020), we aggregate this information when necessary.

year following Hall et al. (2001) and Atanassov (2013). To further address truncation problems, we exclude observations after 2008 in the regressions that require patent or citation information.[15]

We obtain financial analyst information from the Institutional Brokers Estimate Systems (I/B/E/S) database to construct a measure of analyst coverage used as a control in our regressions. Board characteristics come from BoardEx.

Finally, we obtain information on institutional mergers from He and Huang (2017). We use these mergers in our identification strategy (see Section 5).

3.2 Variable construction

3.2.1 Main independent variable

Our main independent variable is a measure of institutional blockholder ownership. We define blockholders[16] as those institutional investors holding at least 5% of the company's outstanding shares as of December 31st, each year. We define the variable *BlockOwn* as the total share of ownership of blockholders in the company.

3.2.2 Dependent variables

Our main dependent variables are measures of firms' innovation strategy and outcomes. We consider two measures to capture different ways firms can invest in innovation. First, firms can invest in internal R&D. To measure firms' in-house R&D activity, we construct the variable *R&D*, corresponding to firms' R&D expenses (scaled by total assets).[17] Second, acquisitions of other firms can be a source of know-how, patents, and other innovative assets. We measure firms' acquisition activity with two different variables: the dummy variable *Acquisition* that takes the value one if a firm acquires one or more companies in a specific year and equals zero otherwise; and *LnAcquisitions* which is the natural logarithm of (0.01 plus) the number of acquisitions (*NumofAcquisitions*) of a company in a given year.

To better assess whether acquisitions are a way for firms to invest in innovation, we use two variables that are proxies for the acquired firms' innovativeness. The variable *LnTargPatent* corresponds to the natural logarithm of (0.01 plus) the cumulative number of patents of firms' acquired targets (*NumofTargPatent*); the variable *LnTargCite* is analogously computed as the natural logarithm of (0.01 plus) the cumulative number of citations of all target firms (*NumofTargCite*). Both measures capture the innovation stock of target companies and are adjusted for truncation, as explained in the previous section.

[15] For more details on innovation data, see Guo et al. (2019).
[16] In this paper when we use the term "blockholders," we always refer to *institutional* blockholders only.
[17] In the variable R&D, we replace missing values in Compustat with zeros.

We measure firms' innovation output based on their patents and citations. The variable *LnPatents* is the natural logarithm of (0.01 plus) the number of applied and eventually granted patents each year. The variable *LnCitations* corresponds to the natural logarithm of (0.01 plus) the number of firms' citations each year. We also construct the variable *LnPatQual*, which proxies the firms' patent quality. It is the natural logarithm of (0.01 plus) a firm's total number of citations divided by the number of patents in a year. The three variables are adjusted for truncation problems.

To uncover the mechanisms behind our main results, in Section 7, we use two measures of the increase in firms' outstanding shares as dependent variables. The variable *LnShareIssue* is the natural logarithm of (0.01 plus) the percentage increase in outstanding shares. We eliminate share issuances of multiples of 100% of outstanding shares since they are likely to correspond to stock splits. We also eliminate negative increases in outstanding shares since they are likely to be due to buybacks. The second variable is *10pctIssue*, an indicator variable that takes value one if the firm increases its outstanding shares by more than 10%, and zero otherwise.

3.2.3 Control variables

Following the literature, we control for several firm and industry characteristics that can affect firms' investments in innovation inputs and their innovation output. We include *InstOwn* as a measure of total institutional ownership (i.e., the share of stocks held by all 13F institutions on December 31st each year). This measure is adjusted in those cases where the ownership by 13F institutions adds up to a value larger than one (for example, due to short selling) by downscaling each institutional investor's ownership.

We also include financial analyst coverage as a control since it significantly affects firm innovation, as previously shown in the literature (He and Tian, 2013; Guo et al., 2019). The variable *LnCoverage* is the natural logarithm of (one plus) the number of analysts, measured as the mean of the 12 monthly numbers of earnings forecasts that a firm receives annually, taken from the I/B/E/S summary file.

The rest of the control variables are *FirmSize*, which is the natural logarithm of total assets; *R&D*, which corresponds to firms' R&D expenses scaled by total assets; *FirmAge*, which is the number of years a firm has existed in Compustat; *Leverage*, which is the ratio of firm debt to total assets; *Cash*, which corresponds to firms' cash scaled by total assets; *Profitability*, which is the return on equity (ROE); *PPE*, which is computed as firms' property, plant, and equipment (PPE) scaled by total assets; *Capex*, which corresponds to firms' capital expenditures scaled by total assets; *MarketCap*, which measures firm's market capitalization at the fiscal year end; and the *KZ* index which is a measure of financial constraints (Kaplan and Zingales, 1997). We also include an index of corporate governance, *CGIndex*, following an approach similar to the one in

Bertrand and Mullainathan (2001). To capture industry concentration, we include the variable *HHI*, which is the Herfindahl-Hirschman index based on market shares. To mitigate the effect of outliers, we winsorize *Profitability* and the *KZIndex* at the 1st and 99th percentiles. We provide a detailed definition of the variables in Table 1.

[Table 1 about here.]

3.3 Summary Statistics

Table 2 provides summary statistics of all the variables used in our analysis.

[Table 2 about here.]

Our main independent variable is *BlockOwn*, the ownership by institutional blockholders. As we can see, on average, blockholders own 18.4% of companies' outstanding shares.

As for the dependent variables, the average ratio of firms' R&D to assets is about 5.2% in our sample. Regarding acquisitions, about 20.8% of firms in our sample acquire other firms in a given year, and the average number of acquired companies is 0.3, including those firms that do not acquire any target. Conditional on acquiring, the average firm acquires 1.4 target firms. In our sample, 4,062 firm-year observations are involved in acquisitions. Acquired firms in our sample have, on average, about 5.1 patents and 95.8 citations.

Concerning firms' innovation output, the average number of patents and citations is 12.4 and 139.6, respectively. The average number of citations per patent is 23. Additionally, the average share issuance of firms in our sample is about 7%, and about 17% of the companies increase their outstanding shares by more than 10%.

Since firms in our sample are all in the Russell 1000 and 2000 indexes, they are pretty large, mature, and get analyst attention. They also have additional institutional ownership that is not blockholder ownership. Specifically, the total institutional ownership of firms in our sample is about 63%. Hence, since blockholder ownership is around 18%, dispersed institutional owners account for the difference, i.e., about 45%. Firms in our sample are followed by around 8 financial analysts on average. Also, firms have about $1.96 billion in total assets on average, and the average firm age is 18.6 years. The mean leverage ratio of these firms is 19.5%, and they hold about 20% of their assets in cash and equivalents. Firms' profitability, measured by the return on equity, is 25.1%, the ratio of tangible to total assets is 25.8%, and the rate of capital expenditures to total assets is 6.1%. Firms' market capitalization is about $4.2 billion on average. The *KZIndex* is a measure of financial constraints, and a larger value means that firms are more financially constrained. Firms in our sample score -6.5 in the *KZIndex* on average, which means our firms are not highly financially constrained on average. The average corporate governance index score (*CGIndex*) is 0.13. Finally, the average industry concentration in our sample is about 28%.

4 Baseline Model and Results

In this section, we estimate the effect of blockholder ownership on firms' innovation inputs and output. However, before that, we want to confirm that our proposed innovation channels, i.e., firms' investments in internal R&D and acquisitions of other innovative companies, are significant determinants of firms' future innovation output.[18] We do so by estimating a regression model where the independent variables correspond to firms' internal R&D investment, i.e., firms' R&D scaled with total assets, and the acquisition of external innovation, i.e., the patent stock of acquired targets. The dependent variables in the model are our measures of firms' innovation output, which are firms' patents, citations, and patent quality measured with the number of citations divided by the number of patents. We include several lags of our regressors to capture the effect of these variables on firms' future patents and citations. Also, since the previous literature has found complementarities between internal R&D and external innovation acquisition (Cassiman and Veugelers, 2006), we add interaction terms of the two innovation channels in some specifications.

We estimate the following regression model using Ordinary Least Squares (OLS):

$$\begin{aligned} InnovationOutput_{(i,t)} &= \alpha + \sum_{k=1}^{3} \beta_k R\&D_{(i,t-k)} + \sum_{k=1}^{3} \delta_k LnTargPat_{(i,t-k)} \\ &+ \sum_{k=1}^{3} \gamma_k R\&D_{(i,t-k)} \times LnTargPat_{(i,t-k)} + \lambda X_{(i,t)} + \omega_i + \delta_t + \varepsilon_{(i,t)}, \end{aligned} \tag{1}$$

where i and t are sub-indexes for firm and year, respectively. The sub-index k captures the effect of past investments in innovation inputs on firms' innovation output. In $X_{(i,t)}$, we include a battery of controls that are other possible determinants of firm innovation. We also include firm and year fixed effects in λ_i and δ_t, respectively. These fixed effects control for firm unobserved heterogeneity and common time shocks, respectively. In the model, errors are robust and clustered at the firm level. We report the results in Table 3.

[Table 3 about here.]

