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Effects of Corporate Diversification on Productivity

ANTOINETTE SCHOAR*

ABSTRACT

Using plant-level observations from the Longitudinal Research Database I show that conglomerates are more productive than stand-alone firms at a given point in time. Dynamically, however, firms that diversify experience a net reduction in productivity. While the acquired plants increase productivity, incumbent plants suffer. Moreover, stock prices track firm productivity and this tracking is equally strong for diversified and stand-alone firms. Therefore, lower transparency of conglomerates is unlikely to explain the discrepancy between productivity and stock prices on average. Finally, I offer some evidence that this discrepancy may arise because conglomerates dissipate rents in the form of higher wages.

Corporate diversification has received much attention from academics as well as management practitioners. Several papers over the last decade have argued that diversification is related to lower valuation for shareholders. Lang and Stulz (1994), for example, find that diversified firms trade at an average discount of about eight percent relative to a portfolio of comparable stand-alone firms.[1] A number of recent studies, however, question the interpretation of these findings or even their validity. Graham, Lemmon, and Wolf (1998) or Campa and Kedia (1999) suggest that the discount should not be interpreted as value destruction due to diversification, since firms which diversify are already discounted prior to diversifying. Moreover, Harris (1998) or Villalonga (2000) argue that COMPUSTAT segment data are systematically biased in favor of finding a diversification discount.

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[1] Berger and Ofek (1995), Servaes (1997), and Lamont and Polk (2001) provide additional evidence on the diversification discount. Negative stock price reactions for the acquirer in a diversifying takeover announcement are documented by Môrck, Shleifer, and Vishny (1990) and Matsusaka (1993).

Since the evidence from market valuations is inconclusive and might not be adequate given the above mentioned data limitations, the current paper takes a different approach. Using detailed plant-level information from the Longitudinal Research Database (LRD), I look inside the black box of conglomerates. The goal of this study is to determine the real effects of diversification and to tie them back to *cross-sectional* differences in market values between diversified firms.

Examining the productive efficiency of firms, measured by total factor productivity, I find that contrary to what the diversification discount might suggest, plants in diversified firms are, on average, seven percent *more* productive than plants in comparable single-segment firms. Increases in diversification, however, are associated with a decline in the firm's overall productivity. While the newly acquired plants increase their productivity by three percent, incumbent plants show productivity declines of almost two percent. Since there are many more incumbent than acquired plants, the total effect on firm productivity is negative. In other words, diversified firms experience a "new toy" effect, whereby management focus shifts towards new segments at the expense of existing divisions. As a whole, these results indicate that diversified firms have a productivity advantage over their stand-alone counterparts. They even increase the productivity of their acquired assets. With each diversifying move, however, these firms lose some of their productivity advantage.

This paper contributes to a small group of empirical studies on the productivity of diversified firms.[2] Using a much smaller sample of LRD plants in 1980, Lichtenberg (1992) finds ambiguous results on the productivity difference between diversified and stand-alone firms. A more recent paper by Maksimovic and Phillips (2002) compares productivity between the different segments *within* a conglomerate. The authors find that main segments are more productive than peripheral segments and that the sales growth of a division varies with its productivity and industry business cycle. Moreover, Maksimovic and Phillips (2001) shows that acquired assets had low productivity before and experience an increase in productivity after the ownership change. The extent of this increase depends on the productivity of the acquiring firm and the type of division (main or peripheral) that is buying or selling the plants. In a related paper, McGuckin and Nguyen (1995) study the productivity of plants that change owners in the food manufacturing industry. The paper contrasts the productivity of small and large plants that change owners: Large plants have low productivity while small plants have high productivity before an acquisition. The authors attribute this contrast to differences in the motives for buying large versus small plants.

[2] A related body of literature on real distortion in diversified firms studies the efficiency of internal capital markets; see Ravencraft and Scherer (1987), Lamont (1997), Scharfstein (1997), Shin and Stulz (1998), Chevalier (1999), and Hubbard and Palia (1999).

