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Empirical evidence on the effect of intra-conglomerate competition in the effectiveness of
internal capital markets

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Abstract

Recent research on corporate diversification suggests the existence of superior performance of conglomerates over specialized firms during recessions. The existence of internal capital markets facilitates the re-distribution of cash flows within conglomerates. Nevertheless, the allocation of funds to a specific segment is contingent on the conglomerate's internal competition for funds. I find noticeable evidence that less competitive conglomerates enhance their responsiveness to investment opportunities to a greater extent during recessionary periods, comparatively to highly competitive conglomerates and specialized firms. Moreover, I find evidence that fiercer intra-conglomerate competition is correlated with greater dependence of investment on internally generated cash flows.

Keywords: Corporate diversification, Internal capital markets, Business cycle, Capital allocation.

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1. Introduction

The relationship between recessions and firms' accessibility to external capital markets has proven to be the outcome of a complex interplay among several factors. Declining levels of economic activity cause companies to exhibit decreased performance. Consequently, stock prices often experience declines, prompting investors to shift their preference towards counter-cyclical stocks, thus rendering the issuance of equity more challenging. Such escalation in consumer pessimism and increased uncertainty regarding the future also leads companies to postpone their investment decisions. All else being equal, reduced demand for external credit funds should lead to narrower interest rate spreads. However, companies' under-performance also leads external creditors to be more cautious and risk-averse, as fears that borrowers will not be able to meet their debt obligations intensify. As a result, not only do external investors reduce their credit supply availability but also price debt more severely, imposing stricter covenants. The outcome of credit markets' conditions will entirely depend on the relative strength of each side.

To shed further light on this dynamic, recent empirical studies provide valuable insights. For instance, (Campello, Graham, and Harvey 2010) directly surveyed CFOs of financially constrained companies during the financial crisis of 2008. The authors found that 81% of the firms experienced limited credit availability, while 59% mentioned having experienced higher costs of funds. (Ivashina and Scharfstein 2010) also documented that lending activity of all debt types substantially declined during the same period.

In situations where the access to external capital markets is restricted, firms tend to rely more on internal sources of funding. (Campello, Graham, and Harvey 2010) found that half of the surveyed firms relied on internally generated cash flows and about 40% relied on cash reserves to fund investment opportunities. More interestingly, the authors found that 56% of

financially constrained firms cancelled investment projects during tight external capital markets, while only 31% of unconstrained firms admitted having done so.

Evidently, during credit-constrained periods, not all positive NPV projects can be financed. One strategic approach companies may leverage to overcome such limitations involves operating within a diversified corporate structure. Conglomerates are organization structures under which several smaller independent and often unrelated segments report to the same holding company, hereby designated as *headquarters*. Although financial constraints curtail the extent to which capital is invested in profitable projects, the evidence presented by (Hovakimian 2011) and (Stein 1997) suggests that, during recessions, headquarters can generate value by proactively redistributing limited funds to segments with more favourable investment prospects, i.e. by giving segments access to an internal capital market. By taking advantage of such organizational form, conglomerates can allocate capital to segments which would not have been as much funded otherwise. Unlike other non-owner intermediaries, such as banks, conglomerates have the potential to engage in a strategic selection process, commonly referred to as "winner-picking" which allows them to create value without necessarily alleviating credit constraints.

The rest of the paper is organized as follows. Section 2 reviews some of the related literature and explores the reasoning behind the formulation and development of the main hypothesis to be tested. Section 3 describes the sample and variables used throughout the discussion. Section 4 starts by discussing the methodology used and is further divided into two different subsections. Section 4.1. presents the systematic differences concerning the efficiency of investment allocation between conglomerates and specialized firms. Section 4.2 introduces intra-conglomerate competition and explores its effects on the efficiency of internal capital markets of conglomerates. Section 5 concludes.

2. Literature Review and hypothesis development

Considerable research effort has been devoted to studying the efficiency of internal capital markets. Numerous articles have failed to provide evidence in favour of conglomerates (see, for example, (Lamont 1997), (Shin, and Stulz 1998), (Scharfstein 1998) and (Ozbas and Scharfstein 2010)). Nevertheless, recent research suggests the existence of superior performance of conglomerates over stand-alone firms during recessions (see, for example (Dimitrov and Sheri 2006), (Hovakimian 2011) and (Wang 2023)).

(Dimitrov and Sheri 2006) highlights internal capital markets and the effect of combining imperfectly correlated divisions on a firm's cash flow availability as the benefits brought about by conglomerates. This strategic approach not only effectively allows firms to re-distribute cash flows internally more efficiently but also reduces the volatility of the firm's cash flows, leaving it less exposed to idiosyncratic negative shocks. In principle, all other factors being equal, firms boasting diversified cash flows are typically positioned to access more favourable external credit conditions. Similarly, (Gertner, Scharfstein, and Stein 1994) argues that internal capital markets offer increased monitoring incentives and easier asset redeployment levels relative to stand-alone firms. However, diversification also comes at a cost. If such costs did not exist, one would expect constrained firms to diversify their businesses when fearing recessions. (Rajan, Servaes, and Zingales 2000) and (Scharfstein and Stein 2000) contends that diversification may introduce complex agency problems absent in stand-alone firms. Specifically, the former asserts that conglomerates often allocate resources to underperforming divisions to encourage cooperative behaviour in joint production with other divisions, a phenomenon referred to as cross-subsidization. Alternatively, the latter authors attribute inefficiencies within internal capital markets to rent-seeking behaviour exhibited by managers of weaker segments whose opportunity cost of taking time away from productive work to engage in rent-seeking is lower. Additionally,

another common perception in the literature attributes inefficiencies to the coinsurance effect brought about by diversification, which positively affect conglomerates' capacity to borrow resources. This may result in conglomerates over-investing in certain divisions.

Nevertheless, even though literature shows that conglomerates seem to provide certain theoretical advantages during recession periods, one might question if their effectiveness depends on their size and/or scope. (Stein 1997) stresses the trade-offs inherent to such decisions. On one hand, increasing the number of segments that report to the same holding company may provide the firm with larger amounts of funds than stand-alone companies can raise independently. However, as conglomerates expand, the headquarters' ability to effectively monitor segments diminishes, reducing its discernment to identify worthy projects. Similarly, (Maksimovic and Phillips 2002) argues that firms demonstrating exceptional productivity within a specific industry face higher opportunity costs of diversifying.

Regarding the scope of conglomerates, given that resource allocation typically involves prioritizing projects relative to one another, the greater the correlation between projects (i.e. the less diverse the conglomerate), the lower the impact of assessment errors in the allocation of funds, as typically correlated projects are likely to yield similar outcomes. Likewise, (Berger and Ofek 1993) documented that the diversification discount is smaller in conglomerates whose segments operate in closer industries.