In columns (1) and (2), the dependent variable is our patent-based measure of innovation output, *LnPatents*. In columns (3) and (4), we use the citation-based measure of innovation output, *LnCites*. In columns (5) and (6), we use patent quality, *LnPatQual*, as a dependent variable. As expected, increases in R&D investment are positively and highly significantly associated with firms' future innovation output, both in terms of patents, citations, and patent quality. This result suggests that internal R&D is a crucial determinant of firm innovation, even in the absence

[18] Sevilir and Tian (2012) and Bena and Li (2014) also find that firms' M&A activity plays a crucial role in determining their future innovation output.

of acquisitions of external innovation. In contrast, the coefficients of target innovativeness are generally not significant for firms with no internal R&D investment, which indicates that the acquisition of external innovation does not help firms increase *their* future patent and citation stock if the company does not count with an internal R&D unit to exploit the acquired know-how and assets. More importantly, the coefficients of the interaction terms are all positive, and significant in most cases, which is consistent with the complementarity of these innovation inputs in generating firms' innovation output. This result suggests that sourcing innovation inputs through engaging in M&A activities increases the productivity of in-house R&D investments, thereby increasing firms' future innovation output.[19]

Overall, our results indicate that both investments in internal R&D and external acquisitions are essential determinants of firms' future innovation.

We then proceed to estimate the effect of blockholder ownership on firms' innovation inputs and output. We test the following model using OLS:

$$Innovation_{(i,t+k)} = \alpha + \beta BlockOwn_{(i,t)} + \gamma X_{(i,t)} + \lambda_i + \delta_t + \varepsilon_{(i,t)}, \tag{2}$$

where the dependent variable, $Innovation_{(i,t+k)}$, corresponds to our different measures of innovation inputs or outputs, and i and t are sub-indexes for firm and year, respectively. The sub-index k can take different values, equal to 0, 1, 2, 3, or 4, indicating that the innovation inputs or outputs correspond to the current period, one, two, three, or four periods forward.

The main independent variable, $BlockOwn_{(i,t)}$, measures the total ownership held by institutional investors with a 5% ownership stake or more. In $X_{(i,t)}$, we include time-varying firm characteristics corresponding to the control variables described in the previous section. These control variables are included to control for other potential determinants of firm innovation. We also include firm and year fixed effects in λ_i and δ_t, respectively. Firm fixed effects control for time-invariant firm characteristics that can affect both the likelihood that firms attract blockholder ownership and their innovation strategy, such as managerial style. Year fixed effects control for time events that could affect both the presence of blockholders and firms' innovation efforts, like the business cycle. Standard errors are robust to heteroskedasticity and clustered at the firm level in all our specifications.

We present the results of our estimations in the following subsections. Although our regressions include fixed effects that control for unobserved heterogeneity and forward lags of the dependent variable to avoid simultaneity, the results from our baseline estimation cannot be interpreted as causal. We address endogeneity issues further in section 5.

[19] The results are similar if we use the measure of citations of the acquired targets, *LnTargCite*, as a measure for external innovation acquisition.

4.1 Institutional Blockholders and R&D

We first study the effect of institutional blockholders on firms' decisions to invest internaly in innovation, which we measure with firms' R&D spending scaled by total assets. We provide two arguments that can explain the effect of blockholders on R&D. The first is a short-termism argument, the second, a career concerns argument. First, Bushee (1998) argues that institutional investors engaged in momentum trading and high turnover strategies induce managers to reduce R&D investment to meet short-term earnings, i.e., the short-term view. We argue that large institutional investors, like blockholders, may have a positive effect on R&D. The reason is that, due to their larger ownership stakes, these investors may adopt trading strategies that are more focused on the long term or, at least, they may trade less frequently than more dispersed investors. If this is true, the presence of blockholder institutional investors may alleviate short-term pressure on managers and induce them to invest more in internal R&D. Second, blockholders, due to their large stakes, may also find it worthy to acquire information and supervise managerial activities, thus alleviating managers' career risk. Accordingly, lower career concerns may induce managers to invest more in risky investments such as R&D (Shleifer and Vishny, 1986; Aghion et al., 2013).

We test these ideas using model 2 and present the results of our estimations in Table 4.

[Table 4 about here.]

In Table 4, the different columns show the effect of blockholder ownership on firms' R&D spending in the same year (column (1)), and one, two, and three years later (columns (2), (3), and (4), respectively). As we can see, blockholders have a positive effect on firms' R&D investment one and two years ahead, and the effect is significant at the 10% level one year later. Specifically, a ten percentage point increase in blockholder ownership in a given year is correlated with a 1.54% increase in R&D expenditure with respect to the unconditional mean.

In our regressions, total institutional ownership is negatively and significantly correlated with firms' R&D investment, consistent with the previous literature (Bushee, 1998; Samila, Simeth, and Wehrheim, 2023). Since we control for total institutional ownership, our coefficient of *BlockOwn* captures the effect of increases in blockholder ownership relative to more dispersed institutional ownership, i.e., holding total ownership by institutional investors constant. Indeed, our objective is to understand how changes in the concentration of institutional ownership affect firm innovation. The results indicate that when blockholder ownership represents a larger percentage of total institutional ownership, firms' R&D spending decreases less. Hence, our preliminary estimations suggest that large institutional owners may mitigate the pressure effect of dispersed institutional investors on managers and/or reduce managerial career concerns. We study the presence of these mechanisms in section 6.

4.2 Institutional Blockholders and Acquisitions

In this section, we study the effect of blockholder ownership on firms' acquisition activity, which is a channel that firms may use to invest in external innovation. We argue that blockholders may have incentives to oppose acquisition proposals for at least two reasons. First, they may fear that, if new shares are issued to pay the target firm's investors, their ownership stake will be diluted and they will lose control rights. Second, blockholders may worry that managers with empire-building incentives propose value-destroying acquisitions. Accordingly, we expect that an increase in blockholder ownership relative to dispersed institutional ownership is related to lower acquisition activity.[20]

We test these ideas with our baseline model using acquisition measures as dependent variables. We report the results of our estimations in Table 5.

[Table 5 about here.]

In columns (1) to (3) of Table 5, Panel A, the dependent variable corresponds to a dummy variable equal to 1 when a firm acquires one or more firms that year, and 0 otherwise. In columns (4) to (6), we use the natural logarithm of (0.01 plus) the number of firms' acquisitions in a year, as our dependent variable. As we can see in the first three columns, an increase in blockholder ownership relative to dispersed institutional ownership leads to a reduction in firms' likelihood of acquiring other firms one, two, and three years later. Specifically, a 10 percentage point increase in blockholder ownership is related to a decrease of 1.4% in the probability of acquiring other firms one and two years later, and a decrease of 0.7% three years after. Since the mean probability of acquisitions is about 21%, these percentages represent a decrease of 6.67% and of 3.3% over the unconditional mean the first two years and three years later, respectively. Consistently, the estimates of our coefficients in the last three columns, indicate that a larger share of blockholder ownership relative to dispersed ownership reduces the number of acquisitions. Hence, our results suggest that blockholder institutional investors have an economically and statistically significant negative effect on acquisitions.

Since acquisitions are one of the main channels that firms may use to invest in external innovation, we explore whether blockholder ownership affects the type of targets acquired, depending on their cumulative innovation content. Indeed, if blockholders were worried about jeopardizing innovation when impeding acquisitions, they could vote in favor of only those acquisitions of very innovative targets, and, as a result, we would see no decrease or even an increase in acquired innovation. To explore this, we estimate the effect of blockholder ownership on the total innovativeness

[20] Alternatively, if blockholders are more focused on obtaining long-term value, they may induce managers to pursue more acquisitions that will create future value by exploiting economies of scale and synergies. In that case, we would observe a positive effect of blockholder ownership on firm acquisition activity.

of acquired targets. We measure target firms' innovativeness with their aggregated stock of patents and citations up to the acquisition date. We present the results of these estimations in Table 5, Panel B.

The results indicate that increases in blockholder ownership relative to dispersed institutional ownership have a negative and significant effect on acquired innovation. Hence, when blockholders reduce acquisitions, they do not compensate for the possible negative implications on innovation by increasing the innovativeness of target firms for those acquisitions that take place. As a result, firms' acquisition of external innovation is lower the larger the share of blockholder ownership relative to dispersed ownership.[21]

In sum, by blocking acquisitions, large institutional investors reduce firms' access to external innovation.[22]

4.3 Institutional Blockholders and Innovation outcomes

We now investigate whether the influence of blockholders on firms' investment in innovation results in significant changes in firms' innovation output. As we explained above, previous research suggests that investing in external innovation can increase the efficiency and effectiveness of firms' internal innovation processes leading to more productive inventions because internal and external innovation are complements. Our results in the previous sections suggest that firms with more blockholders increase their investments in internal R&D but reduce access to external innovation by blocking acquisitions. According to these arguments, we expect blockholders to have a negative effect on innovation output. We test the total effect of blockholder investors on firms' innovation output using model 2, where the dependent variable corresponds to firms' number of patents, citations, and the quality of patents measured by the average number of citations per patent. Since it takes time for companies to develop new patents and for the patents to be cited, we study the effect of blockholder ownership on the patent and citation output three and four years later. We present the results in table 6.

[Table 6 about here.]

Columns (1) to (4) of Table 6 show that firms with more blockholder ownership relative to dispersed institutional ownership generate fewer patents and citations three and four years later. Columns (5) and (6) indicate that blockholder ownership is also negatively and significantly related to firms' future innovation quality.

[21] Untabulated regressions show that the average target innovativeness is not significantly affected, suggesting that blockholders' concern about acquisitions may be unrelated to innovation.

[22] Interestingly, total institutional ownership increases acquisitions, and it seems that, by allowing firms to acquire more, these investors increase firms' acquisitions of external innovation.

The estimates of the variable *InstOwn* in Table 6 show that institutional owners have an overall positive and significant effect on innovation output, as suggested by the previous literature (Aghion et al., 2013). Hence, our results together indicate that blockholders reduce the positive effect of institutional ownership on innovation output.