The work that follows complements the existing literature by analyzing the overall productivity of conglomerates relative to stand-alone firms. It builds on prior results by studying the effects of diversifying acquisitions on the productivity of the firm's *incumbent* plants and by contrasting it with the productivity of newly acquired plants.

This paper takes the current literature a step further by linking stock market performance back to a firm's productivity. I find that market values, such as excess value, correlate strongly with firm productivity, both in the cross section and over time. Interestingly, this correlation is at least as strong for conglomerates as for stand-alone firms. This suggests that differences in transparency between conglomerates and stand-alone firms cannot explain the diversification discount. Despite the high correlation between stock prices and productivity, I still find a diversification discount of about 10 percent alongside the seven percent productivity premium in this sample.

Finally, I examine whether rent dissipation by conglomerates can explain this discrepancy. I find that conglomerates do not dissipate rents in the form of higher overheads. But I offer suggestive evidence that conglomerates leave more rents to their workers. Employees in diversified firms are paid roughly eight percent more than in comparable stand-alone firms.[3] Under reasonable assumptions, this wage differential can account for about 30 percent of the discount. In other words, rent dissipation in the form of higher wages may help explain why conglomerates trade at a discount despite their higher average productivity.

The remainder of the paper is structured as follows. Section I describes the data sample and the construction of variables used in this analysis. Section II lays out the findings on the productivity differential of diversified firms, and Section III examines the dynamic effects of diversification. Section IV reports the results of several robustness checks. Section V ties the findings on stock market valuations back to the productivity premium. Section VI analyzes the wage premium for workers in diversified firms, and Section VII concludes.

I. Data Sample and Construction of Variables

The data for this study is obtained from the Longitudinal Research Database (LRD) at the U.S. Bureau of the Census. The LRD is a large micro database containing plant level information for firms in the manufacturing sector (SIC codes 2,000 to 3,999). McGuckin and Pascoe (1988) provide a detailed description of the LRD and the method of data collection. There are two major advantages to using LRD data relative to COMPUSTAT data in this study. First, the LRD gives much more detailed information on

[3] Pure redistribution does not necessarily constitute inefficiency from a social point of view. But if rent dissipation distorts the cost of capital, it can lead to misallocation of resources in diversified firms.

plants within a segment. Second, plant level data allows me to identify the individual performance of acquired plants before and after the ownership change.

I use a subsample of LRD plants that belong to publicly traded firms and can be matched to COMPUSTAT data. The only available merge between the LRD and COMPUSTAT files includes all the firms that were listed in the COMPUSTAT files in 1987 and matches the corresponding plants in the LRD to these firms. This match is repeated for all sample years to create a panel of all plants belonging to the COMPUSTAT firms that existed in 1987. The advantage of this sample selection is that it allows me to match LRD data to financial variables from COMPUSTAT and thus ensures comparability with results from prior studies. Moreover, it helps obtain a homogeneous sample of manufacturing establishments, since a large fraction of the manufacturing firms contained in the LRD are very small businesses. The disadvantage of using this LRD–COMPUSTAT match is that only firms that were present in 1987 are included in the sample. In principle, this could introduce bias, if there are differences in the survival probability of diversified and stand-alone firms. However, when I reestimate my results for the 1987 sample alone, all the results are unchanged. Moreover, under the most plausible assumptions, a diversified firm should have a greater likelihood of survival than a stand-alone firm, since only one of its segments has to survive. If a single-segment firm underperforms, it is more likely to be shut down completely. Therefore, the single-segment firms in the sample should overrepresent above-average performers. This will left-censor the performance of single-segment firms and bias the sample against my results.