According to (Shin and Stulz 1996), an efficient internal capital market normally complies with three principles.

i) Investment sensitivity to investment opportunities

Segments with better investment opportunities should be given access to relatively more funds. (Ozbas and Scharfstein 2010) find evidence that segments in High-Q (Low-Q) industries invest less (more) than comparable stand-alone firms (see also (Scharfstein 1998)). Similarly,

(Wang 2023) and (Hovakimian 2011) corroborate this notion by revealing that conglomerate segments have lower investment sensitivity to investment opportunities (proxied by *Tobin's Q*) than stand-alone firms during non-recession periods. Nevertheless, during recessions, these last two authors ascertain that conglomerates not only exhibit heightened sensitivity to investment opportunities but inclusively manifest greater responsiveness to investment prospects compared to stand-alone firms. Contrarily, stand-alone firms show no significant alterations to their sensitivity to investment opportunities during the same period. This phenomenon can be attributed to the constraints associated with the limited availability of external capital, as well as the fact that stand-alone firms are not able to benefit from internal capital markets, leaving them with less flexibility and fewer resources to engage in economically favourable projects in the same way as individual segments of conglomerates.

ii) Investment sensitivity to cash flows

If one believes conglomerates are effectively able to internally allocate resources, it should be expected conglomerate segments to be less sensitive to their own cash flows when compared to stand-alone firms. This sounds plausible under the sole premise that conglomerates have simultaneously greater debt capacity than stand-alone firms, as well as an additional source of capital provided by internal capital markets. According to (Wang 2023), there is weak significance proving that, in non-recessionary periods, stand-alone firms exhibit a higher degree of cash flow sensitivity to investment. Moreover, during recessions, the same author's research reveals that segments within conglomerates exhibit higher investment sensitivity to cash flows compared to stand-alone firms. One possible explanation for this phenomenon is the fact that, during recessions, the value of cash increases, and stand-alone firms tend to cut more investment from the optimal level relative to conglomerates. Following the same reasoning, within conglomerates, it should also be expected segments possessing more favourable investment opportunities to exhibit a relatively lower dependence on the overall cash flows of the

conglomerate. Nevertheless, (Shin and Stulz 1998) observed that the investment sensitivity of each individual segment to the cash flows of other segments within conglomerates is not contingent on each segment's investment opportunities.

iii) Intra-conglomerate competitiveness considerations

The allocation of funds to segments with better investment opportunities should fall whenever other segments have better investment opportunities. This third point carries on the effect of competition on the effectiveness of internal capital markets. As put forward by (Stein 1997), individual projects must compete for the scarce funds available within internal capital markets, and the headquarters' job is to select projects based not on their absolute merits but rather on their attractiveness relative to other segments. Consequently, the allocation of funds to a specific segment within an internal capital market is contingent on the conglomerate internal capital market's tightness.

As per my understanding, little research has been devoted to highlighting this trade-off inherent to conglomerates. On the one hand, individual segments within conglomerates enjoy access to an additional source of capital provided by internal capital markets, an advantage that becomes critical during recessions and is not available to stand-alone firms. On the other hand, this advantage comes with the trade-off of increased competition for funds among segments. I argue that this trade-off will intensify during recessions as external credit markets are costlier, thereby rendering internal capital markets as the main source of capital to individual divisions within conglomerates, especially those craving for capital. If such competitive dynamic exists, it should be expected segments within "less competitive" conglomerates to exhibit heightened responsiveness to investment opportunities while displaying less sensitivity to their own cash flows comparatively to stand-alone firms. On the other hand, this effect will be softened in individual segments operating under "more competitive" conglomerates, despite its superiority in investment opportunities. Moreover, within conglomerates, I argue that dispersion regarding

investment opportunities will create different sensitivities to the overall cash flows of conglomerates.

With this research, I intend to provide supplementary considerations for further research on the effectiveness of internal capital markets. If the hypothesis is proven to be right, it should be questioned whether the benefits brought about by internal capital markets during recessions, and therefore, the appeal to operate under conglomerate structures is more accentuated for cases in which there is a large disparity between segments, i.e. less competitive conglomerate.

***Hypothesis 1:** Segments belonging to relatively less (more) competitive conglomerates will display higher (lower) sensitivity to investment opportunities, as well as lower (higher) investment sensitivity to cash flows than comparable firms.*

3. Sample Data

As of the end of 1977, SEC regulations required all publicly listed firms to disclose financial data pertaining to their individual business segments. A business segment is defined as a line of business with at least 10% of the firm's sales.

I obtained the segment-level data from the U.S. Compustat Segment Database (CSD) covering the period 1976-2023. For each segment, this file provides basic accounting information such as sales, assets, capital expenditures, operating profits, and depreciation along with a primary Standard Industrial Classification (SIC) code. Additionally, I retrieved data on the CPI index from the (U.S. Bureau of Labor Statistics 2023). I exclude segment-years (i) operating or whose holding parent operates in the utilities (SIC codes 4900-4999), banking (6000-6199) or insurance (6300-6499) industries; (ii) displaying missing accounting data (sales, assets, capital expenditures, operating profit or depreciation) or missing primary SIC code; (iii)

with sales, assets, capital expenditures or depreciation lower or equal than 0; or (iv) capex investments greater than assets (Wang 2023).

Additionally, to prevent any potential distortion coming from smaller segments, which tend to exhibit significant accounting volatility, I drop segment-years with (iv) sales less than \$12 million in 1976 U.S. dollars (Wang 2023); (v) equivalent annual sales growth greater than 100%, as these are normally indicative of mergers, reorganization and other major corporate events (Almeida, Campello, and Weisbach 2004); or (vi) whose holding company has a market value smaller than \$20 million in 1976 U.S. dollars (Duchin, Ozbas, and Sensoy 2010). Finally, similarly to (Hovakimian 2011), I exclude conglomerate-year observations whose segments' sum of total sales and assets differed by 1% and 20%, respectively, from what is disclosed in the annual files of the holding company.

I calculate segment-years' cash flows as the sum of operating profits plus depreciation. This measure is standard in the literature and does not adjust for taxes, working capital requirements, or other factors due to unavailability of such data. To allow for significant heterogeneity of investment opportunities within each conglomerate, I drop every conglomerate-year observation with less than two reportable segments operating in different industries. Additionally, to mitigate potential inconsistencies stemming from typing errors in segment names over time, I have standardized names by implementing rules aimed at unifying them. More specifically, I convert all names to upper case letters, delete double spaces and replace the word "and" by "&" in every observation.

Data on business cycle analysis was retrieved from (National Bureau of Economic Research 2023). The years 1980, 1981, 1982, 1990, 1991, 2001, 2008, 2009 and 2020 were considered as recessionary.