5 Identification

In this section, we address potential endogeneity problems in our previous estimations. There are many reasons why firms with more blockholder ownership may change their innovation strategy and their innovation outcome. The fixed effects included in our baseline model address some of these concerns, for instance, permanent differences in firms or industries and the business cycle. Still, institutional blockholders do not invest randomly, so there might be time-varying unobserved firm characteristics that induce changes in blockholder ownership and innovation. Specifically, certain types of corporate culture or managerial attributes may encourage blockholder ownership and discourage innovation. Such non-random behavior may bias our estimates in the OLS model.

To address endogeneity concerns, we exploit exogenous events that increase the concentration of institutional investor ownership. These events are the mergers of financial institutions.[23] When two institutional investors merge and both investors hold shares in the same firm before the merger, the total ownership of the merged entity may become a substantial portion of the ownership in the firm. Hence, the merger of two financial institutions may increase blockholder ownership, i.e., holdings of 5% or more, in a given firm. Following He and Huang (2017), we use 38 financial institution mergers between 1992 and 2009.[24] The complete list of mergers and their details are provided in Appendix A in He and Huang (2017). To the extent that the mergers of institutional investors do not depend on the specific characteristics of the firms in which these institutions invest, such mergers provide an exogenous source of variation for changes in firms' blockholder ownership.[25]

We take advantage of this quasi-natural experiment to test our ideas using a generalized difference-in-differences (DID) model. We provide a detailed explanation of our empirical strategy in the next section.

[23] This identification strategy has been used in the previous literature by Huang (2014) and He and Huang (2017).

[24] We exclude the merger between J.P Morgan Chase & Co. and BNY-Consumer Business in 2006 of He and Huang (2017) from our merging list because we cannot identify the target institution (i.e., BNY-Consumer Business) in our sample.

[25] See Huang (2014) and He and Huang (2017) for a detailed discussion about the exogeneity of institutional investors' mergers with respect to portfolio firms' characteristics.

5.1 Sample and Empirical Strategy

From the sample of listed firms retrieved from Compustat, we select our sample of treated and control firms based on their institutional investors' holdings before the merger events. Precisely, we classify a firm as treated if both merging institutions of a merger event invest in that firm the quarter before the merger announcement and at least one of the two investors is not a blockholder. To reduce the noise that could come from small institutional ownership stakes, we also require that at least one of the merging institutions holds more than 1% of the firm's outstanding shares. Firms are classified in the control group if only one of the two merging institutional investors holds a stake in that firm or both investors are blockholders the quarter before the merger.[26] Hence, all the firms in our sample have a share of ownership held by one or the two institutional investors participating in the mergers.

Our objective is to determine the effect of changes in blockholder ownership due to financial institutions' mergers on firm innovation by estimating a generalized DID model. The recent econometrics literature has raised concerns about using the traditional two-way-fixed effects to estimate DID models with heterogeneous treatment (de Chaisemartin and D'Haultfoeuille, 2020; Callaway and Sant'Anna, 2021; Goodman-Bacon, 2021; Sun and Abraham, 2021). One of the concerns raised by Chaisemartin and D'Haultfoeuille (2020) is that linear regression models with group fixed effects estimate weighted sums of average treatment effects (ATEs). The authors show that when treatment effects are heterogeneous across groups and over time, the estimated coefficient may be negative due to negative weights, even if all the ATEs are positive. To address this problem, we follow the literature and adopt a stacked-by-event design following Cengiz et al. (2019). The stacked design ensures that the estimates are obtained by comparing the outcomes of treated observations to the outcomes of observations that have not yet been treated. We start by constructing a sample of treated and control firms for each merger event. For each event, we keep a nine-year window around the merger year for each firm: four years before and after the event plus the merging year based on the announcement date. We choose a rather large window to capture changes in both innovation inputs and output. However, we estimate our model using different windows depending on the variables studied.

Following Cengiz et al. (2019), we stack all of the event-specific samples by event year to construct our final dataset. Aligning events by the event year instead of the calendar year can mitigate negative weighting problems in the multiple events setting. To further avoid bias due to heterogeneous treatment effects, we clean both treated and control firms in the stacked dataset by taking the following steps. First, similar to Cengiz et al. (2019), we drop all control firms treated by other merger events within the nine-year window of a given merger event. Second, for

[26] If both merging investors are blockholders before the merger, we include the firm in the control group because the total blockholder ownership is not affected by the merger event in this case.

each merger event, we also drop all control firms that are treated by previous merger events, i.e., events before the nine-year window related to this merger. Finally, in the third step, for each merger event, we drop treated firms that have already been treated in previous merger events. As a result, in our treated group, we only consider those firms that are treated for the first time in each event, and in the control group, we only consider those firms that have not yet been treated by a previous merger event. In this way, we remove the possible effect of previously treated firms on both treated and control groups.

To further increase the similarity between our treated and control group of firms, we match our treated firms to similar control firms from the pool of controls in each merger event using propensity score matching. Precisely, for each merger event, we match treated firms to a set of control firms based on their year-end blockholder ownership one year before the merger year. We obtain up to four matched control firms. The matching is done with replacement and a caliper equal to 0.1.

We end up with a stacked sample with a maximum of 16,769 observations. Using this sample, we estimate the following difference-in-differences model using two-way fixed effects:

$$Innovation_{(i,t)} = \alpha + \beta Treat \times Post + \delta Treat + \gamma Post + \mu X_{(i,t)} + \lambda_i + \nu_m + \varepsilon_{(i,t)}, \qquad (3)$$

where the dependent variable, $Innovation_{(i,t)}$, corresponds to our measures of innovation inputs or outputs depending on the specification, and i and t are firm and year identifiers, respectively. *Treat* is a dummy variable that equals one for treated firms and zero for control firms. *Post* is a dummy variable that equals one for the post-merger years and zero for the pre-merger years of each merger event. $X_{(i,t)}$ is the same vector of control variables used in our OLS regressions. However, to avoid bad controls problems (Angrist and Pischke, 2009), we replace the pre-merger values of our control variables with their value in year $t-4$, i.e., 4 years before the merger, and we replace their post-merger values for their values in year t, i.e., the merger year. We include firm fixed effects in λ_i to control for permanent differences across firms.[27] Finally, following the multiple events literature, we include merger fixed effects in ν_m to control for heterogeneity across cohorts. In this model, β is the DID coefficient. It captures whether treated firms, i.e., those whose blockholder ownership increases due to financial institutions' mergers, invest more or less in innovation and produce more or less innovation output after being affected by the merger events

[27] Notice that the included firm fixed effect is not completely collinear with our indicator variable *Treat*, since the same firm can be a control in one merger and treated in another merger (in different years).

relative to the control firms.[28]

5.2 The Effect of Mergers on Blockholder Ownership

In this section, we first study whether blockholder ownership increases for firms affected by the mergers of financial institutions relative to unaffected firms. To test that, we estimate model 3 but take, as dependent variables, two measures of blockholder ownership. The first measure, $MergingBlockOwn_{(i,t)}$, is firms' blockholder ownership by the merging institutions. The second measure, $BlockOwn_{(i,t)}$, corresponds to firms' total ownership held by institutional blockholders. The results of these regressions are shown in Table 7.

[Table 7 about here.]

In Table 7, the different columns show the results of different specifications of the model using different windows around the merger events. In columns (1) and (5), we estimate the model using observations that belong to one year before the merger event and the merger year, i.e., the window (-1,0). In columns (2) and (6), we use observations corresponding to one year before and one year after the merger year, i.e., the window (-1,+1). In columns (3) and (7), we include observations that correspond to the two years before and two years after the merger year, i.e., window (-2,+2). And finally, in columns (4) and (8), we include those that belong to three years before and after the merger year, i.e., window (-3,+3). Also, in columns (1) to (4) the dependent variable corresponds to blockholder ownership by the merging institutional investors, and in columns (5) to (8) it corresponds to total institutional blockholder ownership. The coefficient of interest, i.e., $Treat \times Post$, is positive and significant in all regressions. Hence, affected firms experience a positive and significant increase in blockholder ownership after being affected by a financial institution merger (columns (5) to (8)), and this increase seems to be driven by the increase in blockholder ownership of the institutional investors that are involved in the merger (columns (1) to (4)). Accordingly, we can pursue our analysis using financial institutions' mergers as a natural experiment to identify the effect of increases in blockholder ownership on corporate innovation.

For robustness, we also verify that the key identification assumption behind our DID strategy holds. Indeed, the identification of our treatment effects relies on the assumption that financial institutions' mergers are exogenous, i.e., the reason why institutional investors' mergers take place is not related to the different evolution of firms in the treated group compared to the firms in the control group. We test the parallel trends assumption by estimating the same model as before but

[28] In the unstacked dataset, we test for the presence of negative weights in our sample using the estimator developed by de Chaisemartin and D'Haultfoeuille (2020). We find that in all our regressions, between 8% and 17% of the average treatment effects on the treated (ATTs) have negative weights, and the average negative weight range is from -0.045 to -0.106. Hence, the problem of negative weights is not severe in our dataset. However, the fact that we find negative weights provides a rationale for the use of the stacked methodology in our study.

allowing the DID coefficient to vary for each pre-merger and merger years. We test the parallel trends assumption using our measures of blockholder ownership, innovation inputs, and innovation outputs as dependent variables. We present the results in Table 8:

[Table 8 about here.]

As we can see, the parallel trends assumption generally holds for the main variables included in our analysis because none of the coefficients is statistically significant in the pre-merger years. Notice that we find a significant increase in blockholder ownership in the merger year. The reason is that some mergers occur before the year's end, and therefore, the end-of-year blockholder ownership already reflects the effect of the merger.

We use our natural experiment to test the effect of exogenous increases in blockholder ownership on firm innovation in the following sections.

5.3 The effect of Blockholders on R&D expenses

In this section, we explore exogenous increases in blockholder ownership on firms' R&D spending. We estimate model 3 using our measure of firms' R&D investment as a dependent variable and different event windows. We report our estimates in Table 9.

