MBE Strategy, Structure and Investment Productivity

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In 2022 268 of Fortune 500 companies were subjected to activist campaigns. While some campaigns targeted social goals, the majority were hedge fund campaigns to improve operating income, thereby increasing the value of activists' shares. Activists achieve these gains in part by applying a financial control governance structure to their targets. While this structure has the potential to create value in multi-business enterprises (MBE) employing an unrelated diversification strategy because it fosters competition across divisions, it may destroy value in firms following a related diversification strategy, because that strategy requires cooperation across divisions. I look at one element of the financial control structure, long-term compensation of division managers, and find it decreases productivity across all three forms of investment (R&D, capital and advertising). Contrary to expectations however the effect is more pronounced for Unrelated Diversifiers than Related Diversifiers. This suggests that a financial control structure destroys value for MBEs following either strategy. Thus, rather than being concerned with a mismatch between strategy and structure, we need to be concerned with the financial control structure itself.

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In 1993, Jensen argued that reregulation of credit markets, and anti-takeover legislation in response to the 1980s corporate takeovers, had destroyed firm value, because they removed an important mechanism for disciplining corporations. As evidence in support of his argument, Jensen estimated the level of overinvestment in corporations, and concluded there was substantial overinvestment in R&D and capital. To remedy the overinvestment, Jensen recommended that firms adopt tighter governance, including vesting division managers with greater decision authority, and tying their compensation to performance.

While it is unclear what role Jensen (1993) played, over the next sixteen years corporations steadily increased long term incentive compensation of division managers (Figure 1). Ironically this seems to have created the overinvestment problem flagged by Jensen (Figure 2).

[Insert Figures 1 and 2 Here]

How is this possible? How could a prescription intended to remedy overinvestment, instead trigger it. First, overinvestment may have been misdiagnosed. Jensen relied on coarse measures of overinvestment, thus he was advocating a solution to a problem that finer grained measures are unable to replicate.

Second, and more importantly, the prescription relied on a "financial control" structure for creating value in multi-business enterprises (MBE) (Williamson 1975, 1985). In this structure, MBEs create value over holding a portfolio of free-standing firms through superior governance and resource allocation relative to the capital markets. The logic holds that managers in free-standing firms are subject to agency problems, causing them to undertake actions that benefit themselves at the expense of shareholders. Information asymmetries may keep shareholders from detecting these actions, but even if detected, there is little shareholders can do to remedy

them. MBEs employing a financial control structure solve the agency problems by establishing an internal capital market to overcome the information and control disadvantages. A prominent example of a firm adhering to the financial control structure is Fortive (formerly Danaher).

Typically financial control structures are employed when firms follow an unrelated diversification strategy (Unrelated Diversifiers). An alternative strategy for value creation in MBEs is related diversification (Related Diversifiers). Related Diversifiers create value above and beyond holding a portfolio of standalone firms by exploiting scope economies and complementarities across divisions. A famous example of a firm following this strategy is Disney. The characters created by Disney films can be reutilized in merchandise, theme parks, cruises and more recently Broadway shows. Similarly the merchandising, theme parks, and other divisions create demand for new films.

In a classic study, Rumelt (1972) estimated that 19% of firms were Unrelated Diversifiers,¹ while 45% were Related Diversifiers. The remaining 35% of firms were single or dominant businesses. In examining the market performance of firms following each strategy, Rumelt found that Single Businesses had the lowest performance, with an average PE ratio of 14.6. Unrelated Diversifiers, were slightly better, with a mean PE of 15.75, while Related Diversifiers had the greatest market performance, with a mean PE of 19.21.

The Rumelt study therefore demonstrated that an unrelated diversification strategy was able to create value relative to a collection of freestanding firms by applying the financial control structure articulated by Williamson, and advocated by Jensen. However, to the extent firms held resources subject to scope economies, they could create greater value through a related diversification strategy.

¹ In our sample, 22% of firms are Unrelated Diversifiers, roughly the same as Rumelt.