I retrieve annual data on public firms for the period 1976-2023 from Compustat Annual Fundamentals (CAD) database. The file provides detailed accounting data for several U.S. public

companies. Apart from all the conditions mentioned above, I additionally drop firm-year observations with (i) missing common equity reported, information on share price, number of common shares outstanding, annual deferred taxes, cash holdings or short- and long-term financial debt. Details on each variable retrieved and used can be consulted in Appendix A.1.

The final sample for conglomerate firms consists of 1,432 different conglomerates composed of 20,842 segment-year observations. The final sample for specialized firms consists of 6,584 different firms composed of 50,797 firm-year observations. Table 1 provides some summary statistics on the sample firms. It should be noticeable the potential presence of outliers within some variables. A closer look at the outliers within *Capex/Assets₋₁*, *Cashflow/Sales₋₁*, *TobinsQ₋₁* and *ROA₋₁* can be consulted in Appendix A.2.

Table 1
Sample summary statistics

	N	Mean	Median	Std. Dev	Min	Max
Conglomerates						
Assets (1976 \$)	20,842	561.71	126.97	1,831.13	0.90	50,412.51
Sales (1976 \$)	20,842	681.94	157.52	2,675.93	12.00	84,072.61
Capex (1976 \$)	20,842	41.66	6.30	183.81	.00060	5,874.12
Cashflow (1976 \$)	20,842	91.75	20.16	372.08	-2,090.87	12,250.64
Capex/assets ₋₁	20,842	0.082	0.056	0.10	0.00021	2.58
Cash flow/sales ₋₁	20,842	0.17	0.14	0.44	-14.17	53.16
Tobin's Q ₋₁	20,842	1.33	1.27	0.34	0.60	4.65
ROA ₋₁	20,842	0.14	0.13	0.20	-3.29	14.21
Std. Dev. Tobin's Q ₋₁	7,386	0.20	0.16	0.18	0.00011	1.99
Std. Dev. ROA ₋₁	7,386	0.097	0.071	0.16	6.76E-06	7.77
Specialized firms						
Assets (1976 \$)	50,797	1,600.10	180.56	10,513.64	2.31	554,650.40
Sales (1976 \$)	50,797	918.53	161.43	3,721.85	12.02	116,215.3
Capex (1976 \$)	50,797	71.33	7.54	320.23	0.00046	8,493.34
Cashflow (1976 \$)	50,797	177.81	21.72	805.34	-3,865.80	24,745.02
Capex/assets ₋₁	50,797	0.072	0.044	0.090	1.94E-06	2.02
Cash flow/sales ₋₁	50,797	0.18	0.16	0.25	-8.92	6.41
Tobin's Q ₋₁	50,797	1.77	1.50	0.90	0.31	8.20
ROA ₋₁	50,797	0.090	0.089	0.12	-3.19	2.11
TotalDebt ₋₁ /Assets ₋₁	50,797	0.23	0.19	0.23	0	3.89
Cash ₋₁ /Assets ₋₁	50,797	0.12	0.073	0.13	-0.051	0.97

Notes: The sample includes conglomerates that have segments in more than one industry, as defined by the 3-digit SIC code, over the period between 1977 and 2023.

4. Methodology and discussion

The hypothesis explored by this paper aims to examine the influence of intra-conglomerate competition on the efficiency of internal capital markets. It is grounded in the premise that the decision made by headquarters surrounding capital allocation is expected to be relatively more streamlined and less susceptible to biases in less competitive conglomerates, i.e., holding everything else constant, the presence of a distinct segment with significantly greater potential simplifies the decision-making process. Therefore, I argue that segments belonging to relatively less competitive conglomerates will be more responsive to investment opportunities while depending less on the availability of cash flows.

To capture each conglomerate's competitiveness level, it becomes essential to define quantifiable metrics that allow headquarters to assess the existent investment opportunities within the different segments. A conglomerate characterized as being less competitive is one in which investment opportunities demonstrate a higher degree of dispersion across segments. To measure this, I use the standard deviation of each segment's *Tobin's Q* and *Return on Assets (ROA)* at the beginning of the fiscal year. Therefore, a more competitive conglomerate will exhibit a lower standard deviation.

Nevertheless, the extent to which such methodology represents the most effective way of gauging competitiveness within firms is not clear. Measuring instantaneous dispersion may not allow certain conglomerates to adopt the mechanisms that facilitate internal capital allocation. Therefore, an additional approach was employed. Rather than considering the standard deviation of each conglomerate-year isolatedly, the historical median dispersion of each conglomerate over time was used. Instead of occasional competitiveness, such approach identifies conglomerates that tend to be consistently less competitive.

Further considerations concerning the assessment of dispersion within conglomerates warrant attention. It should be anticipated conglomerates that have expanded into related

industries to exhibit decreased levels of dispersion. This last effect can potentially introduce bias in the results, considering the already proven advantage of related diversification over unrelated diversification.

Likewise, the natural idiosyncrasies inherent to each industry should also be assessed. Different industries are prone to exhibiting varying ranges of Tobin's Q . It could be unfair to attribute lower competitiveness levels to conglomerates that naturally aggregate segments belonging to more dispersed industries. Having this into consideration, an alternative research approach was pursued. Instead of measuring diversity along each segment's *Tobin's Q* and *ROA*, I conduct additional research that measures intra-conglomerate competition by considering the standard deviation of the excess of investment opportunities (*Tobin's Q*) of each segment relative to the historical median value of each industry. In the case of *ROA*, each segment-year observation is compared against each segment's historical median *ROA*. Therefore, considering the extreme case of a two-segment conglomerate, the dispersion in investment opportunities will be higher whenever a segment A is above the historical median of the metric in use (*Tobin's Q* -1 or *ROA*-1), and segment B experiences the opposite scenario.

To obtain statistically significant results that instil confidence, it is imperative to carefully consider the factors behind every decision-making process regarding capital expenditures. The objective is not to obtain a comprehensive list of influencing factors, but to capture the most significant ones. A company will only allocate resources when economically viable projects are available. Subsequently, even if such opportunities exist, a firm's investment decision is contingent upon the availability of funds. As external capital markets become costlier, firms significantly rely on internally generated funds, which can either be in the form of cash reserves or cash flow generation. Nevertheless, the presence of liabilities can dissuade companies from making investments, leading them to prioritize saving instead. Moreover, the empirical work in (Gertler and Gilchrist 1995) finds evidence that small firms reduce their economic activity more

sharply and sooner than large firms in response to adverse macroeconomic shocks. Various other qualitative factors could potentially influence managers' decisions, including their own capabilities and those of their competitors.