[Table 9 about here.]

As we can see, the coefficient of $Treat \times Post$ is positive and significant in all specifications. The effect of blockholder ownership on R&D spending is economically stronger and statistically more significant the first year after blockholder ownership increases. In fact, by looking at Column (2) of Table 8, we already observe a positive and significant effect of blockholder ownership on R&D in the same year in which the merger takes place. Two and three years later, the economic effect is reduced by about half, remaining statistically significant at the 10% level.

Overall, an increase in blockholder ownership has a positive and significant effect on firms' investment in internal R&D, corroborating our previous OLS results. Specifically, R&D increases by 0.9 percentage points on average the first year after blockholder ownership increases, representing an increase of 17% over the unconditional mean; and it increases about 0.5 percentage points two and three years after, i.e., an increase of about 9% over the unconditional mean.

5.4 The effect of Blockholders on Acquisition Activity

In this section, we test the effect of blockholder ownership on firms' acquisition activity and the innovativeness of the acquired targets using our natural experiment. We present the estimation results in Table 10.

[Table 10 about here.]

As we can see in Panel A of Table 10, the coefficients of interest are all negative and statistically significant. The results in Columns (1) to (3) show that, after increases in blockholder ownership, firms' likelihood of acquiring other firms decreases by about 4 percentage points during the three years following the increase in blockholder ownership. This reduction in the probability of acquisitions is a relatively large economic effect since it represents a decrease of about 20% over the unconditional mean. Columns (4) to (6) show similar results regarding the number of acquisitions. That is, affected firms acquire about 20% fewer targets. Hence, our results confirm our previous findings using the OLS model, i.e., firms with more blockholder ownership acquire fewer companies than firms with smaller institutional owners.

Firms' acquisition activity has the potential to affect innovation if, in addition to acquiring less, firms acquire less innovative companies. We test the effect on the innovativeness of acquired targets, estimating our model using, as the dependent variable, the stock of patents and citations of target firms. We report the regression results in Table 10, Panel B. Our results indicate that large institutional investors lead firms to acquire less external innovation. Indeed, the coefficients in all the regressions are negative and significant at least at the 5% level two and three years after the exogenous increase in blockholder ownership takes place. Specifically, companies acquire about 15.55% and -20.39% fewer patents, two and three years after blockholder ownership increases, respectively. Similarly, companies acquire about 14.44% and 18.78% fewer citations two and three years after increases in blockholder ownership, respectively. These results are again consistent with the results from our previous OLS estimations.

5.5 The effect of Blockholders on Innovation Output

In this section, we test the effect of exogenous increases in blockholder ownership on firms' innovation output using our natural experiment. As in our OLS model, we study the effect on firms' innovation output three and four years after blockholder ownership increases. We report the results in Table 11.

[Table 11 about here.]

Columns (1) to (4) of Table 11 show that large institutional owners have a negative and highly significant effect on firms' future number of patents and citations. These results confirm our previous OLS results and indicate that even if large investors have a positive effect on R&D investment, which should increase innovation output, reducing external innovation jeopardizes firms' innovative capacity, which results in a net effect that is negative and large. Specifically, after blockholder ownership increases, the average number of firms' patents and citations decreases by about 34.5% to 45.0%. The average quality of patents does not seem to be affected (columns (5) and (6)).

Our results indicate that the positive impact of institutional investors on innovation previously found in the literature (Aghion et al., 2013) disappears when such institutional investors become large. These results also suggest that financial institutions' mergers are not anodyne, as they have important consequences for the concentration of ownership in firms and their corporate strategy.

6 Blockholder ownership and R&D - Mechanism

In this section, we conduct further analysis to uncover the mechanisms through which blockholders influence firm innovation. We first examine possible mechanisms behind blockholders' positive effect on R&D.

6.1 Investor pressure

According to the literature, the effect of firms' ownership structure on R&D investment usually depends on firms' pressure to obtain short-term earnings versus generating long-term revenues. On the one hand, the literature has shown that managers may decrease R&D expenditure due to the *pressure effect* related to the potential disciplinary actions against them when they miss the earnings forecasts periodically issued by financial analysts. Managers do not want to miss analysts' earnings forecasts because investors often react negatively, leading to stock price drops. To avoid missing analysts' forecasts, managers have an incentive to increase earnings in the short run (Bartov, Givoly, and Hayn, 2002). One way to do it is by cutting internal R&D because R&D investments are expensed in the income statement, and cutting them leads to immediate earnings increases (Guo et al., 2019). Moreover, these investments do not tend to affect revenues in the short term because they do not usually generate short-term income (Hazarika, Karpo, and Nahata, 2012; He and Tian, 2013). On the other hand, the literature on large shareholders suggests that blockholders care more about long-term performance than smaller investors (Shleifer and Vishny, 1986). Hence, they may influence firms' R&D strategy by insulating managers from the pressure to meet analysts' earning forecasts. If this mechanism plays a role, we expect firms with more blockholder ownership to suffer less pressure and cut R&D expenditures less often than firms with less blockholder ownership.

To explore this mechanism, we follow Guo et al. (2019), who isolate the pressure effect of financial analysts by using the measure Earnings Per Share Pressure, *EPSP*, defined as the difference between the actual earnings per share (*EPS*) reported by firms and the analysts' consensus forecasts for those firms that are followed by analysts. The authors first identify a discontinuity in the likelihood of decreasing R&D expenditures around an earnings pressure threshold. Specifically, they find, consistently with the pressure effect hypothesis, that firms that meet or beat analysts' forecasts are more likely to have cut their R&D expenses than those that miss the target forecasts. We study whether blockholders influence the pressure effect on managers by running the same regression model for our whole sample of firms, and for two subsamples of firms with high and low blockholder ownership split by the median.

We estimate the following regression model:

$$\begin{aligned} R\&D_{(i,t)} = \alpha + \beta_1 I_{MeetBeat(i,t)} + \beta_2 EPSP_{(i,t)} + \beta_3 EPSP^2_{(i,t)} + \beta_4 EPSP_{(i,t)} * I_{MeetBeat(i,t)} \\ + \beta_5 EPSP^2_{(i,t)} * I_{MeetBeat(i,t)} + \beta_6 X_{(i,t)} + \lambda_i + \delta_t + \varepsilon_{(i,t)} \end{aligned} \quad (4)$$

where $I_{MeetBeat(i,t)}$ is an indicator variable equal to 1 for firms that meet or beat analyst consensus forecasts and 0 for firms that miss them, and $EPSP_{(i,t)}$ is the amount of EPS pressure measured as the difference between the actual and the consensus forecast *EPS*. Since pressure should be stronger when the EPSP is around zero, we focus on the observations around this threshold, i.e., where the absolute difference between the actual and forecasted EPS is less than 20 cents (i.e., $-0.2 < EPSP < 0.2$). Following the regression discontinuity literature, we use a polynomial functional form and interactions to not impose restrictions on the underlying conditional mean functions (Angrist and Pischke, 2009). Finally, we include our usual battery of controls in $X_{(i,t)}$ and firm and year-fixed effects. Errors are robust and clustered at the firm level. We report the results in Table 12.

[Table 12 about here.]

Table 12, Panel A, shows the results of the regression model (4) for our whole sample. As we can see, we replicate the results of Guo et al. (2019), using our sample. The estimated coefficients indicate that meeting or beating analysts' consensus forecasts significantly predicts firms' likelihood of cutting R&D in the short term, i.e., at t.

In Panel B of Table 12, we present the results of the split sample analysis. The results show that firms with low blockholder ownership are more likely to cut R&D to meet analysts earnings forecasts, suggesting that the pressure effect on managers is stronger in firms with less institutional blockholders.[29] In contrast, the coefficient of $I_{MeetBeat(i,t)}$ is not significant for the subsample of firms in which blockholder ownership is above the median. Hence, our results indicate that firms with larger institutional owners feel less pressure to cut R&D expenses to meet or beat analyst

[29] Since the pressure to meet *EPS* forecasts mainly occurs in the last months of the year, when the accounts close, we use the yearly average shares of blockholder ownership instead of the December ownership to split the sample.

forecasts. These results are consistent with Bushee (1998), who reports that cutting R&D expenses in response to a decrease in earnings is more likely to happen when a large portion of institutional owners are short-term investors.

Overall, our analysis confirms that blockholders are less likely to put pressure on managers to reduce R&D expenses than dispersed owners. In our opinion, this mechanism may explain the positive effect of large institutional ownership on R&D investment.[30]

7 Blockholder ownership and acquisitions - Mechanisms

We explore two possible mechanisms that may drive the negative effect of blockholder investors on firms' acquisition activity.

7.1 Dilution

One of the reasons why institutional blockholders may reduce firms' acquisition activity is that large shareholders fear losing ownership and control over firms due to the dilution of their stakes that could occur in an acquisition event (Martin, 1996; Faccio and Masulis, 2005). Dilution happens when the acquiring company uses stocks (possibly in combination with cash) as the payment method for target shareholders in M&A transactions. Issuing new shares to pay target shareholders may be the only feasible (or the cheapest) financing method if the firm has limited cash, and financial constraints restrict its ability to finance the transaction using debt.[31]

If blockholders fear dilution, they may vote against acquisition decisions, which might be the reason why we observe fewer acquisitions in firms with more blockholder ownership in our analyses above. But this dilution argument also suggests that, in the presence of blockholders, the acquisitions that actually take place might be those that require issuing fewer shares, for example,

[30] An alternative mechanism that could explain the positive effect of blockholder institutional investors on firms' R&D investment is managerial career concerns. As argued by Aghion et al. (2013), in a model à la Holmström (1982), risk-averse managers may prefer not to innovate because of the risk of being fired if things go wrong for purely stochastic reasons. Institutional investors, by monitoring managers, may 'insulate' managers from the risk of being fired because they can distinguish between low effort and bad luck. Hence, in the presence of institutional ownership, managers may invest more in innovation. Aghion et al. (2013) test this mechanism by distinguishing between more and less competitive industries, arguing that this effect should be stronger in more competitive industries, where the risk of being fired is larger. We test the career concern mechanism in our sample by separating firms in high and low concentration industries splitting the sample by the median Herfindahl-Hirschman index. We find no significant differences of the effect of blockholders on R&D in more or less competitive industries. Specifically, the effect of blockholders on R&D expenditure is positive and significant in both groups. Hence, this mechanism does not seem to be driving the results in our sample.