A. Productivity Measures

My primary measure of firm performance is total factor productivity (TFP) at the three-digit industry level.[4] TFP measures are obtained at the plant level by estimating a log-linear Cobb–Douglas production function for each industry and year. Here individual plants are indexed i, industries j for each year t in the sample:

$$\ln(y_{ijt}) = a_{jt} + b_{jt}\ln(K_{ijt}) + c_{jt}\ln(L_{ijt}) + d_{jt}\ln(M_{ijt}) + \epsilon_{ijt}. \tag{1}$$

Since coefficients on capital, labor, and material inputs can vary by industry and year, this specification allows for different factor intensities in different industries. Industry is defined at the level of three-digit SIC codes. These production function estimates are pooled across plants of diversified

[4] I reestimate my results using value-added production functions and return on capital and find equivalent results. The results also hold when using industry classifications at the two- or four-digit SIC level.

and stand-alone firms.[5] The TFP measure for each individual plant is the estimated residual from these regressions. It can be understood as the relative productivity rank of a plant within its industry. Since these regressions include a constant term, TFP only contains the idiosyncratic part of plant productivity.

LRD data is used to match the variables in the production function as closely as possible. Output (y) is constructed as plant sales (total value of shipments in the LRD) plus changes in the value of inventories for finished goods and work in process. Ideally, TFP would be constructed from actual quantities. If product markets are not perfectly competitive, the residual might reflect variations in efficiency as well as differences in markups. However, I do not find evidence that diversified firms are more likely to operate in concentrated industries nor that they perform better in these industries.

Labor inputs (L) are formed as production worker equivalent man hours. I also reestimate the TFP regression specifying labor wage bill to proxy for worker quality. Results remain qualitatively the same. Values for the capital stock (K) are generated by the recursive perpetual inventory formula. To reduce the impact of potential accounting manipulations of book values of capital stock, I use the earliest available book value of capital as the initial value (this is either the value in 1963, the first year this information was collected, or the first year a plant appears in the LRD sample). These values are written forward annually with nominal capital expenditure and depreciated with the economic depreciation rate at the industry level obtained from the Bureau of Economic Analysis.[6] Finally, inputs (M) are expenses for parts and intermediate goods, fuel, and energy purchased as well as inputs from contracted work.[7]

B. Measures of Diversification

Although explicit diversification measures for the firms surveyed are not provided in the LRD, they can be constructed from firm identifiers. One important caveat is that the LRD contains only information for establishments in the manufacturing sector; the nonmanufacturing segments of a company that is diversified outside of the manufacturing sector will not be surveyed in the LRD. For example, a car manufacturer that also operates in banking will appear as a nondiversified firm in the LRD. To identify diver-

[5] This specification could introduce bias if these two types of firms used different production technologies. Therefore, I repeat these estimates separately for plants of diversified and stand-alone firms. The results remain qualitatively unchanged. I also compare factor intensities of plants in diversified and stand-alone firms within the same industry and find no significant difference.

[6] Estimates of economic depreciation rates for buildings and structures, as well as deflators for capital stock at the four-digit SIC level, are available from the Bureau of Economic Analysis. The Bartelsman and Gray database at the NBER provides yearly price deflators for output, material, and investment at the four-digit SIC level.

[7] For a detailed description of the construction of TFP measures from LRD variables, see Lichtenberg (1992).

sification outside of manufacturing, I supplement the diversification measures from the LRD with information on nonmanufacturing segments from the COMPUSTAT Business Segment Information Files.

The most straightforward measure of diversification counts the number of segments per year at the two-digit SIC level. To incorporate information on the relative size of segments, I calculate Herfindahl-based indices of firm diversification, where the segment weights are either total value of shipments or total capital stock. This measure is one minus a Herfindahl index for the firm's business segments in manufacturing. It increases with the number of segments, holding constant the variance of segment size.[8]

II. Are Diversified Firms More Efficient?

A. Descriptive Statistics

The descriptive statistics in Table I document size differences between highly diversified, diversified, and nondiversified firms.[9] On average, nondiversified firms operate three plants, while diversified firms operate 10 plants, and highly diversified firms average 43 plants. Similarly, this difference is observable at the segment level: Diversified firms have more than twice as many plants per segment than nondiversified firms. For individual plants, however, this trend is not as pronounced. The average plant size for a diversified firm, measured by the total value of shipments or capital stock, is only 10 percent larger than the plant size of stand-alone firms.