The presence of economically viable opportunities will be proxied by *Tobin's Q* and *Return on Assets (ROA)*. I follow the methodology applied in (Wang 2023) and measure each public firm's *Tobin's Q* as $MVA / (0.9BVA + 0.1MVA)$, where BVA is the book value of assets, and MVA is the market value of assets, which equals the book value of assets minus the book value of common equity plus the market value of common equity minus balance sheet deferred taxes. Subsequently, the *Tobin's Q* for each industry (hereby represented by three-digit SIC codes) is determined considering the median *Tobin's Q* of every public firm belonging to the same industry in each year. I calculate *ROA* as the one-period lag of net operating income divided by the one-period lag of assets. This calculation assumes that management makes all decisions regarding capital expenditures at the beginning of each year, considering historical information. While *Tobin's Q* intends to account for the existence of investment opportunities by exclusively accounting for the average growth potential of the industry, *ROA* also considers the capabilities of each firm. In other words, *ROA* will be higher whenever external opportunities exist, and the company can effectively utilize its assets to generate income.

The size of each segment and specialized firm will be accounted for using the natural logarithm of their respective asset values. Due to the unavailability of data, each segment's cash and short-term liabilities will not be accounted for. Instead, I consider the effect of such factors by controlling for each conglomerate's total cash position and total debt outstanding (both as a percentage of assets).

Likewise, each segment's management capabilities, as well as competitors' will not be factored in. However, if we consider such capabilities to be time-invariant, fixed effects

estimator will address this issue. Additionally, to control for any factor that might be cross-sectionally invariant at each year, like GDP growth, I will consider year fixed-effects as well.

4.1. The performance of conglomerates comparatively to specialized firms

Prior to investigating the effects of intra-conglomerate competition on the efficiency of internal capital markets, it is important to determine the systematic differences between conglomerates and specialized firms. I estimate the following regression both for conglomerates and stand-alone firms.

$$\begin{aligned}
Capex_{i,j}(t) = & \beta_0 + \beta_1 Q_{i,j}(t-1) + \beta_2 Q_{i,j}(t-1) \times REC(t) \\
& + \beta_3 CF_{i,j}(t) + \beta_4 CF_{i,j}(t) \times REC(t) \\
& + \beta_5 ROA_{i,j}(t-1) + \beta_6 ROA_{i,j}(t-1) \times REC(t) \\
& + \beta_7 LnAssets_{i,j}(t-1) + \beta_8 DebtToAssets_j(t-1) \\
& + \beta_9 CashHoldings_j(t-1) + \beta_{10} REC(t)
\end{aligned} \tag{1}$$

In equation (1), $Capex_{i,j}(t)$ represents the one-period lagged assets-normalized capital expenditures of segment i , belonging to conglomerate j , at period t ; $Q_{i,j}(t-1)$ represents the *Tobin's Q* of segment i , belonging to conglomerate j , at period $t-1$; $CF_{i,j}(t)$ represents the one-period lagged sales-normalized cash flow of segment i , belonging to conglomerate j , at period t ; $ROA_{i,j}(t-1)$ represents the Return on Assets of segment i , belonging to conglomerate j , at time $t-1$ ($Op.Income_{t-1} / Assets_{t-1}$); $LnAssets_{i,j}(t-1)$ represents the natural logarithm of the assets of segment i , belonging to conglomerate j , at period $t-1$; $DebtToAssets_j(t)$ represents the proportion of total debt (short- and long-term) on the assets of conglomerate j , at period $t-1$ ($ST Debt_{t-1} + LT Debt_{t-1} / Assets_{t-1}$); $CashHoldings_j(t-1)$ represents the proportion of cash on assets of conglomerate j , at period $t-1$ ($Cash_{t-1} / Assets_{t-1}$); and $REC(t)$ is a dummy variable equal to 1 if period t is classified as a recessionary year. Other interaction terms were also included to study the effects of recessions. Equation (1) applies to specialized firms as well, with the due differences.

The results shown in Table 2 present the regression results for conglomerates and stand-alone firms separately. To minimize the influence of outliers, extreme observations under the 0.5th and above the 99.5th percentile of $Capex_{ij}(t)$, $Q_{ij}(t-1)$, $CF_{ij}(t)$ and $ROA_{ij}(t-1)$ were winsorized. The reported t-statistics reflect standard errors adjusted for heteroskedasticity clustered at firm level. Three different specifications are presented. The first one is the parsimonious model, which includes no control variables on firm or segment levels. The remaining ones are estimations of Equation (1) with firm and both firm and year fixed effects, respectively. Columns (1) to (3) display the coefficients for conglomerates. Columns (4) to (6) display the coefficients for specialized firms.

The coefficient estimates on $LagQ$ suggest variations in the responsiveness to investment opportunities between conglomerate and specialized firms during non-recessionary periods, as observed from the comparison between the coefficients in columns (1) and (3) with those in columns (4) and (6). The coefficients are all significant at the 1% level. This comparison indicates that, on average, specialized firms tend to display a higher sensitivity to investment opportunities. Specifically, these last firms display statistically significant coefficients of 0.019 and 0.014, while conglomerate firms exhibit statistically significant coefficients of 0.016 and 0.013, respectively.

Nevertheless, the same models suggest that conglomerate firms enjoy greater variability in their responsiveness to investment opportunities when facing recessions. While conglomerate firms increase their investment sensitivity to investment opportunities by 0.0083 (column 1) and 0.0094 (column 3), specialized firms only realize approximately a fourth of such variation, as evidenced by the coefficients 0.0017 (column 4) and 0.0027 (column 6). These findings align with the existing literature and potentially suggest that inefficiencies within conglomerate firms, such as undue cross-subsidization, rent-seeking behaviour and excess spending promoted by an easier access to external capital might adversely impact the

efficiency of internal capital markets during non-recessionary periods, albeit to a lesser extent during recessions.

As for cash flow sensitivity of investments, it is observed that both conglomerate and specialized firms manifest a coefficient that is positive and statistically significant at the 1% level. Since the results are somewhat contradictory, no conclusions could be retrieved as to whether conglomerate firms are less dependent on internally generated cash flows during non-recession periods. However, notable differences emerge when recessions are factored in. While conglomerate firms display a positive and statistically significant variation in their cash flow sensitivity of investment, specialized firms do not display the same behaviour. Prior research authors have attributed this difference to the fact that specialized firms reduce their investment levels to a greater extent comparatively to conglomerate firms. As already anticipated, recessions generally exert a negative impact on the proportion of capital expenditures relative to assets. What should also be noted is the fact that both conglomerate and specialized firms' investment levels are more sensitive to *ROA* than *Tobin's Q*.

Table 2

The performance of conglomerates comparatively to individual firms.

