The Power Game between Division Managers and CEOs in Internal Capital Market

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ABSTRACT

Scharfstein and Stein (2000) propose a two-tiered agency model where division managers rent-seek to maximize their own utilities; the CEO being an agent of shareholders may use preferential capital allocation to retain division managers. We build our study on this two-tiered agency model and show empirically that: factors that improve division managers' bargaining power (such as segment profitability or segment requires specific human capital) or increase productivity imbalance (such as variation in segment productivities) among segments tend to aggravate distortion in internal capital allocation; while factors that contribute to stronger CEO power (such as high CEO ownership), easy segment evaluation (such as segment asset tangibility) tend to improve the efficiency in internal capital market. We also find that segment financial opacity and equity-based CEO compensation distort capital reallocation decisions when there are changes in segment investment opportunities. Overall, our results indicate that the relative bargaining positions of conglomerate CEOs and segment managers play an important role in determining the efficiency of internal capital market.

Previous studies have shown that the segments in conglomerates are financially interdependent. For example, Lamont (1997) concludes, based on the investment response of oil companies' nonoil segments to oil cash flows, that investment in one segment is sensitive to other segments' cash flow and collateral values. Shin and Stulz (1998) document that the investment of any given segment in a diversified firm depends on the cash flows of other, unrelated segments.

The financial interdependence among segments in conglomerates may cause distortion in capital allocation, that is, the investment in one segment is not consistent with the investment opportunities in that segment. For example, Scharfstein (1998) proves empirically that the investment of conglomerate divisions is virtually insensitive to their investment opportunities; Gartner, Powers and Scharfstein (1999), by examining the same division before and after it is spun out of a conglomerate, demonstrate that investment is markedly less sensitive to Q when a division is inside a conglomerate. Furthermore, Ozbas and Scharfstein (2010) show that the unrelated segments of conglomerate firms exhibit lower Q-sensitivity of investment than stand-alone firms and this fact is driven by unrelated segments of conglomerate firms that tend to invest less than stand-alone firms in high-Q industries.

Some scholars argue the inefficiency in capital allocation within a conglomerate firm may provide explanation for the diversification discount documented in previous financial studies[1]. Several studies have been conducted on investigating the causes of the friction in internal capital market. Malmendier and Tate (2005) argue that CEO characteristics matter in firm investment decisions, overconfident CEOs may cause greater investment distortion within a conglomerate. Xuan (2009) investigates how the job histories of CEOs influence their capital allocation decisions when they preside over multidivisional firms and finds that new specialist CEOs use the capital budget as bridge-building tool to elicit cooperate from powerful divisional managers.

[1] Lang Stulz (1994), Berger and Ofek (1995), and Comment and Jarrell (1995) document a conglomerate discount in the stock market and low returns to conglomerate firms.

This study builds on Scharfstein and Stein (2000) two-tiered agency model and test some of the model implications empirically. In their study, they propose a two-tiered agency model that examines incentives and behavior of both CEO and divisions managers in a conglomerate. In their model, division managers have the ability to engage not only in productive work, but also in wasteful rent-seeking activities. The effect of such rent-seeking is that it renders division managers more bargaining power when they negotiate a compensation package with the CEO. Instead of paying out cash, CEOs direct extra share of capital allocation to the rent-seeking division managers. The two-tiered agency model allows the authors not only capture divisional rent-seeking behavior, but also the idea that the inefficiency in capital allocation by the CEO reflects her own misaligned incentives.

This study contributes to the literature by finding empirical evidence on the power interplay between the CEO and division managers within diversified companies. We show that factors that improve division managers' bargaining power (such as segment profitability or segment requires specific human capital) or increase productivity imbalance (such as variation in segment productivities) among segments tend to aggravate distortion in internal capital allocation while factors that contribute to stronger CEO power (such high CEO ownership), easy segment evaluation (such as segment asset tangibility) tend to improve the efficiency in internal capital market. In summary, our results indicate that the relative bargaining positions of conglomerate CEOs and segment managers play a significant role in determining the efficiency of internal capital market.

We also look into how segment financial opacity affect capital allocation as creating extremely opaque reporting system is one of examples of division manager rent-seeking behaviors. In accounting studies earning management makes it harder to see a firm's true economic performance. Some financial studies show that misaligned incentives and/ or failed compensation scheme create incentives for managers to misstate earnings (e.g. Bergstresser and Philippon,2006, Efendi, Srivastava and Swanson, 2007, Jiang, Petroni and Wang, 2010). Other studies find that financial opacity leads to less revelation of firm-specific information, higher crash risk and higher idiosyncratic return volatility (Jin and Myers, 2006,

Hutton, Marcus and Tehranian, 2009, Rajgopal and Venkatachalam, 2011). Therefore, earnings management is good proxy for division managers' rent-seeking behaviors. We find that segment financial opacity indeed distorts capital reallocation decision when segment investment opportunities change. In addition, contrary to the popular belief that equity compensation help to align CEO's interest with the shareholders' interest, we find that options granted and proportion of equity related compensation in CEO total compensation package tend to reduce the responsiveness of capital spending to segment investment opportunities as well as distort capital reallocation when there are changes in segment investment opportunities.

The paper is organized as follows: section 1 introduces the model developed by Scharfstein and Stein (2000) and develops testing hypotheses; section 2 develops the sample, define key variables and provides descriptive statistics for key variables; section 3 provides empirical results on capital spending responsiveness to segment investment opportunities; section 4 provides empirical results on capital reallocation decisions when segment investment opportunities change; section 5 concludes.

1. Underlying model and hypotheses

1.1 Two-tiered agency model

The model proposed by Scharfstein and Stein features two levels of agency problem. Consider a firm operating with two divisions and three basic agents: division managers, a CEO, and outside investors. There are two time periods, 1 and 2. At time 1, the CEO hires a new manager for each division to work with assets that are already in place. At time 2, the original division manager has the option to quit, and his decision is based on his outside options. Therefore, division managers have incentives to "rent-seeking", which may enable him to extract more from the CEO when they negotiate at time 2. If a division manager does quit at time 2, the output is reduced. CEO gets private benefits from the assets of all divisions while the manager of a division gets private benefits from the assets of his division only.

From the perspective of outside investors, the capital allocation is efficient if the marginal products of investment in each division are equal.