[31] Evidence suggests that many M&A deals are done using equity swaps as the method of payment. Martin (1996) presents a sample in which around one-third of deals are pure equity deals, and around 50% are either equity or mixed equity and cash deals. Another study shows that around 50% of the value of all large deals was paid for entirely in stock, and only 17% was paid for entirely in cash in 1998. This study uses a sample of firms in the middle of our sample period (Rappaport and Sirower, 1999).

because firms have enough cash or can take on debt to finance the transaction.

Since we cannot test the effect of blockholders on acquisitions that do not take place, we test the presence of an "anti-dilution effect" of blockholders for the acquisitions that take place by estimating the following regression model using OLS:[32]

$$\begin{aligned} ShareIssue_{(i,t+k)} &= \alpha + \beta_1 BlockOwn_{(i,t)} \times Acquisition_{(i,t+k)} + \beta_2 Acquisition_{(i,t+k)} \\ &+ \beta_3 BlockOwn_{(i,t)} + \gamma X_{(i,t)} + \lambda_i + \delta_t + \varepsilon_{(i,t)}, \end{aligned} \tag{5}$$

where i and t are firm and year identifiers, respectively, and k can take the value of 0, 1, or 2. The dependent variable, *ShareIssue*, is measured in the data with two variables: *LnShareIssue*, which is the (natural logarithm of 0.01 plus the) percentage increase in outstanding shares adjusted for stock splits and buybacks, and the indicator variable, *10pctIssue*, which takes the value one if the change in outstanding shares (adjusted for stock splits) is larger than 10% with respect to the previous year's number of outstanding shares.[33] The main coefficients of interest are the ones of the interaction terms $BlockOwn_{(i,t)} \times Acquisition_{(i,t+k)}$. These coefficients capture the effect of blockholder investors on firm share issuances when firms acquire other companies.

[Table 13 about here.]

Table 13 shows the results. The coefficients of the variables $Acquisition_{(i,t+k)}$ are always positive and significant, indicating, as expected, that acquisitions often lead to an increase in the firm's outstanding shares. However, the coefficients of the variables $BlockOwn_{(i,t)} \times Acquisition_{(i,t+k)}$ are always negative and significant, which indicate that the presence of blockholders reduces the previous effect. Specifically, acquisitions in the presence of dispersed institutional ownership entail an increase in firms' number of shares of about 60% on average. However, in firms with blockholder ownership, this effect is eliminated. Similarly, for large increases in the percentage of shares issued, i.e., more than 10%, the point estimates of columns (4) to (6) of Table 13, indicate that, without blockholders, firms are about 12% more likely to do large share issuance when they acquire other firms; but blockholder presence completely eliminates this effect. Hence, the payment method M&A deals done by firms with a large presence of blockholders involve lower share issuances.

It is also interesting to notice that the coefficient of *BlockOwn* is also generally negative and significant, indicating that the presence of blockholder ownership in firms relative to more dispersed ownership is associated with lower share issuances in general, that is, also when no acquisitions

[32] We use OLS and not DID in this setting because we want to study the effect of blockholders on the payment method for those acquisitions that take place. Using triple differences would require to have enough firms that acquire both in the pre- and post-period.

[33] We have also used indicators with 5% and 20% thresholds, and the results are qualitatively similar.

take place. This result might suggest that blockholders fear being diluted also for reasons other than acquisitions.

Overall, our results suggest that the proposed mechanism may be at play: the fear of dilution may lead blockholders to block acquisitions which would entail large share increases because this would dilute their existing ownership and controlling stake.

7.2 Governance

A second mechanism behind the negative effect of blockholders on acquisitions may be managers' empire-building incentives. One of the main fears of shareholders (and other investors) is that managers make decisions that benefit them to the detriment of firm value (Jensen, 1986; Morck et al., 1990; Lang et al., 1991). Large shareholders like institutional blockholders may have the incentives and power to discipline management by acting as a corporate governance mechanism to prevent opportunistic behavior. In particular, blockholders may vote against acquisitions to prevent managers from undertaking value-destroying investments, such as acquisitions. As a result, firms' acquisition activity will be reduced.

To study this mechanism, we estimate our DID model, where the dependent variable corresponds to firm acquisitions, by splitting the sample into two groups of firms with good and poor corporate governance. According to our previous arguments, blockholders should worry more about value-destroying investments in firms with poor corporate governance. Hence, if this mechanism is at work, we expect the negative effect of blockholder ownership on acquisitions to be stronger in poorly-governed firms. We split our sample into two subsamples of firms using the medial value of the governance index *CGIndex*. Table 14 presents the results.

[Table 14 about here.]

The estimates in columns (1) to (3) of Table 14 indicate that well-governed firms do not experience decreases in their acquisition activity as a result of increases in blockholder ownership. In contrast, for firms with poor corporate governance, the estimates indicate that exogenous increases in blockholder ownership reduce firms' probability of acquisitions by about 10 percentage points (Columns (4) to (6)), which represents a reduction of about 50% of the unconditional mean. Therefore, the results also support our proposed mechanism that blockholders may reduce firms' acquisition activity because they act as a governance mechanism that helps prevent managers' "empire-building" acquisitions.[34]

[34] We run the same regressions with our continuous variable *LnAcquisition*. Results (untabulated) are qualitatively very similar.

8 Conclusion

This paper inquires about the differential effect of institutional blockholders relative to dispersed institutional owners on firms' innovation investments and output.

We find that blockholders have two opposite effects on firms' investment decisions related to innovation. On the one hand, blockholder ownership leads to an increase in firms' investment in internal R&D. On the other hand, blockholders decrease the likelihood of acquisitions, reducing the acquisition of external innovation. The final effect on firms' future patents and citations is negative and statistically significant. We attribute this negative effect to a reduction in firms absorptive capacity. The reason is that investments in internal and external innovation are complements in determining firms' future innovation output and blockholders reduce firms' acquisitions of external innovation. This reduction jeopardizes firms' ability to innovate because they obtain lower returns from their investments in internal innovation.

Our empirical analysis sheds light on the mechanisms behind blockholders' influence. We find that blockholders induce companies to invest in (or not to cut) R&D by insulating managers from the pressure to meet analysts' earnings forecasts. We also find that blockholders reduce firms' acquisition activity to prevent managerial empire-building and avoid being diluted and losing control.

Our paper complements previous research on the effects of institutional investors on corporate decisions. It highlights that institutional investors are heterogeneous, and their impact on their investee companies depends on the investors' type. By focusing on firm innovation, we show, for instance, that the positive effect of institutional investors on firms' innovation output (Aghion et al., 2013) may disappear, or is at least greatly reduced if the institutions are blockholders.

Our results call for further investigation of the consequences of the increasing concentration of institutional ownership in the last decades on corporate decisions.

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Table 1: Variable Definitions

Variables	Definitions
Independent variable	
BlockOwn	Percentage of firm's outstanding shares held by blockholders at the end of the (calendar) year.
Dependent variables	
R&D	Firm's R&D expenses (Compustat data item ♯46) to total assets (♯6)
Acquisition	Indicator variable equal to one when a firm acquires one or more other companies, and zero otherwise
LnAcquisitions	Natural logarithm of (0.01 plus) the number of target companies acquired
LnTargPatent	Natural logarithm of (0.01 plus) the accumulated number of patents of all target firms acquired
LnTargCite	Natural logarithm of (0.01 plus) the accumulated number of citations of all target firms acquired
LnPatents	Natural logarithm of (0.01 plus) the number of granted patents per year of a firm
LnCitations	Natural logarithm of (0.01 plus) the number of citations per year of a firm
LnPatQual	Natural logarithm of (0.01 plus) the average number of citations per patent of a firm
mergingBlockOwn	Percentage of firm's outstanding shares held by merging institutions that are blockholders at end of (calendar) year.
LnShareIssue	Natural logarithm of (0.01 plus) the percentage increase in outstanding shares
10pctIssue	Indicator variable equal to one if a firm increases its outstanding shares by more than 10%, and zero otherwise
Control variables	
InstOwn	Percentage of firm's outstanding shares held by 13F institutions (Thomson Reuters s34 file)
LnCoverage	Natural logarithm of (one plus) the arithmetic mean of the 12 monthly numbers of earnings forecasts obtained from financial analysts
FirmSize	Natural logarithm of the book value of total assets (♯6) at the end of the fiscal year
FirmAge	Natural logarithm of the number of years listed on Compustat
Leverage	Book value of debt ($\sharp 9 + \sharp 34$) divided by book value of total assets (♯6)
Cash	Cash (♯1) at the end of fiscal year divided by book value of total assets (♯6)
Profitability	Operating income before depreciation (♯13) divided by book value of total stockholders' equity (♯216)
PPE	Property, plant, and equipment (♯8) divided by book value of total assets (♯6)
Capex	Capital expenditure (♯128) divided by book value of total assets (♯6)
MarketCap	Market capitalization of equity ($\sharp 199 \times \sharp 25$)
KZIndex	Kaplan and Zingales index calculated as $-1.002\times$ cash flow $[(\sharp 18 + \sharp 14)/\sharp 8]$ plus $0.283\times$ Tobin's Q plus $3.139\times$ Leverage minus $39.368\times$ dividends $[(\sharp 21 + \sharp 19)/\sharp 8]$ minus $1.315\times$ cash holdings ($\sharp 1/\sharp 8$), where ♯8 is lagged
CGIndex	Average of three standardized variables: the percentage of independent directors on a board, G-index, and CEO duality
HHI	Herfindahl-Hirschman Index calculated as sum of sales revenue scaled by sales of four-digit standard industrial classification (SIC) code

Table 2: **Summary Statistics.** This table reports the descriptive statistics for the variables of our main regressions based on the sample of US public firms from 1990 to 2012.