	Conglomerates			Specialized firms		
	(1)	(2)	(3)	(4)	(5)	(6)
LagQ	0.016*** (0.0033)	0.020*** (0.0030)	0.013*** (0.0031)	0.019*** (0.00083)	0.014*** (0.00083)	0.014*** (0.00084)
LagQ*REC	0.0083* (0.0047)	0.0047 (0.0036)	0.0094** (0.0045)	0.0017* (0.00090)	0.0021** (0.00088)	0.0027*** (0.00093)
Cashflow	0.075*** (0.013)	0.054*** (0.011)	0.049*** (0.012)	0.055*** (0.0045)	0.051*** (0.0046)	0.051*** (0.0045)
Cashflow*REC	0.040*** (0.011)	0.036*** (0.011)	0.036*** (0.011)	0.0034 (0.0047)	0.0068 (0.0053)	0.0070 (0.0053)
REC	-0.11*** (0.014)	-0.0081 (0.0051)	0.025 (0.017)	-0.11*** (0.0097)	-0.0053*** (0.0016)	-0.036*** (0.010)
LagROA		0.11*** (0.013)	0.11*** (0.013)		0.056*** (0.0060)	0.042*** (0.0060)
LagROA*REC		-0.0046 (0.013)	-0.0080 (0.014)		-0.010 (0.0081)	-0.019** (0.0089)
Assets		-0.031*** (0.0025)	-0.035*** (0.0033)		-0.020*** (0.00078)	-0.014*** (0.0010)

DebtToAssets		-0.070*** (0.0084)	-0.068*** (0.0084)		-0.043*** (0.0036)	-0.044*** (0.0035)
Cash		0.032* (0.019)	0.028 (0.020)		-0.030*** (0.0044)	-0.018*** (0.0044)
Constant	0.081*** (0.0087)	0.23*** (0.015)	0.23*** (0.018)	0.093*** (0.0093)	0.18*** (0.0053)	0.15*** (0.010)
Observations	20,842	20,842	20,842	50,797	50,797	50,797
R-squared	0.059	0.125	0.134	0.177	0.192	0.206
Firm F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table reports estimates from regressions of equation (1). The table presents OLS regression coefficients and robust standard errors clustered at the firm level. Extreme observations under the 0.5th and above the 99.5th percentile of $Capex_{i,j}(t)$, $Q_{i,j}(t-1)$, $CF_{i,j}(t)$ and $ROA_{i,j}(t-1)$ were winsorized. The coefficients related to year-fixed effects are not included in the table due to space constraints.

*** p<0.01, ** p<0.05, * p<0.1

4.2. The effects of intra-conglomerate competition within conglomerates.

If competition is indeed a significant factor influencing the allocation of capital within conglomerates, one would anticipate the coefficients derived in columns (1) through (3) of Table 2 to change when accounting for the influence of intra-conglomerate competition.

In theory, we would expect β_1 to be higher for less competitive conglomerates. The existence of a wider dispersity of value facilitates the decision-making process of headquarters regarding capital allocation. I contend that such conglomerates are likely to exhibit an overall greater responsiveness to investment opportunities. Lower competition will not only favour segments with greater investment opportunities but also generate greater inertia when funding smaller divisions. In other words, if the same conglomerate was to be more concentrated in value, the likelihood of smaller segments receiving excess funding would be higher, thus rendering the internal capital market less efficient. However, such predictable efficiencies might be eroded by several factors. It might be argued that “rent-seeking” behaviour and undue “cross-subsidization” are more common within less competitive conglomerates. I anticipate such factors to be less relevant during economic recessions and consequently expect β_2 to be positive and statistically significant for less competitive conglomerates, while it is likely to be insignificant for highly competitive ones.

What should also be anticipated is the lower sensitivity of investment to cash flows attributed to less competitive conglomerates, and thus, a lower β_3 . If one considers the extreme case of having several segments with equal investment opportunities within the same conglomerate, holding everything else constant, there would not be any reason to exploit internal capital markets, leaving segments heavily reliant on their own cash flow generation. The results can be found in Table 3. The conglomerates dataset employed in the preceding section was divided according to two different criteria. Panel A displays the regression coefficients obtained using the standard deviation of segments' *Tobin's Q* at the beginning of the year as the criteria to measure intra-conglomerate competitiveness. Conversely, the results in Panel B represent the regression coefficients obtained using the standard deviation of segments' return on assets (*ROA*). Lower standard deviations imply more competitive conglomerates. The conglomerate-year observations within the 50th percentile were deemed as the most competitive. Three different specifications for each subset are presented. Column (1) represents the parsimonious model of equation (1). Columns (2) and (3) represent the estimates of equation (1) with firm and both firm and fixed effects, respectively.

There is no clear evidence supporting any negative effect brought about by competition on the investment sensitivity of investment opportunities. On one side, when internal competition is measured using the standard deviation of each segment's *Tobin's Q*₋₁ (Panel A), I found evidence that Highly competitive (HC) conglomerates exhibit a much higher investment sensitivity to *LagQ*. On the other hand, when competitiveness levels within each conglomerate is measured using the standard deviation of each segment's *Return on Assets*₋₁ (Panel B), I found evidence that Low competitive (LC) conglomerates are more responsive to investment opportunities. The validity of these findings hinges upon the underlying assumption that there is no measurement error when we quantitatively proxy the investment opportunities of each segment by the median *Tobin's Q* of each industry. It is conceivable that variations from the

industry median may exist among firms due to several endogenous reasons. Nevertheless, during economic recessions, I find noticeable evidence that LC firms enhance their responsiveness to investment opportunities, as evidenced by increases of 0.011 and 0.0098 in columns (1) and (3) displayed in Panel A. In contrast, HC firms do not appear to alter their capital allocation standards. Such findings may suggest that, during non-recession periods, the benefits of internal capital markets in less competitive conglomerates are potentially outweighed by other agency-related issues, and these adverse effects tend to diminish when firms face economic downturns.

As per cash flow sensitivity of investment, it can be concluded that LC firms are less dependent on internally generated cash flows than other more competitive firms during non-recession periods, as evidenced by the fact that LC firms consistently display smaller coefficients than HC firms. No clear-cut conclusions can be retrieved during recession periods, as HC firms exhibit contradictory results in both panels. While there is no statistically significant evidence in Panel A proving that HC firms alter their investment sensitivity to cash flows, the results in panel B show that HC firms manifest a greater variation than LC firms. Nevertheless, there is moderate evidence supporting the fact that LC firms tend to be less dependent on internally generated cash flows regardless of the economic cycle.

If we compare the results obtained with those for specialized firms (column 4 to 6) in Table 2, there is evidence proving the outperformance (underperformance) of LC (HC) firms relative to specialized firms in some respects. Regarding the investment sensitivity of investment opportunities, the regression coefficients do not yield definitive conclusions. Contradictory outcomes are observed across both panels, leading to an absence of strong consensus.