As an agent of outside shareholders, instead of maximizing shareholders' wealth CEO maximizes his own utility:

$$U \equiv \varphi\theta_1 k(I_1) - \omega_1 + \varphi\theta_2 k(\bar{I} - I_1) - \omega_2 \quad (1)$$

subject to the retention constraints

$$\omega_1 + \gamma\theta_1 k(I_1) \geq g(r_1) \quad (2)$$

$$\omega_2 + \gamma\theta_2 k(\bar{I} - I_1) \geq g(r_2) \quad (3)$$

where $\theta_i k(I_1)$ is the output of division i at time 2 and θ_i is a measure of the productivity of the assets in place. φ measures the proportion of private benefit that the CEO can reap from each division's output. γ captures the private benefit that division manager i reaps from his division's output. ω_i is the cash wage (if any) agreed by the CEO. I_1 is the investment in division 1 and $\bar{I}$ is the total investment available. $g(r_i)$ is the outside option for division manager i and r_i captures the time spent on rent-seeking by manager i.

The model assumes that the CEO is subject to a total "operating budget", from which he direct cash wage to division managers. Thus CEO has incentive to hold down division manager cash wages so she can spend more of the operating budge on things that raise her utility. The total utility for the CEO is thus the private benefits he reaps from both divisions minus the total cash he needs to pay out as division manager wages. Then, for the original division manager, he only stays if the sum of his cash wage and the private benefits he reaps from his division's output is greater than his outside option.

Model concludes that the rent-seeking behavior on the part of division managers can subvert the workings of an internal capital market. A prediction arises from the model is that investment is most likely to be tiled towards the weaker division in a firm when it is paired with a much stronger division.

1.2 **Testing hypothesis**

Based on the discussion in session 1.1, we propose that any factors that contribute to greater bargaining power of segment mangers will aggravate distortion in capital allocation while any factors that contribute to greater CEO bargaining power will moderate distortion in capital allocation. Furthermore, as pointed out in the two-tiered model, the imbalance in productivity among segments also provide additional incentive for division managers to rent seek. Specifically, we hypothesize that (1) higher segment profitability, more specific human capital requirement in managing a segment will give segment more bargaining power and thus lead to more capital allocation distortion; (2) higher variation in segment profitability leads to higher capital allocation distortion; (3) higher proportion of tangible asset in segment asset base makes it easier to value segment performance and investment opportunities and thus lead to better more efficient capital allocation; (4) higher CEO ownership puts CEO in a stronger bargaining position and improves the efficiency of internal capital market.

In addition, Willaimson (1975) suggests that the internal capital market of conglomerates might allocated capital more efficiently than the external market as top management of a conglomerate is better informed about investment opportunities than external investors. However, segment financial opacity could make it more difficult for top management to precisely evaluate segment performance. Therefore, we hypothesize that (5) segment financial opacity could reduce investment sensitivity to segment investment opportunities.

2. Data and Variables

2.1 Sample selection and data sources

We start with all firm-segments that are reported in Compustat Segment Files. To be included in the final sample, a firm must have at least two business segments and have no segment in the financial industry (SIC codes 6000-6999). Then we collect firm-level data from Compustat Industry Files and firm executives' information (e.g. CEO age, gender, compensation structure, etc) from Compustat ExecuComp. To be included in the final sample, a firm must have enough information needed to

calculate at least one CEO characteristic variable, and a segment must report enough information for estimation of its investment ratio and its imputed Q[2]. After deleting firms/segments that do not meet our data requirement, we end up with 12,903 observations spreading 17 years and 45 different Fama-French industries.

Panel A of Table 1 reports time period distribution of our sample. We only have 10 observations from year 1997, the first year of our sample period while year 2001 contributes most to the sample. In Table 1 Panel B, we provide the Fama-French industries that appear in our sample as well as the number of observations from each included industry. The biggest contributing industry is "Petroleum and Natural Gas" followed by "Utilities". Four industries that didn't make to our sample are "Communication" with Fama-French industry code "32", "Transportation" with Fama-French industry code "41", "Banking" with Fama-French industry code "45" and "Insurance" with Fama-French industry code "46".

2.2 Variable definitions and constructions

2.2.1 Segment-level variables.

We use segment investment ratio (Seg_INV) to proxy for capital allocation to a certain segment within a firm. It is calculated as segment capital expenditure over segment total assets. Segment cash flow (Seg_CF) is segment operating income before depreciation over segment assets; when segment operating income before depreciation is not directly available, we use segment operating profit plus depreciation and amortization to proxy for cash flow and normalize the sum by segment assets as well. Company cash flow (Com_CF).

To test the efficiency of internal capital market, we need some measure to proxy for investment opportunities for each specific segment. Following previous studies, we use segment imputed Q to measure this investment opportunity. A segment's imputed Q is the median Tobin's Q of stand-alone firms that operate in the same industry of segment. Specifically, we first identify stand-alone firms using the following two standards: the sales value reported for one segment in the Compustat merged segment file is at least 99% of the sales value reported for the firm in the Compustat industry file; the calculated

[2] Detailed variable description is provided in the following session.

segment number from the merged segment file is one. I then group stand-alone firms/segments into different industries using Fama-French 49 industry classification. We also adjusted our imputed Q estimate as Ozbas and Scharfstein (2010) by bounding it above at 10 to reduce the effect of potential measurement error in the book value of assets. The bounded stand-alone Q (Ind_Q) is computed as MVA/(0.9*BVA+0.1*MVA), where the book value of assets equals Compustat item AT and the market value of assets equals the book value of assets plus the market value of common equity (CSHO *PRCC_F) less the book value of common equity (CEQ) and balance sheet deferred taxes (TXDB). As pointed out by Ozbas and Scharfstein (2010), this measure differs from standard measure of Q in that no estimation of replacement cost of fixed assets or adjustment for taxes is needed for this measure.