Because the approaches to value creation differ so substantially across Related Diversifiers and Unrelated Diversifiers, the appropriate governance structure also differs. Under the financial control structure employed by Unrelated Diversifiers, the role of headquarters is to discipline divisions (divisions) and to act as an internal financial market. This requires little operational knowledge of the divisions. Operational knowledge rests with division managers, who utilize their knowledge to a) maximize division value, and b) request funds from headquarters when needed investment exceeds the cash generated by the division.

In contrast, for Related Diversifiers, investments by divisions have spillover effects on other divisions. Because of these spillovers, decisions that are optimal for a given BU, may be suboptimal for the corporation. As an example, consider Disney's acquisition of Marvel. Because Disney only makes ten blockbuster films per year, the film returns to Marvel might not justify its acquisition. However, because the Marvel characters can also be used in merchandise and theme parks, those additional uses contribute to expected returns to the acquisition. Accordingly, investment decisions involving shared resources need to be made jointly.

Given that MBEs follow different strategies, and the optimal governance structure differs across strategies, Jensen's prescription may have created value in Unrelated Diversifiers, while potentially destroying value in Related Diversifiers.

I test that by examining the impact of one element of the financial control structure (division managers' long-term compensation) on firms' investment productivity. To do so, I compare Unrelated Diversifiers and Related Diversifiers to one another. For each strategy I also compare investments in resources subject to scope economies and likely to be shared, such as R&D, to those that may be parochial to a division, such as advertising and physical capital.

Using a proprietary dataset of division-level compensation data for 189 US publicly traded firms, I find that investment productivity decreases in long-term incentive intensity for all three forms of investment under both strategies. I further

find that the determinantal effects were more pronounced in Unrelated Diversifiers than Related Diversifiers.

These results were contrary to expectations. What appears to be happening is that long-term incentives enhance cooperation around investments in R&D when divisions share resources (Related Diversifiers). But surprisingly, they also appear to enhance competition in Unrelated Diversifiers, such that when division managers must bear the entire investment themselves, they tend to underinvest.

The paper proceeds as follows. Section reviews the theory of value creation in multi-business firms. Section 2 links theories of value creation to strategy, structure and investment. Section 3 outlines the empirical approach. Section 4 presents results and section 5 offers a discussion.

I. Value Creation in Multi-Business Firms

One of the four fundamental issues of strategy is the role of the headquarters in a multi-business enterprise (MBE) (Rumelt, Schendel and Teece 1994). This issue is important because over 60% of US business assets reside within MBEs. The challenges for these firms are a) creating value beyond holding a portfolio of standalone firms, and b) doing so in such a way that the value created exceeds the administrative costs of headquarters. These challenges appear to be non-trivial-on average MBEs trade at a 20% discount relative to their breakup value (Collis and Montgomery 2004).

There are two generic strategies for creating value in MBEs. The first, attributed to Chandler (1962), builds on Penrose (1957) who views firm growth as arising from continual exploitation of slack resources in existing businesses to enter new markets/businesses. In these Related Diversifiers, headquarters creates value by managing scope economies across existing businesses, determining when any of these resources exhibit slack, then entering markets where those slack resources generate the greatest returns.

The second strategy for value creation, generally attributed to Williamson (1975), views MBEs as offering information and control advantages relative to capital markets. In these Unrelated Diversified firms, headquarters creates value both through more efficient allocation of capital resources across businesses, and better governance to ensure efficiency within businesses.

Both strategies for value creation require a multi-divisional organizational structure, the M-form in Chandler's Strategy and Structure (1962). However, they differ in requisite governance structure. Value creation by realizing economies of scope (Related Diversifiers) requires *cooperation* across businesses, while value creation through internal capital markets and tight governance (Unrelated Diversifiers) stimulates *competition* across businesses (Hill, 1994).

Relatedly, achieving cooperation across businesses in Related Diversifiers requires centralization to identify where cooperation is required, integrating mechanisms to facilitate business-to-business communication, and incentives tied to overall firm performance. In contrast, achieving effective competition across businesses in Unrelated Diversifiers requires division autonomy as well as highpowered incentives to drive the appropriate resource allocation within the division.