Variable	25th percentile	Median	Mean	75th percentile	Std. Dev.	No. of Obs.
Independent variable						
BlockOwn	0.069	0.167	0.184	0.274	0.142	28679
Dependent variables						
R&D	0.000	0.008	0.052	0.069	0.097	28679
Acquisition	0.000	0.000	0.208	0.000	0.406	28679
NumofAcquisitions	0.000	0.000	0.283	0.000	0.679	28679
NumofTargPatent	0.000	0.000	5.105	1.000	38.799	4062
NumofTargCite	0.000	0.000	95.760	5.000	548.136	4062
Patents	0.000	0.000	12.361	2.000	84.004	16512
Citations	0.000	0.000	139.637	13.000	1038.238	16512
PatQual	0.000	0.000	22.984	9.713	76.649	16512
mergingBlockOwn	0.000	0.000	0.009	0.000	0.029	13742
ShareIssue	0.000	0.010	0.072	0.043	0.164	27947
10pctIssue	0.000	0.000	0.169	0.000	0.375	27947
Controls						
InstOwn	0.441	0.663	0.627	0.837	0.257	28679
Coverage	3.250	6.083	7.987	10.750	6.666	28679
FirmSize (in $billion)	0.238	0.582	1.962	1.573	5.883	28679
FirmAge (in years)	9.000	15.000	18.638	27.000	12.500	28679
Leverage	0.011	0.155	0.195	0.310	0.208	28679
Cash	0.032	0.118	0.200	0.301	0.216	28679
Profitability	0.144	0.266	0.251	0.384	0.448	28679
PPE	0.093	0.193	0.258	0.360	0.216	28679
Capex	0.022	0.041	0.061	0.074	0.067	28679
MarketCap (in $billion)	0.338	0.813	4.181	2.413	22.494	28679
KZIndex	-6.147	-1.359	-6.494	0.692	17.829	28679
CGIndex	-0.252	0.045	0.128	0.613	0.610	28679
HHI	0.131	0.217	0.281	0.369	0.202	28679

Table 3: **R&D, target innovativeness, and innovation output.** This table presents OLS regression results of the effect of R&D investments, the innovative content of the targets, and their interaction one $(t-1)$, two $(t-2)$, and three $(t-3)$ years backward. *LnPatents* and *LnCites* are the natural logarithm of (0.01 plus) the total number of patents and citations, respectively. *LnPatQual* is the natural logarithm of (0.01 plus) firm's average citation count per patent. *R&D* is the R&D expenses scaled by total assets and *LnTargPatent* is the natural logarithm of (0.01 plus) the accumulated number of patents of all the targets. We include a battery of controls and fixed effects that are usual in the literature. All variables are defined in Table 1. Robust standard errors clustered at the firm level are in parentheses. $***$, $**$, and $*$ indicate significance at the 1%, 5%, and 10% level, respectively.

Dependent variable	*LnPatents*		*LnCites*		*LnPatQual*	
	(1)	(2)	(3)	(4)	(5)	(6)
	t	t	t	t	t	t
$R\&D_{t-1}$	1.327**	1.926***	1.380**	2.067***	3.146***	4.036***
	(0.540)	(0.746)	(0.541)	(0.771)	(0.907)	(1.312)
$R\&D_{t-2}$	1.107*	2.130**	1.428**	2.498***	2.037**	3.670***
	(0.590)	(0.838)	(0.689)	(0.845)	(0.992)	(0.941)
$R\&D_{t-3}$	1.487***	2.684***	1.590***	2.931***	2.151***	2.552***
	(0.427)	(0.693)	(0.499)	(0.805)	(0.634)	(0.964)
$LnTargPatent_{t-1}$	0.024*	0.014	0.025*	0.013	0.018	0.004
	(0.013)	(0.016)	(0.013)	(0.016)	(0.017)	(0.022)
$LnTargPatent_{t-2}$	0.014	-0.003	0.009	-0.008	0.013	-0.015
	(0.013)	(0.015)	(0.014)	(0.016)	(0.017)	(0.020)
$LnTargPatent_{t-3}$	-0.007	-0.027*	-0.007	-0.030*	0.003	-0.003
	(0.013)	(0.016)	(0.014)	(0.017)	(0.017)	(0.020)
$R\&D_{t-1}\times LnTargPatent_{t-1}$		0.153		0.176		0.216
		(0.155)		(0.163)		(0.233)
$R\&D_{t-2}\times LnTargPatent_{t-2}$		0.266*		0.276*		0.442***
		(0.159)		(0.160)		(0.168)
$R\&D_{t-3}\times LnTargPatent_{t-3}$		0.314**		0.354**		0.087
		(0.145)		(0.164)		(0.180)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	14236	14236	14236	14236	14236	14236
adjusted R^2	0.695	0.695	0.685	0.685	0.621	0.621

Table 4: **Blockholders and R&D expenses.** This table presents OLS regression results of the effect of Blockholder ownership on firms' R&D investments in the current year (t) and one ($t+1$), two ($t+2$), and three ($t+3$) years forward. R&D investments *R&D* that captures firms' variations in R&D expenses scaled by total assets. We include a battery of controls and fixed effects that are usual in the literature. All variables are defined in Table 1. Robust standard errors clustered at the industry level are in parentheses. $***$, $**$, and $*$ indicate significance at the 1%, 5%, and 10% level, respectively.

Dependent variable	*R&D*			
	(1)	(2)	(3)	(4)
	t	$t+1$	$t+2$	$t+3$
BlockOwn	-0.003	0.008*	0.002	-0.001
	(0.004)	(0.005)	(0.005)	(0.005)
InstOwn	-0.008**	-0.018***	-0.011***	-0.002
	(0.003)	(0.003)	(0.004)	(0.004)
Coverage	0.009***	0.004***	0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)
FirmSize	-0.031***	-0.013***	-0.006***	-0.003*
	(0.002)	(0.002)	(0.002)	(0.002)
FirmAge	0.006**	-0.003	-0.004	-0.005
	(0.003)	(0.003)	(0.003)	(0.003)
Leverage	0.010*	-0.007	-0.014**	-0.011*
	(0.005)	(0.007)	(0.005)	(0.006)
Cash	-0.011	0.013*	0.008	0.008
	(0.007)	(0.007)	(0.007)	(0.006)
Profitability	-0.011***	-0.006***	-0.004**	-0.003
	(0.003)	(0.002)	(0.002)	(0.002)
PPE	0.049***	0.035***	0.019*	0.000
	(0.010)	(0.012)	(0.011)	(0.010)
Capex	0.009	-0.006	-0.017*	-0.014
	(0.010)	(0.013)	(0.010)	(0.010)
MarketCap	0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
KZIndex	0.001***	0.000***	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
HHI	-0.006	-0.000	-0.003	0.003
	(0.005)	(0.006)	(0.007)	(0.006)
CGIndex	-0.002**	-0.001	0.000	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Year fixed effects	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Observations	28679	24996	21805	19132
$adjusted R^2$	0.800	0.768	0.791	0.787

Table 5: **Blockholders and acquisitions.** This table presents OLS regression results of the effect of Blockholder ownership on firms' acquisition activity one (*t+1*), two (*t+2*), and three (*t+3*) years forward. Panel A displays the firms' acquisition activity with two variables: the dummy *Acquisition* that takes the value one if a firm acquires one or more companies in the year and equals zero otherwise and *LnAcquisitions* that is the natural logarithm of (0.01 plus) the total number of acquired companies. Panel B uses as dependent variables two measures of the targets' innovativeness: *LnTargPatent* and *LnTargCite*, the natural logarithm of (0.01 plus) the accumulated number of patents and citations, respectively, of all the targets. We include a battery of controls and fixed effects that are usual in the literature. All variables are defined in Table 1. Robust standard errors clustered at the firm level are in parentheses. $***$, $**$, and $*$ indicate significance at the 1%, 5%, and 10% level, respectively.