Moreover, Table I shows that diversified firms tend to operate more capital intensively than nondiversified firms. Capital per worker is \$51,000 in stand-alone firms and \$57,000 and \$54,000 in diversified and highly diversified firms, respectively. This means diversified firms are about five percent more capital intensive than nondiversified firms. Looking at partial productivity measures, I find that output per worker, measured by total value of shipments divided by total hours worked, is about five percent lower for stand-alone firms compared to diversified firms. Capital productivity, measured by total value of shipments per unit of capital, is slightly lower for diversified firms relative to stand-alone ones. Finally, hourly wages for blue collar workers is \$10.00 in stand-alone firms versus \$10.50 in diversified firms. This five percent wage difference could be due to higher labor productivity in diversified firms. Yet labor productivity should be higher in diversified firms, since they are also more capital intensive. Therefore, the descriptive statistics cannot help determine whether workers in diversified

[8] Several authors have voiced concern that relatedness between industries might not be satisfactorily controlled when using SIC codes; see, for example, Matsusaka (1993) or Scharfstein (1997). Therefore, I use data from the input–output tables at the Bureau of Economic Analysis to adjust the diversification measures for vertical relatedness. See the robustness checks in Section VII for more details.

[9] Due to the disclosure rules of the Census Bureau, I cannot show median numbers or quartile ranges.

Table I

Descriptive Statistics

Plant-level characteristics for the sample firms in the LRD between 1977 and 1995. Total value of shipments and capital stock are in million dollars, hours worked in millions, and production wages are in dollars. Total value of shipments is plant sales in the LRD and contains interfirm transfers valued at market prices. Capital stock includes book values of machinery and buildings. Hours worked is defined as production-worker hours per year. Diversification is defined as number of segments at the two-digit SIC level. Stand-alone firms operates in only one industry. Multisegment firms are subdivided into diversified firm (have more than one but less than the mean number of segments of diversified firms) versus highly diversified firms (above mean number of segments).

	Sample							
	All Firms		Stand-Alone		Diversified		Highly Diversified	
	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*
Plant level								
Total value of shipments	40.43	43.91	38.53	41.56	41.25	44.30	40.80	43.46
Capital stock	16.70	14.78	13.03	14.65	17.77	14.79	16.81	14.86
Hours worked	0.26	0.25	0.25	0.24	0.25	0.25	0.27	0.26
Capital/worker	55.08	46.47	51.59	46.65	57.16	47.07	53.71	45.61
Production wage	10.45	3.69	10.08	3.72	10.62	3.71	10.35	3.66
Total value of shipments/hour	172.59	123.56	163.31	122.07	182.59	128.57	164.95	118.09
Total value of shipments/capital	7.82	5.65	8.39	5.69	7.87	5.66	7.61	5.62
Number of observations	245,006		23,770		112,669		108,567	
Firm Level:								
Plants per firm	12.03	20.38	3.46	5.76	10.29	14.21	42.64	34.89
Plants per segment	6.31	10.19	3.46	5.76	6.28	9.98	14.17	15.09
Two-digit diversification	2.87	2.30	1.00	0.00	2.90	1.97	7.82	1.98
Number of observations	20,366		6,869		10,951		2,546	

firms are compensated for higher productivity or whether they earn rents. Generally, partial productivity measures are problematic when comparing plants across different industries, because production functions and factor intensities vary systematically.