We employ three measures for segment importance or segment manager bargaining power. The first measure proxies for segment size, as measured by segment PP&E normalized by segment assets (Seg_SPPE). The rest two measures are used to proxy for segment profitability: one is segment return on assets (Seg_ROA) and the other is segment profit margin (Seg_PM). To measure the imbalance in productivity among different segments within a conglomerate, we use the standard deviation of segment ROAs (Vol_ROA) and the standard deviation of segment profit margins (Vol_PM) within the conglomerate in a particular year. We add two additional variables to measure the bargaining power of segment managers. One is a dummy variable for high-tech industries (SIC codes 2833-2836, 3570-3577, 3600-3674, 7371-7379 and 8731-8734). As pointed out in Scharfstein and Stein (2000), segment output may be reduced if the original division manager quits and has to be placed because "the original division manager has acquired some specific human capital, which makes him particularly valuable". We expect this "learning by doing" effect is more pronounced in high-tech industries. The other measure is segment financial opacity. This measure tries to capture the "scorched earth" type rent-seeking of division managers in Scharfstein and Stein (2000). Division managers might create excessively opaque internal accounting systems, hiding other information to make it harder for any successor to take over the job. We use unsigned discretionary accrual to measure financial opacity (Opaque) at segment level. Due to data availability, we use Jones (1991) model,

$$Total\ Accruals_{it} = \alpha + \beta_1(\Delta Sales_{it}) + \beta_2(PPE_{it}) + \varepsilon_{it} \quad (4)$$

where total accruals is the difference between segment cash flows and income before extraordinary items at segment level. Segment cash flow is calculated as either segment operating income before depreciation or the sum of operating profits and segment depreciation given data availability. $\Delta Sales_{it}$ is the change in segment sales from the previous year to the current year. And PPE_{it} is the segment's end of year property, plant and equipment. All variables are scaled by beginning period total assets at winsorized at 1% level.

We estimate equation (4) for each Fama-French-year group and the regression residuals are discretionary accruals. The magnitude of discretionary accruals reflects the extent of managers' discretion in reporting earnings. Therefore, we use the absolute value of discretionary accruals to capture segment financial opacity. In our regression analysis, we use opaque quintiles.

2.2.2 Firm-level and CEO characteristics

We use several measures to capture the bargaining power of conglomerate CEOs. The first group of variables are linked to CEO compensation arrangement, they are: (1) cash payment to salary ratio (Cash_Pay_SAL), measured as the sum of salary, bonus and the amount paid to the executive under the company's long-term incentive plan over total salary; (2) bonus to salary ratio (BN_SAL); (2) restricted stocks granted to salary ratio (OPGRT_SAL); (3) in the money options to salary ratio (IMOP_SAL), calculated as the sum of estimated value of in-the-money unexercised exercisable options and estimated value of in-the-money unexercised unexercisable options over total salary; (4) fraction of equity compensation (EBC_TDC), calculated as the sum of the value of restricted shares granted and the Blanc and Scholes value of options granted over total compensation; (5) CEO pay slice (CPS), calculated as the percentage of total compensation to the top five executives that goes to the CEO as in Bebchuk, Cremers and Peyer (2011). The other included CEO characteristics are CEO age (CEO_AGE), dummy variable for female CEOs (Female), number of years a person has served as CEO (CEO_Tenure) and the percentage of conglomerate shares owned by its CEO (CEO_OWN).

2.3.1 Descriptive Statistics

Table 2 provides key variable descriptions as well as summary statistics. On average, the segment capital expenditure is about 5.6 percent of segment assets with a standard deviation of 7.8 percent. The mean value of imputed Q is 1.451, which is broadly consistent with Ozbas and Scharfstein (2010). An average segment in our sample seems to have negative cash flow, return on asset, and negative profit margin over the sample period, though the corresponding medians are positive. The average company cash flow also seems to be negative during this period for our sample firms. An average segment has around 35.4 percent assets in PP&E. Approximate 10.4 percent of our sample segments are in high-tech industries and approximate 40.3 percent of our sample segments are manufacturing industries.

Average volatility in segment profit margin and ROA is 5.2 percent and 1.7 percent respectively. It seems that an average CEO in our sample earns twice as much cash_pay as salary, receives bonus and restricted stocks amounting to 50 percent of salary and owns around 3.95 percent of the employer's stocks. It's interesting to see that options granted and in-the-money options held by CEOs on average exceeds their base salaries. For an average CEO in the sample, 38.4 percent of total compensation is equity related. Together, these numbers have highlighted the popularity of using equity compensation to align managers' interest with shareholders' interest in modern corporations. The average age for sample CEOs is 55 and they on average have been in the CEO position for around 7.8years. We only have lightly more than 1% female CEOs in our sample.

3. Empirical results on investment sensitivity

In this study we try to investigate how different segment factors and CEO characteristics affect the internal capital market efficiency. Our main empirical approach is to test whether the proposed variables have any impact on the investment responsiveness to segment investment opportunities. Specifically, we run the following regression using different variables we propose,

$$Seg\_INV_{j,t} =$$

$$a_j + b_t + c_i + d_1 * Ind\_Q_{j,t} + d_2 * Ind\_Q_{j,t-1} * F_{j,t} + e_1 * Seg\_CF_{j,t} + e_2 * Com\_CF_{j,t} \quad (5)$$

The dependent variable is the asset-normalized capital spending of segment j operating in industry i in year t. $a_j, b_t,\ and\ c_i$ are segment, year and industry fixed effects, respectively. We follow Fama-French 49 industry classification. $Ind\_Q_{j,t}$ is the imputed Q for segment j in year t as defined above, it proxies for the segment investment opportunities. Previous studies have shown that investment opportunities are usually positively related to segment capital spending. Our main interest lies in the interaction term, $Ind\_Q_{j,t-1} * F_{j,t}$, where $F_{j,t}$ represents any of our proposed factors. The last two terms in the equation represent segment cash flow and company cash flow, respectively.

3.1 The responsiveness of investment to imputed Q

We start our empirical analysis by establishing the relationship between capital allocation and investment opportunities. To do so, we regress segment investment on lagged segment imputed Q and control variables. We add segment fixed effect, industry fixed effect and year fixed effect to control for unobservable heterogeneity. The result is reported in Column 1 of Table 3. As expected, the coefficient of segment imputed Q is positive and significant. So on average, conglomerates tend to allocate more capital to segments with better investment opportunities. To check the robustness of our result, we then re-run the regression using only manufacturing segments and we report the result in Table 3, Column 2. The positive association between investment and imputed Q still holds and it seems to be more pronounced in manufacturing segments.

3.2 The bargaining power of CEO and the efficiency of internal capital market

We next turn out attention to whether the bargaining power of CEO affects the capital allocation within conglomerates. In Table 4. Panel A, we investigate whether different compensation arrangement bears any merit on determining internal capital market efficiency. In each of the regression, we include imputed Q, company and segment cash flows, our chosen compensation variable, and the interaction of imputed Q and compensation variable. The interested coefficients are those on the interaction terms. A positive coefficient suggests the corresponding compensation variable increases investment responsiveness to investment opportunities, or in another word, improves the efficiency of internal capital market; on the

other hand, a negative number would suggest the corresponding variable aggravates the distortion in internal capital market.