Panel A: Acquisitions

Dependent variable		*Acquisition*			*LnAcquisitions*	
	(1)	(2)	(3)	(4)	(5)	(6)
	$t+1$	$t+2$	$t+3$	$t+1$	$t+2$	$t+3$
BlockOwn	-0.136***	-0.141***	-0.066*	-0.698***	-0.692***	-0.324*
	(0.033)	(0.033)	(0.036)	(0.158)	(0.160)	(0.175)
InstOwn	0.115***	0.054*	0.053*	0.585***	0.280**	0.285*
	(0.025)	(0.029)	(0.030)	(0.121)	(0.140)	(0.146)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	24996	21805	19132	24996	21805	19132
adjusted R^2	0.160	0.154	0.145	0.173	0.166	0.157

Panel B: Targets' Innovativeness

Dependent variable		*LnTargPatent*			*LnTargCite*	
	(1)	(2)	(3)	(4)	(5)	(6)
	$t+1$	$t+2$	$t+3$	$t+1$	$t+2$	$t+3$
BlockOwn	-0.153	-0.235**	0.059	-0.143	-0.255**	0.086
	(0.121)	(0.120)	(0.117)	(0.124)	(0.124)	(0.119)
InstOwn	0.130	0.299***	0.250***	0.136	0.302***	0.252**
	(0.096)	(0.097)	(0.093)	(0.100)	(0.101)	(0.099)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	20702	19083	17823	20702	19083	17823
adjusted R^2	0.095	0.097	0.096	0.096	0.099	0.098

Table 6: **Blockholders and innovation output.** This table presents OLS regression results of the effect of Blockholder ownership on firms' innovation output three (*t+3*) and four (*t+4*) years forward. The firms' innovation output is measured with three variables. *LnPatents* and *LnCites* are the natural logarithm of (0.01 plus) the total number of patents and citations, respectively. *LnPatQual* is the natural logarithm of (0.01 plus) firm's average citation count per patent. We include a battery of controls and fixed effects that are usual in the literature. All variables are defined in Table 1. Robust standard errors clustered at the firm level are in parentheses. $***$, $**$, and $*$ indicate significance at the 1%, 5%, and 10% level, respectively.

Dependent variable	*LnPatents*		*LnCites*		*LnPatQual*	
	(1)	(2)	(3)	(4)	(5)	(6)
	$t+3$	$t+4$	$t+3$	$t+4$	$t+3$	$t+4$
BlockOwn	-0.424*	-0.628***	-0.507**	-0.688***	-0.540*	-0.474*
	(0.219)	(0.228)	(0.229)	(0.235)	(0.291)	(0.287)
InstOwn	0.579***	0.689***	0.594***	0.722***	0.627**	0.638**
	(0.190)	(0.204)	(0.197)	(0.211)	(0.256)	(0.264)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17823	16797	17823	16797	17823	16797
adjusted R^2	0.638	0.623	0.624	0.608	0.587	0.575

Table 7: **DiD Test of the Effect of Institutional Mergers on Blockholder ownership.** This table presents the multivariate difference-in-differences (DiD) test results on the effect of financial institutions' mergers on blockholder ownership by the merging institutions and total blockholder ownership. *mergingBlockOwn* is the percentage of firms' outstanding shares held by merging institutions as blockholders. *BlockOwn* is the percentage of firms' outstanding shares held by all blockholders. *Post* is a dummy that equals one for the post-event period and zero for the pre-event period. *Treat* is a dummy variable that equals one if a firm is a treatment stock and zero if it is a control. All variables are defined in Table 1. Robust standard errors clustered at the firm level are in parentheses. $***$, $**$, and $*$ indicate significance at the 1%, 5%, and 10% level, respectively.

Dependent variable	*mergingBlockOwn*				*BlockOwn*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$(-1,0)$	$(-1,+1)$	$(-2,+2)$	$(-3,+3)$	$(-1,0)$	$(-1,+1)$	$(-2,+2)$	$(-3,+3)$
Treat × *Post*	0.012***	0.007***	0.008***	0.008***	0.013**	0.017***	0.016***	0.023***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.005)	(0.006)	(0.006)	(0.006)
Post	-0.002*	-0.003**	-0.002*	-0.003*	-0.002	-0.011*	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.005)	(0.006)	(0.006)	(0.007)
Treat	-0.001	0.005	0.006	0.007	0.028	0.023	0.026	0.022
	(0.005)	(0.004)	(0.004)	(0.005)	(0.023)	(0.026)	(0.022)	(0.022)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Merger fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5114	6652	10339	13742	5114	6652	10339	13742
adjusted R^2	0.580	0.664	0.602	0.574	0.633	0.648	0.621	0.597

Table 8: **Parallel Trends.** This table presents the parallel trends for the main dependent variables. *BlockOwn* is the percentage of firms' outstanding shares held by all blockholders. *R&D* is firms' R&D expenses scaled by total assets. *NumofAcquisitions* is the number of targets acquired by a firm in a given year. *Patents* is the number of granted patents per year. *Treat* is a dummy variable that equals one if a firm is a treatment stock and zero if it is a control. *Year-t* is an indicator that takes a value of 1 for observations t years before the merger events and zero otherwise. All variables are defined in Table 1. Robust standard errors clustered at the firm level are in parentheses. $***$, $**$, and $*$ indicate significance at the 1%, 5%, and 10% level, respectively.

Dependent variable	*BlockOwn* (1)	*R&D* (2)	*NumofAcquisitions* (3)	*Patents* (4)
Year-3 × *Treat*	0.002	0.002	0.020	0.293
	(0.006)	(0.003)	(0.046)	(0.784)
Year-2 × *Treat*	0.013*	0.004	-0.022	0.403
	(0.007)	(0.004)	(0.060)	(1.413)
Year-1 × *Treat*	0.012	-0.004	-0.041	-0.276
	(0.009)	(0.004)	(0.059)	(1.569)
Year0 × *Treat*	0.024***	0.006*	-0.078	-1.423
	(0.009)	(0.004)	(0.059)	(1.591)
Control variables	Yes	Yes	Yes	Yes
Merger fixed effects	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Observations	16769	16769	16769	14236
adjusted R^2	0.585	0.794	0.241	0.870

Table 9: **DiD Test of the Effect of Blockownerhip on R&D Expenses.** This table presents the multivariate difference-in-differences (DiD) test results on the effect of blockownership on R&D expenses scaled by total assets (*R&D*). *Post* is a dummy that equals one for the post-event period and zero for the pre-event period. *Treat* is a dummy variable that equals one if a firm is a treatment stock and zero if it is a control. All variables are defined in Table 1. Robust standard errors clustered at the firm level are in parentheses. $***$, $**$, and $*$ indicate significance at the 1%, 5%, and 10% level, respectively.

Dependent variable		*R&D*	
	(1)	(2)	(3)
	$(-1,+1)$	$(-2,+2)$	$(-3,+3)$
Treat × *Post*	0.009**	0.005*	0.004*
	(0.004)	(0.003)	(0.003)
Post	0.004	0.005**	0.005***
	(0.003)	(0.002)	(0.002)
Treat	-0.001	-0.004	-0.006
	(0.007)	(0.007)	(0.005)
Control variables	Yes	Yes	Yes
Merger fixed effects	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
Observations	6652	10339	13742
adjusted R^2	0.791	0.793	0.790

Table 10: **DiD Test of the Effect of Blockownerhip on Acquisition Activity.** This table presents the multivariate difference-in-differences (DiD) test results on the effect of blockownership on the firm's acquisition activity. In Panel A, *Acquisition* is a dummy variable equal to one when a firm acquires one or more other companies, and zero otherwise. *LnAcquisition* is the natural logarithm of (0.01 plus) the number of target companies acquired. Panel B uses as dependent variables two measures of the targets' innovativeness: *LnTargPatent* and *LnTargCite*, the natural logarithm of (0.01 plus) the accumulated number of patents and citations, respectively, of all the targets. *Post* is a dummy that equals one for the post-event period and zero for the pre-event period. *Treat* is a dummy variable that equals one if a firm is a treatment stock and zero if it is a control. All variables are defined in Table 1. Robust standard errors clustered at the firm level are in parentheses. $***$, $**$, and $*$ indicate significance at the 1%, 5%, and 10% level, respectively.

Panel A: Acquisitions

Dependent variable		*Acquisition*			*LnAcquisitions*	
	(1)	(2)	(3)	(4)	(5)	(6)
	$(-1,+1)$	$(-2,+2)$	$(-3,+3)$	$(-1,+1)$	$(-2,+2)$	$(-3,+3)$
Treat $\times$ *Post*	-0.047*	-0.037*	-0.047**	-0.214*	-0.174*	-0.220**
	(0.027)	(0.021)	(0.020)	(0.130)	(0.101)	(0.097)
Post	0.019	0.018	0.027	0.105	0.104	0.141*
	(0.025)	(0.018)	(0.017)	(0.119)	(0.088)	(0.083)
Treat	0.043	-0.007	0.013	0.196	-0.053	0.033
	(0.058)	(0.050)	(0.044)	(0.274)	(0.241)	(0.211)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Merger fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6652	10339	13742	6652	10339	13742
adjusted R^2	0.228	0.215	0.190	0.240	0.229	0.202

Panel B: Targets' Innovativeness

Dependent variable		*LnTargPatent*			*LnTargCite*	
	(1)	(2)	(3)	(4)	(5)	(6)
	$(-1,+1)$	$(-2,+2)$	$(-3,+3)$	$(-1,+1)$	$(-2,+2)$	$(-3,+3)$
Treat $\times$ *Post*	-0.115	-0.169**	-0.228***	-0.096	-0.156**	-0.208***
	(0.094)	(0.075)	(0.072)	(0.099)	(0.077)	(0.074)
Post	0.104	0.130**	0.175***	0.083	0.113*	0.155***
	(0.079)	(0.064)	(0.058)	(0.085)	(0.066)	(0.059)
Treat	-0.232	-0.234	-0.192	-0.245	-0.241	-0.192
	(0.200)	(0.212)	(0.162)	(0.211)	(0.217)	(0.163)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Merger fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6038	9538	12384	6038	9538	12384
adjusted R^2	0.139	0.122	0.106	0.148	0.128	0.111

Table 11: **DiD Test of the Effect of Blockownerhip on Innovation Output.** This table presents the multivariate difference-in-differences (DiD) test results on the effect of blockownership on the firm's innovation output. *LnPatents* is the natural logarithm of (0.01 plus) the number of granted patents per year of a firm. *LnCitations* is the natural logarithm of (0.01 plus) the number of citations per year of a firm. *LnPatQual* is the natural logarithm of (0.01 plus) the average number of citations per patent of a firm. *Post* is a dummy that equals one for the post-event period and zero for the pre-event period. *Treat* is a dummy variable that equals one if a firm is a treatment stock and zero if it is a control. All variables are defined in Table 1. Robust standard errors clustered at the firm level are in parentheses. $***$, $**$, and $*$ indicate significance at the 1%, 5%, and 10% level, respectively.