Nevertheless, differences arise in the context of the cash flow sensitivity of investments. The analysis across both panels consistently reveal that LC firms exhibit lower reliance on internally generated cash flows compared to specialized firms. Specifically, whereas conglomerate firms exhibit sensitivities of 0.043 (column 3 of panels A and B), specialized firms

exhibit a sensitivity equal to 0.051 (column 6 of Table 2). Moreover, specialized firms, in turn, display a reduced dependence on internal cash flows when compared to highly competitive firms, which exhibit a sensitivity equal to 0.056 and 0.057 (column 6 of panels A and B). The robustness of these findings is strengthened by the statistical significance of the coefficients pertaining to the investment sensitivity to cash flows during non-recessionary periods, all of which are significant at the 1% level.

The effect of recessions on cash flow sensitivity cannot be fairly assessed since specialized and conglomerate firms do not experience the same accessibility to capital during recessions, leading specialized firms to cut investment more severely.

Table 3

The effect of intra-conglomerate competition on the efficiency of internal capital markets (momentaneous dispersion).

Panel A: Standard deviation of Tobin's Q_{-1}						
	Low competitive			Highly competitive		
	(1)	(2)	(3)	(1)	(2)	(3)
LagQ						
Non-Recession	0.0071**	0.012***	0.0077**	0.024***	0.040***	0.028***
Recession	0.0181**	0.012***	0.0175**	0.024***	0.040***	0.028***
Change	0.011**	0	0.0098*	0	0	0
Cash flow						
Non-Recession	0.045***	0.048***	0.043***	0.066***	0.062***	0.056***
Recession	0.082*	0.084*	0.077*	0.058***	0.057***	0.051***
Change	0.037*	0.036*	0.034*	0	0	0
Observations	10,727	10,727	10,727	10,115	10,115	10,115
R-squared	0.086	0.113	0.130	0.099	0.142	0.155
Firm F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes		Yes	Yes		Yes
Panel B: Standard deviation of ROA_{-1}						
	Low competitive			Highly competitive		
	(1)	(2)	(3)	(1)	(2)	(3)
LagQ						
Non-Recession	0.012***	0.023***	0.016***	0.0087*	0.013***	0.0081*
Recession	0.012***	0.023***	0.016***	0.0087*	0.013***	0.0081*
Change	0	0	0	0	0	0
Cash flow						

Non-Recession	0.049**	0.044**	0.043**	0.061***	0.064***	0.057***
Recession	0.082**	0.071*	0.069*	0.092*	0.097**	0.088*
Change	0.033**	0.027*	0.026*	0.031*	0.033**	0.031*
Observations	11,041	11,041	11,041	9,801	9,801	9,801
R-squared	0.082	0.122	0.134	0.104	0.117	0.131
Firm F.E	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes		Yes	Yes		Yes

Notes: This table reports estimates from regressions of equation (1). The coefficients on variables other than LagQ and Cashflow, as well as their respective interaction terms, were not displayed due to space constraints. The low and highly competitive datasets were obtained by comparing the standard deviation of all conglomerate-year observations. The low competitive dataset corresponds to the subset of observations lying above the 50th percentile of the standard deviation of each metric (*Tobin's Q_{it}* and *ROA_{it}*). The table presents OLS regression coefficients and robust standard errors clustered at the firm level. Extreme observations under the 0.5th and above the 99.5th percentile of *Capex_{it}(t)*, *Q_{it}(t-1)*, *CF_{it}(t)* and *ROA_{it}(t-1)* were winsorized. The coefficients related to year-fixed effects are not included in the table due to space constraints. Panel A displays the regression coefficients obtained using the standard deviation of segments' *Tobin's Q_{it}*. Panel B displays the regression coefficients obtained using the standard deviation of segments' *ROA_{it}*.

*** p<0.01, ** p<0.05, * p<0.1

The results presented in Table 3 rely on instantaneous measures of standard deviation to delineate levels of intra-conglomerate competitiveness. Each conglomerate-year was individually observed and subsequently compared against all other observations to infer conglomerate-years exhibiting comparatively lower competitiveness. Therefore, a conglomerate could be considered to exhibit low levels of competition in a year while being classified as the opposite in another.

Nevertheless, it might be argued that conglomerates subject to momentaneous sharp declines in their competitiveness levels might face challenges in timely adopting the required organizational processes to support their most promising segments. Consequently, they may lack the efficiencies observed in other conglomerates which are consistently classified as being less competitive.

The results displayed in Table 4 are homologous to those in Table 3. However, instead of measuring the competitiveness within conglomerates on a yearly basis, an alternative holistic approach was adopted. The median value of dispersion over the years for each conglomerate was compared across the entire set of conglomerates. Therefore, conglomerate-year observations are grouped and conglomerates can either be classified as LC or HC. Such

approach attenuates the effects of momentaneous dispersion and concedes weight to conglomerates which have been consistently more disperse.

The coefficients obtained when using the standard deviation of *Tobin's Q*₋₁ (Panel A of Table 4) are similar to those observed in Table 3. Nevertheless, the coefficient results obtained in Panel B differ from those observed in Table 3 in some variables. While LC firms do not alter their investment sensitivity to *Tobin's Q*₋₁ during recessions, HC firms manifestly become more responsive. Regarding the cash flow sensitivity of investment, even though LC firms display greater levels of dependence, the difference is not as considerable as those observed in other variants of dispersion measurement previously studied. Nevertheless, and similarly to what has been proved in the literature, there is evidence proving that HC firms tend to cut investment from the optimal level when facing recessions.

Table 4

The effect of intra-conglomerate competition on the efficiency of internal capital markets (historical dispersion).

Panel A: Standard deviation of Tobin's Q_{-1}						
	Low competitive			Highly competitive		
	(1)	(2)	(3)	(1)	(2)	(3)
LagQ						
Non-Recession	0.0065*	0.013**	0.0079*	0.021***	0.032***	0.022***
Recession	0.0185**	0.013**	0.0199**	0.021***	0.032***	0.022***
Change	0.012**	0	0.012**	0	0	0
Cash flow						
Non-Recession	0.047***	0.050***	0.045**	0.057***	0.057***	0.052***
Recession	0.0507***	0.094***	0.09***	0.091**	0.084*	0.079*
Change	0.046***	0.044***	0.045***	0.034**	0.027*	0.027*
Observations	10,801	10,801	10,801	10,041	10,041	10,041
R-squared	0.1	0.117	0.133	0.101	0.139	0.153
Firm F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes		Yes	Yes		Yes
Panel B: Standard deviation of ROA_{-1}						
	Low competitive			Highly competitive		
	(1)	(2)	(3)	(1)	(2)	(3)