We find three statistically significant coefficients of the interaction terms. They are the interaction of imputed Q with cash-pay to salary ratio, with option granted to salary ratio, and with equity-based compensation to total compensation ratio. It seems that a higher cash-pay to salary ratio helps diversified firms to allocate capital more efficiently. Contrary to popular belief that equity compensation helps to align manager interest with shareholders' interest, both option granted and equity-based compensation reduce investment sensitivity to segment investment opportunities.

In Panel B of Table 4, we follow the same approach and investigate how other CEO characteristics affect internal capital market efficiency. Only one interaction term turns out to be statistically significant – the higher percentage of shares held by CEOs, the more efficient is the internal capital market. This is consistent with the implications of Scharfstein and Stein (2000) model. As a CEO accumulates more employer's stocks, she becomes more powerful in the corporate hierarchy and has less incentives to use capital allocation to retain a division manager or to gain his support.

3.3 The bargaining power of division managers and the efficiency of internal capital market

An important feature of Scharfstein and Stein (2000) two-tiered agency model lies in its explicit attention to the rent-seeking behaviors of division managers. They discuss two different formulations of rent-seeking: resume-polishing and scorched earth. Resume polishing refers to division managers' activities that improve his external options if he wants to quit; while scorched earth points to division managers' activities that make it harder for any successor to take over the job. We propose that any factors that contribute to higher bargaining power of division managers could lead to more distortion in capital allocation.

In Table 5, we investigate how segment size and profitability affect investment sensitivities to segment investment opportunities. For each regression in Table 5, we regress segment investment on segment imputed Q, cash flow variables as well as the interaction of imputed Q and one of our size/profitability measures. We also include in each regression the segment-, industry- and year-fixed effects for omitted

variables. Our results show that more profitable segments, as measured by ROA, tend to receive more capital allocation; however, their allocated capital is less responsive to their investment opportunities. The result lends support to our division manager bargaining power hypothesis. When a division manager is in charge of more profitable segment, he has more influence on CEO's capital allocation decisions. This may because the conglomerate relays heavily on the segment or the division manager's external option has improved. We also find that the investment tends to be more responsive to investment opportunities when a segment has more tangible assets in its asset base. We interpret this result as when a segment has more tangible assets, it's easier to evaluate its performance and it's easier for a successor to take over the job from the original division manager as well. We fail to find any significant result using segment profit margin.

We move on to examine other implications of Scharfstein and Stein (2000) model. First, we examine whether segments operating in industries that more likely to help division manager to acquire specific human capital aggravate investment distortion in internal capital market. We use high-tech industries to proxy for such industries. The result is reported in Table 6 column 1. Consistent with our hypothesis, we find that the investment in high-tech-industry segment is less responsive to investment opportunities, as evidenced by the negative and significant coefficient of the interaction term of high-tech and imputed Q.

Scharfstein and Stein (2000) also propose that when there's greater heterogeneity in segment productivities, the division manager from the less productive segment is more prone to rent-seeking. We extend this argument and propose that when there are more imbalances in segment productivities in the same conglomerate, the capital allocation distortion is more severe. We test his hypothesis by investigating whether the productivity imbalance among segments affect the responsiveness of investment to imputed Q. We use the standard deviation of segment ROA and profit margins within the same conglomerate to proxy for productivity heterogeneity among segments. The results are provided in column 2 and column 3 in Table 6. Our interest lies in the interaction term of segment imputed Q and our imbalance measures. As predicted, the interaction terms using both imbalance measures turn out to be

negative and significant – greater differences in segment profitability lead to greater distortion in capital allocation.

4. The reallocation of capital spending on changes in investment opportunities

So far, we have shown that higher portion of equity-based pay in CEO compensation package, more powerful division mangers, and higher productivity imbalance among segments tend to aggravate the inefficiency in internal capital market; while higher cash-pay in CEO compensation package, higher CEO ownership in employer's shares and higher asset tangibility on segment level tend to improve capital allocation efficiency within diversified companies. In this session, we further exploit whether our proposed factors have any impact on capital spending changes when there are changes in investment opportunities. More specifically, we estimate the following regression,

$$\Delta Seg\_INV_{j,t} =$$

$$a_j + b_t + c_i + d_1 * \Delta Ind\_Q_{j,t} + d_2 * \Delta Ind\_Q_{j,t-1} * F_{j,t} + e_1 * Seg\_CF_{j,t} + e_2 * Com\_CF_{j,t} \quad (6)$$

The dependent variable is the change in asset-normalized capital spending of segment j operating in industry i in year t. $a_j, b_t, \ and \ c_i$ are segment, year and industry fixed effects, respectively. We follow Fama-French 49 industry classification. $\Delta Ind\_Q_{j,t}$ is the change in imputed Q for segment j in year t as defined above. Our main interest lies in the interaction term, $Ind\_Q_{j,t-1} * F_{j,t}$, where $F_{j,t}$ represents any of our proposed factors. The last two terms in the equation represent segment cash flow and company cash flow, respectively. The interaction term captures how different factors affect changes in capital spending given certain changes in segment investment opportunities.

4.1 Bargaining power of CEO and the reaction of capital spending to changes in investment opportunities

In Table 7 Panel A, we report the regression results of equation (6) using CEO compensation arrangement measures. For the seven compensation measures we examine, we find the interaction term between changes in imputed Q and the bonus-salary ratio (BN_SAL), the restricted stocks granted to salary ratio (RSTGRT_SAL), the options granted to salary ratio (OPGRT_SAL) and the in-the-money options to

salary ratio (IMOP_SAL) to be statistically significant. Among the significant variables, we find that bonus-to-salary ratio and restricted stocks granted-to-salary ratio have positive impact on capital spending adjustment when segment investment opportunities change. On the other hand, we find that options granted and in-the-money options held by CEOs reduce the adjustment in capital spending given changes in segment investment opportunities. We interpret the results as whenever there's more uncertainty associated with CEO compensation (i.e. high options-to-salary ratio), the CEO is more conservative in reallocating internal capital. This may because CEOs are not sure whether the change in segment investment opportunities is permanent or transient and do not want to make premature adjustments, as any mis-judged reallocation could lead to subsequent bad outcome and reduce the option value held by CEOs. The in-the-money option also makes CEOs more conservative when it comes to capital reallocation. CEOs who hold a lot of in-the-money options may see the moneyness of their options as an approval of the current capital allocation policy and are reluctant to immediately adjust it without further evidence that some segments are becoming more investable relative to other segments.