Dependent variable	*LnPatents*		*LnCitations*		*LnPatQual*	
	(1)	(2)	(3)	(4)	(5)	(6)
	$(-3, +3)$	$(-4, +4)$	$(-3, +3)$	$(-4, +4)$	$(-3, +3)$	$(-4, +4)$
Treat × *Post*	-0.456***	-0.598***	-0.423***	-0.552***	0.022	-0.131
	(0.110)	(0.117)	(0.111)	(0.116)	(0.155)	(0.160)
Post	-0.351***	-0.374***	-0.331***	-0.360***	-0.752***	-0.910***
	(0.114)	(0.118)	(0.114)	(0.114)	(0.168)	(0.163)
Treat	-0.059	-0.096	-0.276	-0.262	-0.808**	-0.758**
	(0.231)	(0.208)	(0.240)	(0.217)	(0.404)	(0.355)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Merger fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	12384	15083	12384	15083	12384	15083
adjusted R^2	0.767	0.753	0.759	0.746	0.709	0.685

Table 12: **Regression Discontinuity Analysis of the Effect of Blockholder Ownership on R&D cut.** This table shows how the effect of earnings pressure on firms' R&D activities is influenced by the blockholder ownership. In the panel A, we show results of the regression discontinuity analysis of analysts' earnings pressure on firms' R&D activities for the whole sample. The earnings pressure is captured by EPSP (i.e., distance between analysts' forecasts and firms' actual earnings per share) and an indicator variable that equals one when firms meet or beat analysts' forecasts. The dependent variable is a dummy equal to one if firms cut R&D with respect to the previous year and zero otherwise. We use several specifications including one-degree and two-degree polynomials. In the panel B, we split the sample by the median value of the variable *AvgBlockOwn* constructed as the average amount of blockholder ownership of a firm over a year. We include the firm-level controls, year and firm fixed effects for all the regressions. Robust standard errors are in parentheses. $***$, $**$, and $*$ indicate significance at the 1%, 5%, and 10% level, respectively.

Panel A: The Whole Sample

Dependent variable	*R&D Cut*		
	(1)	(2)	(3)
	t	t	$t+1$
$I_{MeetBeat(i,t)}$	0.025*	0.036**	0.007
	(0.014)	(0.018)	(0.019)
EPSP	-0.200	-0.561	-0.654
	(0.158)	(0.521)	(0.574)
EPSP polynomial	1-order	2-order	2-order
Observations	14863	14863	12893
adjusted R^2	0.054	0.054	0.063

Panel B: Low/High Blockholder Ownership

Dependent variable	*R&D Cut*			
Subsample	*Low BlockOwn*		*High BlockOwn*	
	(1)	(2)	(3)	(4)
	t	t	t	t
$I_{MeetBeat(i,t)}$	0.040**	0.045*	0.017	0.035
	(0.020)	(0.026)	(0.021)	(0.028)
EPSP	-0.300	-0.521	-0.052	-0.623
	(0.240)	(0.787)	(0.238)	(0.804)
EPSP polynomial	1-order	2-order	1-order	2-order
Observations	7431	7431	7432	7432
adjusted R^2	0.061	0.061	0.050	0.050

Table 13: **Blockholders, Acquisitions, and Dilution.** This table presents OLS regression results of the effect of Blockholder ownership on firms' share issuance in the same year (t), and one ($t+1$) and two ($t+2$) years forward. The firms' share issuance is measured with two variables. *LnShareIssue* is the natural logarithm of (0.01 plus) the percentage change increase in outstanding shares adjusted for stock splits. *10pctIssue* is a dummy variable that takes the value one if a firm increases its outstanding shares by more than 10%, and zero otherwise. We include a battery of controls and fixed effects that are usual in the literature. All variables are defined in Table 1. Robust standard errors clustered at the firm level are in parentheses. $***$, $**$, and $*$ indicate significance at the 1%, 5%, and 10% level, respectively.

Dependent variable		*LnShareIssue*			*10pctIssue*	
	(1)	(2)	(3)	(4)	(5)	(6)
	t	$t+1$	$t+2$	t	$t+1$	$t+2$
BlockOwn	-2.581***	-0.691***	0.476***	-0.393***	-0.139***	0.010
	(0.155)	(0.159)	(0.164)	(0.030)	(0.029)	(0.030)
InstOwn	1.795***	1.128***	0.006	0.262***	0.177***	0.015
	(0.123)	(0.126)	(0.140)	(0.024)	(0.025)	(0.026)
$Acquisition_t$	0.650***			0.128***		
	(0.054)			(0.011)		
$BlockOwn \times Acquisition_t$	-0.897***			-0.172***		
	(0.220)			(0.043)		
$Acquisition_{t+1}$		0.623***			0.116***	
		(0.054)			(0.011)	
$BlockOwn \times Acquisition_{t+1}$		-0.681***			-0.126***	
		(0.226)			(0.045)	
$Acquisition_{t+2}$			0.610***			0.096***
			(0.056)			(0.011)
$BlockOwn \times Acquisition_{t+2}$			-0.833***			-0.083*
			(0.249)			(0.050)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	27947	24973	21774	27947	24973	21774
adjusted R^2	0.271	0.271	0.258	0.168	0.156	0.133

Table 14: **DiD Test of the Effect of Blockholder ownerhip on Acquisition: Split Sample Analysis by Governance.** This table presents the split sample analysis of the multivariate difference-in-differences (DiD) test results on the effect of blockholder ownership on acquisition. The sample is split using the variable *CGIndex*. *Post* is a dummy that equals one for the post-event period and zero for the pre-event period. *Treat* is a dummy variable that equals one if a firm is a treatment stock and zero if it is a control. All variables are defined in Table 1. Control variables that capture firm, industry, and merger characteristics are included. Robust standard errors clustered at the firm level are in parentheses. $***$, $**$, and $*$ indicate significance at the 1%, 5%, and 10% level, respectively.

Dependent variable	*Acquisition*					
Subsample	*Good Governance*			*Poor Governance*		
	(1)	(2)	(3)	(4)	(5)	(6)
	$(-1,+1)$	$(-2,+2)$	$(-3,+3)$	$(-1,+1)$	$(-2,+2)$	$(-3,+3)$
Treat × *Post*	0.015	0.006	-0.018	-0.115***	-0.082**	-0.104***
	(0.044)	(0.033)	(0.028)	(0.043)	(0.035)	(0.033)
Post	-0.085**	-0.056*	-0.042*	0.161***	0.127***	0.136***
	(0.041)	(0.031)	(0.025)	(0.037)	(0.029)	(0.027)
Treat	0.107	0.097	0.116*	-0.163	-0.260***	-0.207***
	(0.080)	(0.073)	(0.060)	(0.117)	(0.091)	(0.074)
Observations	3127	5081	6794	3126	5132	6832
adjusted R^2	0.217	0.205	0.188	0.269	0.245	0.212

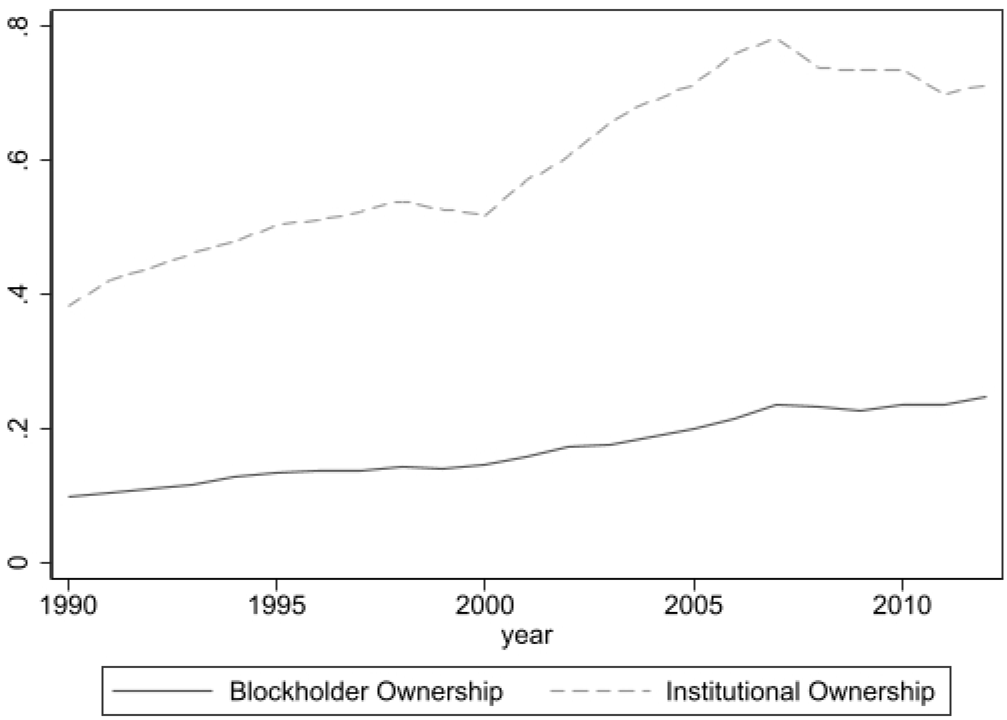

Figure 1: Institutional and Block Ownership in US publicly traded companies over time.