LagQ

Non-Recession	0.013***	0.022***	0.015***	0.011**	0.017***	0.011***
Recession	0.013***	0.022***	0.015***	0.026**	0.0256*	0.024**
Change	0	0	0	0.015**	0.0086*	0.013**
Cash flow						
Non-Recession	0.054***	0.054***	0.050***	0.049***	0.053***	0.045***
Recession	0.11***	0.104***	0.099***	0.049***	0.053***	0.045***
Change	0.056***	0.050***	0.049***	0	0	0
Observations	10,945	10,945	10,945	9,897	9,897	9,897
R-squared	0.092	0.125	0.135	0.102	0.128	0.142
Firm F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes		Yes	Yes		Yes

Notes: This table reports estimates from regressions of equation (1). The coefficients on variables other than LagQ and Cashflow, as well as their respective interaction terms, were not displayed due to space constraints. The low and highly competitive datasets were obtained by comparing the median value of standard deviation of each conglomerate over time. The low competitive dataset corresponds to the subset of conglomerates whose median standard deviation (*Tobin's* $Q_{i,t}$ and $ROA_{i,t}$) lie above the 50th percentile. The table presents OLS regression coefficients and robust standard errors clustered at the firm level. Extreme observations under the 0.5th and above the 99.5th percentile of $Capex_{i,j}(t)$, $Q_{i,j}(t-1)$, $CF_{i,j}(t)$ and $ROA_{i,j}(t-1)$ were winsorized. The coefficients related to year-fixed effects are not included in the table due to space constraints. Panel A displays the regression coefficients obtained using the standard deviation of segments' *Tobin's* $Q_{i,t}$. Panel B displays the regression coefficients obtained using the standard deviation of segments' $ROA_{i,t}$.

*** p<0.01, ** p<0.05, * p<0.1

The results displayed so far did not consider the systematic differences inherent to different industries. Again, it could be unfair to attribute lower levels of competitiveness to conglomerates aggregating segments belonging to industries which are normally more dispersed. Table 5 displays the results obtained through measuring the dispersion of investment opportunities in excess of historical values. For the case of Panel A, the standard deviation of each segment's excess of investment opportunities in relation to the historical industry's median value was computed (*Tobin's* $Q_{i,j}(t-1) - Tobin's$ $Q_{i,j}$). In Panel B, each segment's $ROA_{i,t}$ was compared against each segment's historical median value of ROA ($ROA_{i,j}(t-1) - ROA_{i,j}$). Even though the results are similar to those already observed, there are some nuances. Specifically, contradictory to what was observed in previous tables, Panel A shows evidence that LC firms display a much more dependence on internally generated cash flows than HC firms. On the other hand, Panel B supports the idea that HC firms manifestly increase their capital allocation efficiency during recessions, while LC firms remain equally responsive.

Table 5

The effect of intra-conglomerate competition on the efficiency of internal capital markets (excess dispersion).

Panel A: Standard deviation of Tobin's Q_{-1}						
	Low competitive			Highly competitive		
	(1)	(2)	(3)	(1)	(2)	(3)
LagQ						
Non-Recession	0.0062	0.015***	0.0085**	0.026***	0.029***	0.024***
Recession	0.014**	0.015***	0.0215**	0.026***	0.029***	0.024***
Change	0.014**	0	0.013**	0	0	0
Cash flow						
Non-Recession	0.060***	0.066***	0.059***	0.040**	0.037**	0.032**
Recession	0.129***	0.13***	0.126***	0.040**	0.037**	0.032**
Change	0.069***	0.064***	0.067***	0	0	0
Observations	10,822	10,822	10,822	10,020	10,020	10,020
R-squared	0.106	0.126	0.14	0.091	0.130	0.145
Firm F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes		Yes	Yes		Yes
Panel B: Standard deviation of ROA_{-1}						
	Low competitive			Highly competitive		
	(1)	(2)	(3)	(1)	(2)	(3)
LagQ						
Non-Recession	0.015***	0.022***	0.015***	0.0097***	0.017***	0.011***
Recession	0.015***	0.022***	0.015***	0.0217*	0.017***	0.022*
Change	0	0	0	0.012*	0	0.011*
Cash flow						
Non-Recession	0.037**	0.041***	0.035**	0.094***	0.092***	0.086***
Recession	0.083***	0.08***	0.075***	0.094***	0.092***	0.086***
Change	0.046***	0.039***	0.040***	0	0	0
Observations	10,885	10,885	10,885	9,957	9,957	9,957
R-squared	0.092	0.12	0.131	0.119	0.147	0.163
Firm F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes		Yes	Yes		Yes

Notes: This table reports estimates from regressions of equation (1). The coefficients on variables other than LagQ and Cashflow, as well as their respective interaction terms, were not displayed due to space constraints. The low and highly competitive datasets were obtained by comparing the standard deviation of the excess of investment opportunities in relation to the historical median value of the respective industry ($Tobin's Q_{-1}$) and in relation to each segment's historical median value (ROA_{-1}) of each conglomerate. The low competitive dataset corresponds to the subset of conglomerates lying above the 50th percentile of the standard deviation of the excess of investment opportunities of each metric ($Tobin's Q_{-1}$ and ROA_{-1}). The table presents OLS regression coefficients and robust standard errors clustered at the firm level. Extreme observations under the 0.5th and above the 99.5th percentile of $Capex_{i,j}(t)$, $Q_{i,j}(t-1)$, $CF_{i,j}(t)$ and $ROA_{i,j}(t-1)$ were winsorized. The coefficients related to year-fixed effects are not included in the table due to space constraints. Panel A displays the regression coefficients obtained using the standard deviation of segments' $Tobin's Q_{-1}$ in excess of the industry's historical median value. Panel B displays the regression coefficients obtained using the standard deviation of segments' ROA_{-1} in excess of each segment's historical median value of ROA_{-1} .

*** p<0.01, ** p<0.05, * p<0.

5. Conclusion

This paper provides evidence on the relationship between intra-conglomerate competition and the efficiency of internal capital markets of diversified firms. I investigate the patterns of capital allocation between low and highly competitive conglomerate firms. As put forward by (Stein 1997), individual projects must compete for the scarce funds available within internal capital markets, and the headquarters' job is to select projects based on their attractiveness relative to other segments. Consequently, the allocation of funds to a specific segment is contingent on the conglomerate's internal capital markets tightness.

I find evidence in favour of the most recent stream of literature pointing towards a superior performance of conglomerates over specialized firms during recessions. Furthermore, although no clear evidence supporting any negative effect brought about by competition on the investment sensitivity to investment opportunities was found, I find noticeable evidence that low competitive firms enhance their responsiveness to *Tobin's Q*-1 to a greater extent compared to highly competitive conglomerates and specialized firms. Additionally, during non-recession periods, I find evidence that low competitive conglomerates are less dependent on internally generated cash flows than specialized firms. In turn, specialized firms are less dependent than conglomerates with higher levels of internal competition. Finally, contrary to low competitive firms, I found evidence proving that highly competitive firms tend to cut investment from the optimal level when facing recessions.