We investigate how other CEO characteristics affect capital reallocation in internal capital market in Panel B of Table 7. Interestingly, we find that higher CEO ownership in employer's shares lead to less adjustment in capital spending when segment investment opportunities change. From our analysis in Table 4. Panel B, we know that CEO ownership helps to improve the efficiency of internal capital market, as investment spending is more sensitive to segment investment opportunities when CEO owns more employer's shares. We interpret the negative and significant coefficient on the interaction term of CEO ownership and change in imputed Q here as CEO overconfidence. This is because those CEOs already have their human capital tied up in the company but instead of diversifying their financial capital, they choose to hold a great amount of their financial capital in their employers' shares. Therefore, CEOs holding a significant amount of employer's shares may indicate they are extremely confidence in their leadership and expertise. As argued by Malmendier and Tate (2005), overconfident CEOs may cause greater investment distortion within a conglomerate; we take the negative coefficient on the interaction

term here as overconfident CEOs refuse to immediately adjust their capital allocation decisions for changes in segment investment opportunities.

4.2 Bargain power of division managers and the reaction of capital spending to changes in investment opportunities

We are also curious whether the segment variables that affect internal capital market efficiency also have any impact on internal capital reallocation when segment investment opportunities change. We test how segment profitability and size affect capital reallocation in Table 8. Segment profitability as measured by segment ROA and segment tangible assets facilitates the capital allocation flow to (out from) the segments whose investment opportunities have improved (decreased). The results are also roughly consistent with implications from Scharfstein and Stein (2000) two-tiered model. High ROA segment are more profitable, given a fixed division manager expropriation ratio, the private profit that the division manager can reap is still very high; and benefit of staying on the current job outweighs the division manager's outside option. Therefore there's no need for the CEO to use capital allocation to retain the division manager instead her capital reallocation is more likely to reflect the changed investment opportunities of the segments. For the segment with higher tangible assets, it's easier to value its performance and there's clearer signal on its changed investment opportunities, both of which will help CEO to reallocate capital accordingly. Oddly, the interaction of segment profit margin and change in investment opportunities turn out to be negative and significant.

In Table 9, we examine whether high-tech industries, productivity imbalance among segments and segment financial opacity have any impact on capital reallocation. Among all the variables examined, only the interaction term of segment financial opacity and change in segment imputed Q turns out to be statistically significant. The result tells us when division mangers create more opaque financial reporting systems, it become more changeling for CEOs precisely evaluate the change in segment investment opportunities and to reallocate capital accordingly.

5. Conclusion

In this study, we build on the two-tiered agency model proposed by Scharfstein and Stein (2000) and investigate how the bargaining power of CEO and division managers in a conglomerate affects the efficiency of internal capital market. We find on the CEO side, higher cash-pay to salary ratio and higher ownership of employer's shares tend to increase the efficiency of internal capital market; while higher options granted-to-salary ratio and higher equity-based pay in compensation package tend to aggravate the distortion in capital allocation. On the segment level, we find when segment managers have more bargaining power; the capital spending is less responsive to investment opportunities. Specifically, we find that the capital spending in segment with higher profitability, operating in high-tech industries tend to be less sensitive to segment investment opportunities, as proxied by imputed Q; while capital allocation to segment with higher tangible assets tend to be more responsive to the segment investment opportunities. We also investigate whether imbalance in segment productivity affects internal capital market efficiency and find evidence that higher heterogeneity in segment productivity leads to more distortion in internal capital allocation.

We also take one step further to examine how these measures affect capital reallocation when there are changes in segment investment opportunities. Our results show that high cash pay or high restricted stocks granted to salary ratios in CEO compensation arrangement improve capital reallocation efficiency when the investment opportunities change; while more options granted or more in-the-money options held by CEOs tend to distort capital reallocation. Interestingly, we find that when CEO shares higher ownership in her employer, the capital reallocation is less efficient. We attribute this result to CEO overconfidence. As they choose to tie up both their human capital and financial capital in their companies, they are reluctant to change their original capital allocation plans when there are changes in segment investment opportunities.

At last, we investigate how the segment level variables we propose in this study affect internal capital reallocation. We find that high segment return on asset and high segment asset tangibility improves

capital reallocation efficiency while high segment financial opacity distorts capital reallocation when a segment investment opportunities change.

In summary, factors that improve division managers' bargaining power or increase productivity imbalance among segments tend to aggravate distortion in internal capital allocation while factors that contribute to stronger CEO power, clearer segment evaluation tend to improve the efficiency in internal capital market.

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Table 1. Sample distribution

Panel A. This table reports the number of observations from each year.

Year	Number of Obs	Percent
1997	10	0.08
1998	35	0.27
1999	363	2.81
2000	1,016	7.87
2001	1,224	9.49
2002	1,196	9.27
2003	1,123	8.7
2004	1,083	8.39
2005	1,022	7.92
2006	978	7.58
2007	914	7.08
2008	842	6.53
2009	788	6.11
2010	742	5.75
2011	704	5.46
2012	656	5.08
2013	207	1.6
Total	12,903	100

Table 1. Sample distribution

Panel B. This table reports industry distribution of sample segments. Industry classification follows Fama-French 49-industry classification.

FF industry Code	Industry Description	Number of Obs	Percent
1	Agriculture	48	0.37
2	Food Products	236	1.83
3	Candy & Soda	152	1.18
4	Beer & Liquor	52	0.4
5	Tobacco Products	16	0.12
6	Recreation	80	0.62
7	Entertainment	441	3.42
8	Printing and Publishing	76	0.59
9	Consumer Goods	231	1.79
10	Apparel	151	1.17
11	Healthcare	555	4.3
12	Medical Equipment	394	3.05
13	Pharmaceutical Products	700	5.43
14	Chemicals	95	0.74
15	Rubber and Plastic Products	48	0.37
16	Textiles	24	0.19
17	Construction Materials	223	1.73
18	Construction	226	1.75
19	Steel Works. etc	128	0.99
20	Fabricated Products	38	0.29
21	Machinery	210	1.63
22	Electrical Equipment	91	0.71
23	Automobiles and Trucks	84	0.65
24	Aircraft	34	0.26
25	Shipbuilding, Railroad Equipment	25	0.19
26	Defense	6	0.05
27	Precious Metals	148	1.15
28	Non and &sic le Metallic and Industrial Metal Mining	47	0.36
29	Coal	56	0.43
30	Petroleum and Natural Gas	1,147	8.89
31	Utilities	909	7.04
33	Personal Services	213	1.65
34	Business Services	692	5.36
35	Computers	184	1.43
36	Computer Software	712	5.52
37	Electronic Equipment	631	4.89
38	Measuring and Control Equipment	160	1.24
39	Business Supplies	58	0.45
40	Shipping Containers	21	0.16
42	Wholesale	575	4.46
43	Retail	1,755	13.6
44	Restaraunts, Hotels, Motels	523	4.05
47	Real Estate	200	1.55
48	Trading	342	2.65
49	Other	166	1.29
Total		12,903	100

Table 2. Variable description and summary statistics.