Thus, the two strategies have different cross-business relationships, different loci of decision making and different incentive schemes, as summarized in Table 1. Employing the governance structure of a related diversification strategy to Unrelated Diversifiers should undermine their source of headquarters' value. Similarly employing the governance structure of an unrelated diversification strategy to a Related Diversifiers should undermine their source of headquarters value. Accordingly, Jensen's recommendation for tighter governance, may improve performance in Unrelated Diversifiers, while reducing performance in Related Diversifiers.

[Insert Table 1 Here]

II. Relatedness and Investment Behavior

The most obvious performance impact of tighter governance is parochial investment by division managers. While the intuition for why high-powered incentives would lead to parochial investment may seem obvious, theory from the innovation literature formalizes the intuition. In his seminal piece, Nelson (1959) argues that R&D generates knowledge spillovers, particularly for basic research. Because firms don't fully capture the benefits of these spillovers, they will underinvest in research. Nelson notes however, that the greater the technological and market breadth of a firm, the better ability to capture spillovers, and accordingly, the higher likelihood of investing in basic research. Akcigit, Hanley and Serrano-Velarde (2021) test Nelson's proposition using survey data on French firms, and find that each additional industry occupied by a firm increases its basic research by 3 percentage points (50% more than the level of basic research in a single industry firm).

Akcigit et al presuppose that firms have governance structures that diffuse/share the spillovers—those for Related Diversifiers. Thus, the study doesn't address whether spillover exploitation varies with governance structure. Other studies in the innovation literature attempt to do that by looking at the relationship between centralization of R&D and innovation outcomes.

The first study to examine the centralization question is Argyres and Silverman (2004), which linked firm patent data to self-reports from Industrial Research Institute (IRI) members on the extent to which their R&D decisions were

centralized. They found that centralized R&D produces innovations that had larger and broader impact on subsequent technological evolution.

In a later study with a broader set of firms, Arora, Belenzon and Rios (2011), measure R&D centralization as the percentage of a company's patents assigned to the company's name (as opposed to one of the company's affiliates). A "decentralized company" was defined as one whose value for this measure was in the bottom fifth of the sample; a "centralized company" was one whose value was in the top fifth. Their findings match those of Argyres and Silverman: centralized R&D produces innovations with larger and broader impact on subsequent technological evolution. Finally, Cummings (2018) defined centralization using a Herfindahl measure of the geographic distance between headquarters and the location where each of the firm's patents was filed. Results with this measure also matched the prior studies: The greater the distance, the lower the patent intensity and R&D productivity.

With the exception of Argyres and Silverman the decentralization measures capture distribution of activity rather than decision authority. It is possible, and even likely, that firms could centralize decisions, but locate research activity in research clusters to take advantage of spillovers from other organizations doing related research (Shaver and Flyer 2000).

The centralization studies presuppose that firms have Related Diversification strategies and therefore that centralization is an appropriate component of the governance structure, thus they don't address the question of potential mismatch between strategy and governance structure. In addition, the focus in these studies is on R&D, thus they don't deal with the question of whether the strategy/structure "mismatch" differentially affects investments subject to spillovers (R&D) versus those likely to be division specific.

III. Empirical Approach

The test of whether governance structure differentially affects Related Diversifiers and Unrelated Diversifiers, proceeds in two stages. In the first stage I construct measures of investment productivity, looking separately at firm investments in R&D, physical capital and advertising. In the second stage I utilize the measures to estimate the impact of governance structure on investment productivity. I expect to find that a financial control governance structure reduces the productivity of investments in R&D (subject to cross-division spillovers), while potentially increasing the productivity of investments in advertising and physical capital (more likely to be division specific).