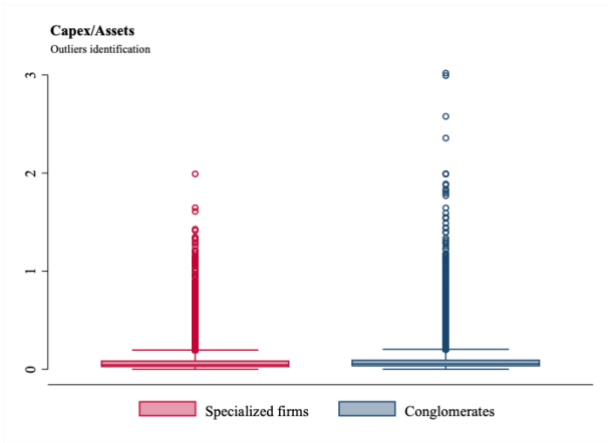
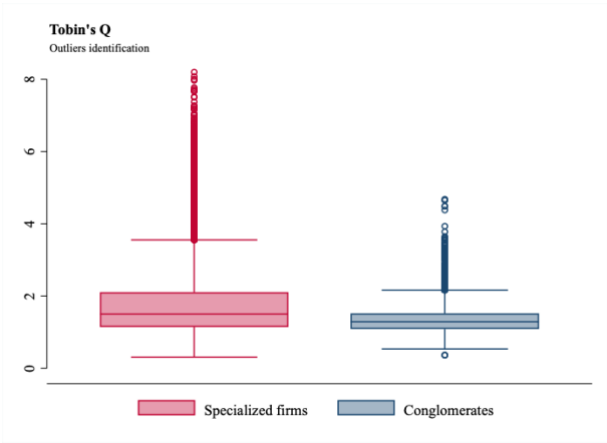
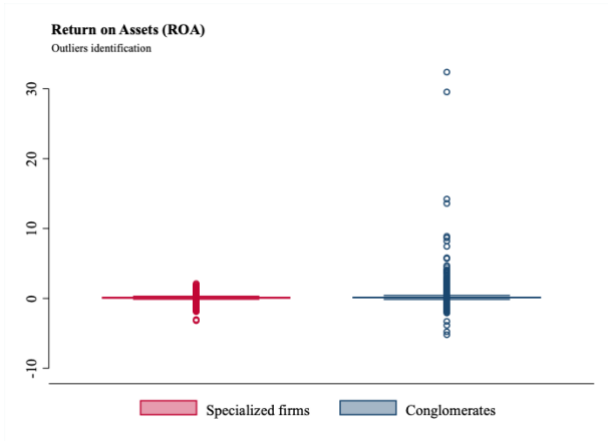
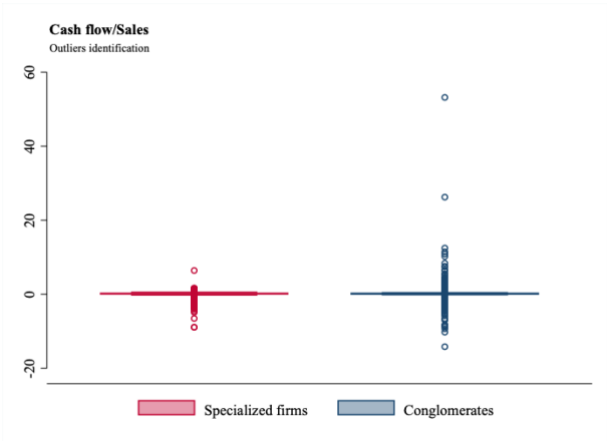
Nevertheless, further research on how to objectively measure investment opportunities should be conducted. Moreover, the extent to which firms invest capital is certainly broader than simply investing in fixed assets. Due to the unavailability of the data, several other forms of investment apart from capital expenditures were not taken into consideration in this study. Certainly, firms less capital-intensive will exploit investment opportunities in intangibles, research & development, or simply human capital.

Appendix

A.1. Variable Definitions

- *Assets*. Current assets plus net property, plant and equipment plus other noncurrent assets, including intangible assets, deferred items and investments and advances. (source: *ias* for segment firms and *at* for specialized firms in COMPUSTAT).
- *Sales*. Gross sales reduced by cash discounts, trade discounts, and returned sales and allowances for which credit is given to customers. (source: *sales* for segment firms and *sale* for specialized firms in COMPUSTAT).
- *Capex*. Cash outflow or the funds used for additions to the company's property, plant and equipment, excluding amounts arising from acquisitions, reported in the statement of cash flows. (source: *capxs* for segment firms and *capx* for specialized firms in COMPUSTAT).
- *Operating Income*. Sales of the company minus its allocated share of operating costs and expenses, such as, cost of goods sold, selling, general and administrative expenses, and depreciation, depletion and amortization. (source: *ops* for segment firms and *oiadp* for specialized firms in COMPUSTAT).
- *Depreciation & Amortization*. Non-cash charges for obsolescence of and wear and tear on property, allocation of the current portion of capitalized expenditures, and depletion charges. (source: *dps* for segment firms and *dp* for specialized firms in COMPUSTAT).
- *Common Equity*. The common shareholders' interest in the company. (source: *ceq* variable in COMPUSTAT).
- *Share Price*. Share price as of the end of the fiscal period. (source: *prcc_f* variable in COMPUSTAT).
- *Shares Outstanding*. Number of common shares outstanding. (source: *csho* variable in COMPUSTAT).
- *Deferred Taxes*. Accumulated tax deferrals due to timing differences between the reporting revenues and expenses for financial reporting and tax purposes. (source: *txdb* variable in COMPUSTAT).
- *Cash*. Cash and short-term investments on the balance sheet. (source: *ch* variable in COMPUSTAT).
- *Short-Term Debt*. Total amount of short-term notes and the current portion of long-term debt. (source: *dlc* variable in COMPUSTAT).
- *Long-Term Debt*. Long-term portion of debt. (source: *dltt* variable in COMPUSTAT).
- *Market Value of Equity (MVE)*. Equal to the price of each share at the end of a fiscal year (*prcc_f*) times the number of outstanding shares (*csho*).
- *Market Value of Assets (MVA)*. Equal to the sum of the book value of assets (*at*) minus the book value of common equity (*ceq*) plus the market value of equity minus deferred taxes (*txdb*).
- *Tobin's Q*. Equal to the quotient of Market Value of Assets (*MVA*) over the sum of 90% of the book value of assets (*at*) plus 10% of the Market Value of Assets (*MVA*).

A.2. Outliers identification



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