This table provides the definition of key variables as well as the sample average, median, and standard deviation for each variable.

Variable	Description	Mean	Std Dev
Seg_INV	segment investment ratio, capital expenditure over segment assets	0.056	0.078
Ind_Q	Imputed Q	1.451	0.380
Seg_CF	segment CF ratio, operating income before depreciation over segment assets	-0.154	2.150
Com_CF	company cash flow	-0.231	2.456
Seg_ROA	segment return on assets	-0.287	2.372
Seg_PM	segment profit margin	-1.086	5.594
Seg_SPPE	segment PP&E normalized by segment assets	0.354	0.359
High-tech	dummy variable for segments that are in high-tech industry, identified by SIC codes, 2833-2836, 3570-3577, 3600-3674, 7371-7379 and 8731-8734	0.104	0.305
Manuf	dummy variable for segments that are in manufacturing industries, identified by SIC codes 2000-3999	0.403	0.490
Vol_PM	volatility of segment profit margin	0.052	0.826
Vol_ROA	volatility of segment ROA	0.017	0.469
Opaque	absolute value of segment discretionary accruals	0.179	0.218
Cash_pay_SAL	(salary+bonus+ltip) to salary ratio. LTIP is the amount paid out to the executive under the company's long-term incentive plan.	2.040	2.167
BN_SAL	bonus to salary ratio	0.559	1.455
RSTGRT_SAL	restricted stocks granted to salary ratio	0.507	1.237
OPGRT_SAL	options granted to salary ratio	2.167	3.275
IMOP_SAL	in the money options to salary ratio	7.820	15.521
CPS	CEO pay slice (Bebchuk, Cremers and Peyer, 2011), calculated as the percentage of total compensation to the top five executives that goes to the CEO	0.182	0.077
EBC_TDC	fraction of equity compensation	0.384	0.304
CEO_AGE	CEO age	55.02	6.75
CEO_TENURE	number of years a person has served as CEO	7.777	6.946
CEO_OWN	percentage shares owned including options	3.947	6.744
Female	dummy variable for female CEO	0.011	0.104

Table 3. Segment investment sensitivity to imputed Q

This table reports the regressions results of segment investment. Segment investment is segment capital expenditures divided by segment assets. Segment cash flow is calculated as either segment operating income before depreciation or the sum of operating profits and segment depreciation given data availability. Imputed Q is calculated as the median bounded Q of stand-alone firms within the same Fama-French industry. Company cash flow is operating income before depreciation over assets from Compustat industry file. Manufacturing segments are those that have a SIC code between 2000 to 3999. Column 1 controls for segment fixed effect, industry fixed effect and year fixed effect; Column 2 controls for segment fixed effect and year fixed effect. Robust standard errors are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

VARIABLES	(1) All Industries	(2) Manufacturing Industries
Ind_Q_{t-1}	0.0145***	0.0271***
	(0.004)	(0.007)
Seg_CF_{t-1}	0.0003	-0.0008
	(0.001)	(0.001)
Com_CF_{t-1}	-0.0005	-0.0004
	(0.001)	(0.001)
Constant	-0.0425*	0.0385***
	(0.022)	(0.013)
Observations	12,023	4,798
Number of seg_id	2,643	1,169
Segment F.E.	Yes	Yes
Industry F.E.	Yes	No
Year-Fixed	Yes	Yes
R-square (within)	0.0342	0.0421

Table 4. Panel A. The impact of CEO characteristics on investment sensitivity.

This table reports how different CEO compensation measures affect the segment investment sensitivity to segment imputed Q. Variables are defined as in Table 2. Robust standard errors are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Ind_Q_{t-1}	0.0102	0.0202**	0.0136	0.0245***	0.0154*	0.0195**	0.0226***
	(0.010)	(0.009)	(0.009)	(0.007)	(0.009)	(0.010)	(0.007)
$Cash\_Pay\_Sal_t$	-0.0019*						
	(0.001)						
$Cash\_Pay\_Sal_t{*}Ind\_Q_{t-1}$	0.0011**						
	(0.001)						
BN_SAL_t		-0.0008					
		(0.002)					
$BN\_SAL_t{*}Ind\_Q_{t-1}$		0.0004					
		(0.001)					
$RSTGRT\_SAL_t$			0.0040				
			(0.003)				
$RSTGRT\_SAL_t{*}Ind\_Q_{t-1}$			-0.0033				
			(0.002)				
$OPGRT\_SAL_t$				0.0025***			
				(0.001)			
$OPGRT\_SAL_t{*}Ind\_Q_{t-1}$				-0.0020***			
				(0.001)			
$IMOP\_SAL_t$					0.0000		
					(0.000)		
$IMOP\_SAL_t{*}Ind\_Q_{t-1}$					0.0001		
					(0.000)		
CPS_t						-0.0103	
						(0.066)	
$CPS_t{*}Ind\_Q_{t-1}$						0.0037	
						(0.049)	
EBC_TDC_t							0.0261
							(0.017)
$EBC\_TDC_t{*}Ind\_Q_{t-1}$							-0.0188*
							(0.011)
Seg_CF_{t-1}	0.0757**	0.0478*	0.0758**	0.0663**	0.0512**	0.0479**	0.0719**
	(0.031)	(0.025)	(0.031)	(0.031)	(0.022)	(0.024)	(0.030)
Com_CF_{t-1}	0.0014	-0.0227***	0.0006	0.0067	-0.0230***	-0.0227***	0.0056
	(0.016)	(0.004)	(0.015)	(0.017)	(0.004)	(0.004)	(0.017)
Constant	0.0379**	0.0136	0.0329**	0.0211*	0.0191	0.0184	0.0227*
	(0.016)	(0.014)	(0.014)	(0.012)	(0.013)	(0.014)	(0.012)
Observations	1,061	2,273	1,061	1,053	2,273	2,284	1,055
Number of seg_id	324	467	324	322	467	470	322
Segment F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-square (within)	0.0535	0.0853	0.0546	0.0753	0.110	0.0859	0.0623

Table 4. Panel B. The impact of CEO characteristics on investment sensitivity.