A. Constructing investment productivity

To derive firms' investment productivity I estimate the firm production function for the set of all U.S.- traded firms conducting R&D:

(1)
$$Y_{i,t} = A_{i,} K_{i,t}^{a_i} L_{i,t}^{\beta_i} R_{i,t-1}^{\gamma r_i} S_{i,t-1}^{\delta_i} D_{i,t}^{d_i} e_{i,t}$$

where Y_{it} is output, A_i is a firm fixed effect, K_{it} is capital, L_{it} is labor, $R_{i,t-1}$ is lagged R&D, $S_{i,t-1}$ is lagged spillovers of R&D from other firms, and D_{it} is advertising.

Equation 1 is estimated using a random coefficients model (RCM) that generates firm-specific elasticities for all inputs: α_1 captures the firm-specific output elasticity for capital, γ_1 for R&D and δ_1 for advertising. Each elasticity is interpreted as the percentage increase in revenues for a 1% increase in that input, when other inputs and their elasticities are held constant. Importantly, if indeed the firm-specific terms are significant, a fixed effects model produces biased estimates.² The translation of equation 1 into an RCM is given in equation 2, where the $\beta_{and} \beta_{i}$ represent the direct effect and the firm-specific error, respectively for each of the exponents in equation 1, e.g., $(\beta_2 + \beta_{2i})$ corresponds to γ_{ri} in equation 1.

(2)
$$\ln Y_{it} = (\beta_0 + \beta_{0i}) + (\beta_1 + \beta_{1i}) \ln K_{it} + (\beta_2 + \beta_{2i}) \ln L_{it} + (\beta_3 + \beta_{3i}) \ln R_{i,t-1} + (\beta_4 + \beta_{4i}) \ln S_{i,t-1} + (\beta_5 + \beta_{5i}) \ln D_{it} + \varepsilon_{it}$$

I estimate equation 2 using rolling 7-year windows of the Compustat North American Annual database. I require all firms to have a minimum of six years of non-missing R&D data within each 7-year estimation window. I then define the elasticities for each firm-year as the sum of fixed effect and the firm-specific error for the respective input estimated over the prior 7-year window. For example, the 1986 elasticities for each firm are formed using data from the 1979 to 1986 window.

B. Estimating the impact of governance structure on investment productivity

In the second stage I estimate the impact of governance structure on investment productivity in a fixed effects specification (Equation 3)

(3)
$$Ei_{jt} = \beta_1 Structure_{jt} + \beta_3 Strategy_{jt} + \beta_4 Structure_{jt} * Strategy_{jt} * \alpha_j + \varepsilon_{jt}$$

where E_{ijt} is the output elasticity of investment *i* (R&D, capital or advertising), for firm *j* in year *t*. Note that studies of firm strategy and structure typically utilize firm market value as the dependent variable. There are two concerns with market measures for the purpose here. First market measures are based on investors'

² Note that a central assumption of RCM is that the β_{-i} terms are uncorrelated with the regressors. This is of particular concern in production function estimation, since firms should allocate more resources to inputs that are more productive. Interestingly, over the period we examine, the covariance between R&D and its elasticity is insignificant: -.0002(.9799).

perceptions of firm value, which efficient market theory aside, are based on public information. They are therefore extremely noisy (the mean beta is 1.0). Even ignoring the investor perception issue, firm value confounds things the firm is doing well, with things it is doing poorly. Ei_{jt} is a more primitive measure that both disentangles forms of investment and provides a more direct measure of their quality.

C. Data

Data for estimating investment productivities in equation 2 come from the Compustat North American Annual database for years 1978-1999. Firm-level data items include (in \$MM unless otherwise stated): revenues (Y_{it}); capital as net property; plant and equipment (K_{it}); labor as full-time equivalent employees (L_{it}); in units of 1000, advertising (D_{it});, and R&D (R_{it}). From these primary data, I calculate firm-specific *spillovers* (S_{it}), a "free input" in equation 2. I follow Knott, Posen and Wu (2009) in computing *spillovers* as the sum of the differences in knowledge between focal firm *i* and rival firm *j* for all firms in the four digit SIC industry with more knowledge (R&D) than the focal firm (Equation 4). Knott et al find this functional form better matches empirical outcomes than either pooled spillovers (all firms in an industry share knowledge equally), or a leader distance form (a firm's spillover pool equals its distance from the frontier firm).

(4)
$$S_{it} = \sum_{j \neq i} R_{jt} - R_{it} \forall R_{jt} \ge R_{it}$$

I lag R&D and spillovers one year. This follows the approach in Cooper, Knott and Yang (2022). As documented in Cooper, et al, tests with alternative lags reveal that one-year and two-year lags were equally significant. Beyond two-year lags, the coefficients on R&D became increasingly less significant. Of one-year and two-year lags, one-year is favored because it allows for more observations.

I require all firms to have a minimum of six years of non-missing data for all variables other than advertising and R&D. Firms with no reported advertising are assumed to do no advertising, and are set equal to zero. Firms with no reported R&D are dropped.

Data on firm strategy and structure come from a confidential compensation survey conducted by Hewitt Associates. The data cover more than 250 publicly traded U.S. firms from 1986-1999. I restrict attention to data on divisions and division managers, defined as "the lowest level of profit center responsibility for a division that engineers, manufactures and sells its own products". The data for division managers includes all components of compensation including salary, bonus, restricted stock, stock options and other forms of long-term incentives. These are the same data used in Wulf (2007), which the author generously shared.

These Hewitt data allow me to form variables for firm strategy and governance structure. Firm strategy (relatedness) is based on revenue shares across two-digit SIC codes. To form revenue share I add the revenues of all divisions in each two-digit industry. I then divide these revenues by the total revenues across divisions. The first measure of relatedness, *MaxRevenueShare* is the maximum observed share across industries. The second measure of relatedness is the *Entropy* of the revenue shares constructed as:

(5)
$$E = \sum_{i=1}^{n} s_i \ln\left(\frac{1}{s_i}\right)$$

where s_i denotes the *i*th industry's share of firm revenues, which is weighted by the logarithm of its inverse. While *MaxRevenueShare* increases in firm relatedness (=1 for a single industry firm), *Entropy* decreases in firm relatedness (=0 for a single industry firm). The two measures are almost perfectly negatively correlated (correlation coefficient= -0.958)

The primary measure of governance structure is division manager *LTIintensity*, defined as total long-term compensation divided by salary. The firm-level variable is the mean *LTIintensity* across all its division managers. In addition to this primary measure, I conduct robustness checks with three other measures: *LTIshare*, the share of division managers with any long-term compensation, *OfficerShare*, the share of division managers who are also officers of the company, and *DirectReport*, the share of division managers who report directly to the CEO. Choice of *LTIintensity* as the primary measure of governance structure is based on the fact that it exhibited the greatest rise since Jensen (1993), as was shown in Figure 1.

I match investment productivity data from stage 1 to the Hewitt data using firm gvkey (the unique identifier in Compustat) to form the final data set. Summary statistics for these data are provided in Table 2.

[Insert Table 2 Here]

IV. Results

A. Estimating investment productivity

Estimation of equation 2 generated firm-year elasticities for investments in R&D, advertising and physical capital. Evolution in the mean value of these elasticities is presented in Figure 3. Panel A presents the evolution for all firms in Compustat from 1986-2020; Panel B presents the evolution for firms in the Hewitt subsample over the sample period. The figure indicates that across all firms as well as the Hewitt subsample, the elasticities of R&D and capital are decreasing over time. The elasticity of advertising is fluctuating during the sample period for all firms as well as the subsample, but increasing thereafter. Thus the empirical subsample appears to be representative of the broader set of public firms.

[Insert Figure 3 Here]

B. Estimating the impact of governance structure on investment productivity

Results for testing the impact of governance structure on investment productivity (Equation 3) are presented in Table 3. Model 1 presents results for R&D; model 2 for advertising and model 3 for capital. Looking first at the main effect of strategy (*Entropy*), we find it is not significant for any form of investment. This matches the expectation that both Related Diversification and Unrelated Diversification strategies have the potential to create value.