This table reports how different CEO characteristics affect the segment investment sensitivity to segment imputed Q. Variables are defined as in Table 2. Robust standard errors are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

VARIABLES	(1)	(2)	(3)	(4)
Ind_Q_{t-1}	0.0736*	0.0217***	-0.0778***	0.0145***
	(0.042)	(0.008)	(0.029)	(0.004)
CEO_AGE_t	0.0018			
	(0.001)			
$CEO\_AGE_t * Ind\_Q_{t-1}$	-0.0010			
	(0.001)			
CEO_TENURE_t		0.0002		
		(0.001)		
$CEO\_TENURE_t * Ind\_Q_{t-1}$		-0.0001		
		(0.001)		
CEO_OWN_t			-0.0148*	
			(0.008)	
$CEO\_OWN_t * Ind\_Q_{t-1}$			0.0129*	
			(0.007)	
$Female_t$				0.0139
				(0.023)
$Female_t * Ind\_Q_{t-1}$				-0.0105
				(0.018)
Seg_CF_{t-1}	0.0402	0.0464*	-0.0103	0.0003
	(0.026)	(0.024)	(0.050)	(0.001)
Com_CF_{t-1}	-0.0209***	-0.0225***	-0.0141**	-0.0005
	(0.004)	(0.004)	(0.007)	(0.001)
Constant	-0.0858	0.0134	0.1635***	-0.0426*
	(0.061)	(0.012)	(0.044)	(0.022)
Observations	2,226	2,254	588	12,023
Number of seg_id	470	464	226	2,643
Segment F.E.	Yes	Yes	Yes	Yes
Industry F.E.	Yes	Yes	Yes	Yes
Year-Fixed	Yes	Yes	Yes	Yes
R-square (within)	0.0904	0.0879	0.222	0.0342

Table 5. The impact of segment size on investment sensitivities.
This table reports how segment profitability and size affect the sensitivity of segment investment to segment imputed Q. Variables are defined as in Table 2. Robust standard errors are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

VARIABLES	(1)	(2)	(3)
Ind_Q_{t-1}	0.0117***	0.0114***	0.0101**
	(0.004)	(0.004)	(0.004)
SEG_ROA_t	0.0015***		
	(0.001)		
$SEG\_ROA_t * Ind\_Q_{t-1}$	-0.0018***		
	(0.000)		
SEG_PM_t		0.0000	
		(0.000)	
$SEG\_PM_t * Ind\_Q_{t-1}$		-0.0000	
		(0.000)	
SEG_SPPE_t			-0.0018
			(0.005)
$SEG\_SPPE_t * Ind\_Q_{t-1}$			0.0100***
			(0.003)
Seg_CF_{t-1}	-0.0005**	0.0007**	0.0002
	(0.000)	(0.000)	(0.000)
Com_CF_{t-1}	-0.0001	-0.0009***	-0.0004*
	(0.000)	(0.000)	(0.000)
Constant	0.0003	0.1855**	-0.0423
	(0.067)	(0.085)	(0.068)
Observations	11,711	11,238	12,023
Number of seg_id	2,596	2,497	2,643
Segment F.E.	Yes	Yes	Yes
Industry F.E.	Yes	Yes	Yes
Year-Fixed	Yes	Yes	Yes
R-square (within)	0.0552	0.0371	0.0521

Table 6. Segment imbalance and investment sensitivities.
This table reports how segment imbalance and financial opacity affect the sensitivity of segment investment to segment imputed Q. Variables are defined as in Table 2. Robust standard errors are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1

VARIABLES	(1)	(2)	(3)	(4)
Ind_Q_{t-1}	0.0198***	0.0112***	0.0104***	0.0136***
	(0.005)	(0.004)	(0.004)	(0.005)
Vol_PM		0.0183**		
		(0.009)		
$Vol\_PM_t * Ind\_Q_{t-1}$		-0.0131*		
		(0.007)		
$High - tech_t * Ind\_Q_{t-1}$	-0.0196***			
	(0.007)			
VOL_ROA_t			0.0636*	
			(0.035)	
$VOL\_ROA_t * Ind\_Q_{t-1}$			-0.0585*	
			(0.032)	
$Opaque\ Quintile_t$				0.0017
				(0.002)
$Opaque\ Quintile_t * Ind\_Q_{t-1}$				0.0003
				(0.001)
Seg_CF_{t-1}	0.0003	0.0007	0.0003	0.0003
	(0.001)	(0.001)	(0.001)	(0.001)
Com_CF_{t-1}	-0.0005	-0.0009	-0.0005	-0.0005
	(0.001)	(0.001)	(0.001)	(0.001)
Constant	-0.0492**	-0.0519	-0.0137	-0.0514**
	(0.023)	(0.033)	(0.035)	(0.023)
Observations	12,023	11,203	11,669	12,023
Number of seg_id	2,643	2,488	2,584	2,643
Segment F.E.	Yes	Yes	Yes	Yes
Industry F.E.	Yes	Yes	Yes	Yes
Year-Fixed	Yes	Yes	Yes	Yes
R-square (within)	0.0348	0.0373	0.0355	0.0361

Table 7. Panel A. How CEO characteristics affect investment change to changes in imputed Q
This table provides results on how CEO compensation affects the reaction of segment investment to changes in segment imputed Q. The dependent variable is change in segment investment ratio, ΔInd_Q_{t-1} is change in segment imputed Q. Other variables are defined as in Table 2. Robust standard errors are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ΔInd_Q_{t-1}	0.0126	-0.0280***	0.0104	0.0172**	-0.0045	0.0037	0.0186
	(0.008)	(0.010)	(0.007)	(0.008)	(0.010)	(0.025)	(0.012)
$Cash\_Pay\_SAL_t$	-0.0023**						
	(0.001)						
$Cash\_Pay\_SAL_t * \Delta Ind\_Q_{t-1}$	-0.0015						
	(0.002)						
BN_SAL_t		-0.0013					
		(0.001)					
BN_SAL_t*ΔInd_Q_{t-1}		0.0121***					
		(0.003)					
$RSTGRT\_SAL_t$			-0.0007***				
			(0.000)				
$RSTGRT\_SAL_t$*ΔInd_Q_{t-1}			0.0070**				
			(0.003)				
$OPGRT\_SAL_t$				-0.0002***			
				(0.000)			
$OPGRT\_SAL_t$*ΔInd_Q_{t-1}				-0.0017*			
				(0.001)			
$IMOP\_SAL_t$					0.0001**		
					(0.000)		
$IMOP\_SAL_t$*ΔInd_Q_{t-1}					-0.0011**		
					(0.000)		
CPS_t						0.0041	
						(0.024)	
CPS_t*ΔInd_Q_{t-1}						-0.0670	
						(0.098)	
EBC_TDC_t							-0.0114
							(0.007)
EBC_TDC_t*ΔInd_Q_{t-1}							0.0115
							(0.026)
Constant	-0.0434	-0.0160	-0.0482	-0.0450	-0.0149	-0.0155	-0.0401
	(0.031)	(0.010)	(0.031)	(0.031)	(0.010)	(0.012)	(0.032)
	1,063	2,276	1,063	1,055	2,276	2,287	1,057
Number of seg_id	324	467	324	322	467	470	322
Segment F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Company&segment cash flows	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-square (within)	0.0439	0.0628	0.0554	0.0575	0.0880	0.0558	0.0530

Table 7. Panel B. How CEO characteristics affect investment change to changes in imputed Q
This table provides results on how other CEO characteristics affect the reaction of segment investment to changes in segment imputed Q. The dependent variable is change in segment investment ratio, ΔInd_Q_{t-1} is change in segment imputed Q. Other variables are defined as in Table 2. Robust standard errors are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1

VARIABLES	**(1)**	**(2)**	**(3)**	**(4)**
ΔInd_Q_{t-1}	0.0502	-0.0005	-0.0098	0.0067
	(0.079)	(0.015)	(0.022)	(0.008)
CEO_AGE_t	0.0000			
	(0.000)			
$CEO\_AGE_t * \Delta Ind\_Q_{t-1}$	-0.0011			
	(0.001)			
CEO_TENURE_t		0.0000		
		(0.000)		
$CEO\_TENURE_t * \Delta Ind\_Q_{t-1}$		-0.0012		
		(0.001)		
CEO_OWN_t			0.0028*	
			(0.001)	
$CEO\_OWN_t * \Delta Ind\_Q_{t-1}$			-0.0071**	
			(0.003)	
$Female_t$				-0.0053
				(0.005)
$Female_t * \Delta Ind\_Q_{t-1}$				-0.0185
				(0.016)
Constant	-0.0172	-0.0151	-0.0996***	-0.0119
	(0.014)	(0.010)	(0.024)	(0.046)
Observations	2,229	2,257	589	12,049
Number of seg_id	470	464	227	2,649
Segment F.E.	Yes	Yes	Yes	Yes
Industry F.E.	Yes	Yes	Yes	Yes
Year-Fixed	Yes	Yes	Yes	Yes
Company&Segment Cash Flow	Yes	Yes	Yes	Yes
R-square (within)	0.0578	0.0564	0.140	0.0107

Table 8. The impact of segment-level variables on the reaction of investment to imputed Q
This table investigates the how the relation between capital allocation and changes in segment Q is affected by segment size and profitability. The dependent variable is change in segment investment ratio, ΔInd_Q_{t-1} is change in segment imputed Q. Other variables are defined as in Table 2. Robust standard errors are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1

VARIABLES	**(1)**	**(2)**	**(3)**
ΔInd_Q_{t-1}	0.0121**	0.0090	-0.0360***
	(0.006)	(0.006)	(0.005)
SEG_ROA_t	-0.0008***		
	(0.000)		
$SEG\_ROA_t * \Delta Ind\_Q_{t-1}$	0.0063***		
	(0.001)		
SEG_PM_t		0.0000	
		(0.000)	
$SEG\_PM_t * \Delta Ind\_Q_{t-1}$		-0.0003**	
		(0.000)	
SEG_SPPE_t			-0.0204***
			(0.002)
$SEG\_SPPE_t * \Delta Ind\_Q_{t-1}$			0.1127***
			(0.003)
Constant	0.0067	0.0864	0.0021
	(0.113)	(0.117)	(0.108)
Observations	11,737	11,262	12,049
Number of seg_id	2,602	2,503	2,649
Segment F.E.	Yes	Yes	Yes
Industry F.E.	Yes	Yes	Yes
Year-Fixed	Yes	Yes	Yes
Company&segment cash flows	Yes	Yes	Yes
R-square (within)	0.0206	0.0124	0.139

Table 9. The impact of segment imbalance on the reaction of investment to imputed Q
This table investigates the how the relation between capital allocation and changes in segment Q is affected by segment imbalance and financial opacity. The dependent variable is change in segment investment ratio, ΔInd_Q_{t-1} is change in segment imputed Q. Other variables are defined as in Table 2. Robust standard errors are reported in parentheses. *** p<0.01, ** p<0.05, *

VARIABLES	**(1)**	**(2)**	**(3)**	**(4)**
ΔInd_Q_{t-1}	0.0075	0.0105*	0.0091	0.0355***
	(0.006)	(0.006)	(0.006)	(0.011)
$High - tech_t$	-0.0301			
	(0.149)			
$High - tech_t * \Delta Ind\_Q_{t-1}$	-0.0046			
	(0.011)			
Vol_PM_t		0.0010		
		(0.005)		
$Vol\_PM_t * \Delta Ind\_Q_{t-1}$		0.0031		
		(0.013)		
Vol_ROA_t			0.0007	
			(0.004)	
$Vol\_ROA_t \Delta Ind\_Q_{t-1}$			0.0249	
			(0.102)	
$Opaque\ Quintile_t$				0.0037***
				(0.001)
$Opaque\ Quintile_t * \Delta Ind\_Q_{t-1}$				-0.0103***
				(0.003)
Constant	0.0748	-0.0323	-0.0203	-0.0365
	(0.120)	(0.118)	(0.116)	(0.116)
Observations	12,049	11,227	11,695	12,049
Number of seg_id	2,649	2,494	2,590	2,649
Segment F.E.	Yes	Yes	Yes	Yes
Industry F.E.	Yes	Yes	Yes	Yes
Year-Fixed	Yes	Yes	Yes	Yes
Company&segment cash flows	Yes	Yes	Yes	Yes
R-square (within)	0.0107	0.0118	0.0109	0.0136