[Insert Table 3 Here]

Looking next at the main effect of governance structure, we see *LTI intensity* has a negative impact on all three forms of investment, though it is only significant for R&D and advertising. This result was unanticipated—the purpose of long-term incentives is to mitigate the tendency to focus on short-term returns. Though to the extent that investors prefer short-term returns, it may not be possible to mitigate the tendency for division managers to focus on them as well.

Our main interest, however, is the contingent effects of strategy and governance structure on performance. This is captured by the interaction term, *Entropy*LTIintensity*. The coefficient estimates for the interaction are negative across all forms of investment. Thus the negative impact of *LTIintensity* on investment productivity increases as divisions become less related to one another. The effects are most pronounced for capital investment, and least pronounced (insignificant) for advertising investment. The net impact of all three effects is captured graphically in Figure 4.

[Insert Figure 4 Here]

These results are robust to alternative measures of governance structure (*LTIshare*, *OfficerShare* and *DirectReport*) and use of *MaxRevenueShare* in lieu of *Entropy* as the measure strategy. Though coefficient estimates with these measures tend to be less significant.

The result that the negative impact of governance structure was most pronounced for Unrelated Diversifiers was contrary to expectations. Providing division managers in Unrelated Diversifiers with high powered incentives was expected to allow them to focus on division performance, without adversely impacting other divisions. Conversely providing those same incentives to division managers in Related Diversifiers was expected to hurt investments, such as R&D, that are subject to spillovers to other divisions.

What might explain the results is that long-term incentives amplify the natural tendency of division managers in Related Diversifiers to cooperate, and those in Unrelated Diversifiers to compete. Looking first at R&D, cooperation in Related Diversifiers may occur either because division managers don't bear the full investment cost, or because they cooperate with other division managers to make these investments, so reach better investment decisions. The obverse for Unrelated Diversifiers is that without potential for investment sharing, competition with other divisions may become so intense that division managers cut investment.

I examine this interpretation of the results by replicating a version of Equation 2 that replaces investment productivity with investment levels (expressed as intensity: investment divided by revenues). Examining investment levels allows us to separate decision quality from other organizational factors affecting investment productivity.

Rather than presenting coefficient estimates, I graphically present the imputed effects (Figure 5). The figure indicates that incentive intensity has very little impact on R&D investment levels, whereas it has a significant negative impact on advertising and capital investment levels. The relationships for advertising and

capital investment mimic those for the advertising and capital productivity--the negative impact of *LTIintensity* is more pronounced in Unrelated Diversifiers. Thus, results for investment levels are consistent with the conjecture that high-powered incentives reduce investment commitment when competing with other divisions.

Interestingly, the relationship is reversed for R&D. R&D investment increases as firms become less related. This suggests Nelson's expectation that basic research increases in the breadth of opportunities, dominates the cooperation/competition conjecture with respect to R&D.

[Insert Figure 5 Here]

V. Discussion

Jensen (1993) argued that legislative responses to the hostile takeovers of the 1990s destroyed firm value because they removed an important mechanism for disciplining firms. Ironically his prescription to restore firm value appears instead to have destroyed it. This occurred first, because Jensen's diagnosis of overinvestment was incorrect. In fact, a more accurate measure of optimal investment defined by firms' output elasticities, indicates that the firms he flagged as overinvesting were actually underinvesting at the time.

Second, firms seemed to have embraced his prescriptions—there was a dramatic rise in financial control governance beginning in 1993. This increase coincides with a decrease in investment productivity. I argued that while Jensen's prescription might increase performance in Unrelated Diversifiers, it had the potential to harm performance in Related Diversifiers, at least for R&D which is subject to cross-division spillovers.

I tested that by looking at the impact of governance structure on investment productivity separately for Related Diversifiers and Unrelated Diversifiers. I found that a financial control governance structure reduced productivity for all forms of investment under both strategies. Moreover, and contrary to expectations, the determinental effects were more pronounced in Unrelated Diversifiers than Related Diversifiers. What appears to be happening is that long-term incentives amplify cooperation in Related Diversifiers, while also amplifying competition in Unrelated Diversifiers.

While Jensen (1993) and its aftermath may be relegated history, the implications of these findings are newly relevant. Financial control is the governance structure of choice for activist investors. Given the structure reduces investment productivity across both Related Diversifiers and Unrelated Diversifiers, activists may be systematically destroying value.

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FIGURE 1. TRENDS IN DIVISION MANAGER COMPENSATION

Notes: source data from wulf (2007) $\,$



FIGURE 2. R&D OVERINVESTMENT INCREASED FOLLOWING JENSEN (1993)

Notes:



FIGURE 3. EVOLUTION IN OUTPUT ELASTICITIES OF FIRM INVESTMENTS

A. All firms in Compustat 1986-2020



B. Firms in Hewitt sample 1986-1999

FIGURE 4. IMPLIED RELATIONSHIP BETWEEN DIVISION MANAGER INCENTIVES, STRATEGY AND PRODUCTIVITY









FIGURE 5. IMPLIED RELATIONSHIP BETWEEN DIVISION MANAGER INCENTIVES, STRATEGY AND INVESTMENT LEVELS





Table 1—	-ORGANIZATIONAL	FEATURES OF RELATE	d Diversified Firms and	UNRELATED DIVERSIFIED FIRMS

	Related Diversified Firms	Unrelated Diversified Firms
Source of Headquarters' Value	Scope Economies	Governance
Locus of Decision-Making	Headquarters	Business Units
Relationship between Businesses	Cooperation	Competition
BU Manager Compensation	Tied to Firm Performance	Tied to BU Performance

Notes: These are the notes applicable to the table. The style is Tables Notes.

(1598 firm-year observations)													
	Mean	Std.Dev	Min	Max	1	2	3	4	5	6	7	8	9
1. Entropy of revenue shares (2 dig SIC)	0.477	0.481	0.000	2.306	1.000								
2. Maximum Revenue Share across 2 digit SI	0.778	0.224	0.236	1.000	-0.958	1.000							
3. Mean LTI Intensity of Division Managers	0.521	0.491	0.000	6.589	-0.067	0.054	1.000						
4. Share of Division Managers with LT comp	0.946	0.202	0.000	1.000	0.064	-0.073	0.245	1.000					
5. Share of Division Managers who are Offic	0.342	0.416	0.000	1.000	-0.190	0.173	0.163	0.009	1.000				
6. Share of Division Managers reporting direc	0.143	0.316	0.000	1.000	-0.136	0.121	0.084	-0.040	0.276	1.000			
7. R&D productivity	0.128	0.042	0.004	0.369	-0.040	0.034	-0.064	0.028	0.019	-0.079	1.000		
8. Advertising productivity	-0.001	0.009	-0.065	0.039	-0.068	0.068	-0.089	-0.040	0.075	-0.077	0.298	1.000	
9. Capital productivity	0.191	0.038	0.078	0.384	-0.036	0.055	-0.144	-0.122	-0.010	-0.080	0.290	0.097	1.000

TABLE 2. SUMMARY STATISTICS

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	DV (elasticity of investment)				
	R&D	Advertising	PP&E		
Entropy (SIC2 revenues)	-0.005	0.000	0.006		
	0.006	0.001	0.004		
Mean DivMgr LTI intensity	-0.010	-0.002	-0.005		
	0.003	0.001	0.004		
Entropy*LTI intensity	-0.009	-0.001	-0.012		
	0.005	0.001	0.005		
Firm FE	yes	yes	yes		
Observations	1598	1598	1598		
Groups	196	196	196		
R-squared					
Within	0.028	0.019	0.028		
Between	0.000	0.009	0.021		
Overall	0.006	0.008	0.027		

TABLE 3. ESTIMATES THE IMPACT OF LOCAL DECISION AUTHORITY ON INVESTMENT PRODUCTIVITY

Notes: Coefficients for estimates of Equation 2. Standard errors clustered by firms below coefficients