B. Productivity Premium for Diversified Firms

I use TFP as a comprehensive index of efficiency. To analyze systematic differences in the productivity of diversified versus stand-alone firms, I regress plant-level TFP on different measures of diversification (*DIV*) and controls:[10]

$$TFP_{ijt} = a + b(DIV_{it}) + c(SIZE_{it}) + d(AGE_{it}) + \epsilon_{ijt}. \tag{2}$$

I include controls for segment as well as firm size in the regression, since a number of prior studies have argued that economies of scope affect plant productivity (see, e.g., Lichtenberg (1992) or Demsetz (1973)). Ex ante, how-

[10] The results are qualitatively unchanged if I estimated the relationship between TFP and productivity in a one-step regression.

ever, it is not clear whether economies of scope in diversified firms should occur at the segment or firm level. The measure of firm (segment) size is the overall number of plants a firm (segment) operates in.[11]

Since the descriptive statistics indicate significant size differences between diversified and stand-alone firms, I allow the slope of the size controls to vary across size quintiles. Plant age is included to control for vintage effects. It is not necessary to control for *plant* size, since I do not impose restrictions on the coefficients of the production function in the TFP regressions. Economies of scale at the plant level are indicated by the sum of the input coefficients in the Cobb–Douglas production function being greater than one. I correct the variance–covariance matrix for correlation at the firm-year level. This is important, since the diversification index as well as the controls for firm size vary only at the firm level, while the unit of observation for the dependent variable is the individual plant. TFP measures are windsorized at the 1st and 99th percentiles.

The results in Table II, columns (1) to (4) show that the coefficient on diversification is positive and significant. The outcome is robust to different measures of diversification and economically significant. For example, in column (1) of Table II, moving from the first quartile of the distribution of diversification to the mean results in a productivity increase of seven percent. Under certain assumptions this can be translated into a more familiar measure of firm performance, like accounting profits. Holding input costs constant, seven percent higher productivity translates into a seven percent increase in revenues, *ceteris paribus*. An increase in revenues leads to a more than proportional increase in profits, since the elasticity of profits to productivity is greater than one. Intuitively, an increase in productivity holding all else constant leads to higher revenues without changing costs. Since profits are revenues minus costs, the smaller the profit margin, the higher the elasticity of profits to productivity.[12] If I assume a revenue margin of about 40 percent over costs, profits increase by roughly 10 percent annually. All else equal, diversified firms should experience a percent diversification premium in the stock market.

The results presented in columns (1) to (4) of Table II are based on a panel regression which includes cross-sectional and longitudinal variation. To separate the cross-sectional differences between plants from the effect of changes in diversification, I reestimate model (2) with plant fixed effects. Two sources of variation in diversification remain in the sample when introducing plant

[11] I do not use capital stock or total value of shipments at the firm or segment level as a control for size. This could induce a mechanical correlation with the dependent variable, since these values are used in the construction of TFP. In fact, when reestimating the model with firm and segment size controls specified as total capital stock or sales, the coefficient on diversification does not change qualitatively.

[12] As an additional robustness check, I use a size-weighted regression, where each plant is weighted by its *relative* size within its firm. This specification reduces the impact of very small segments in the productivity regression. All results are qualitatively unchanged under this specification.

Table II

Effect of Diversification on Productivity

The dependent variable is total factor productivity (TFP) at the three-digit SIC level. TFP is the residual from estimating a log linear Cobb–Douglas production function for each industry and year at the plant level, where one regresses the value of output (total value of shipments adjusted for changes in inventories) on labor (production worker hours), capital stock (constructed via the perpetual inventory method), and material inputs (intermediate inputs, fuels, and energy consumed). Two-digit diversification is the logarithm of the number of segments at the two-digit SIC level. Herfindahl is an assets-weighted measure of diversification. The dummy variable Down is equal to one if a plant is a downstream segment in a vertically integrated firm. Similarly, Up equals one if a plant is an upstream segment in a diversified firm, and zero otherwise. Controls for Segment size and Firm size are constructed as the number of plants at the segment or firm level, respectively. These size controls are splined. Age is the logarithm of plant age. Heteroskedasticity-robust standard errors are in parentheses. Standard errors are corrected to allow for group effects within firms.

	(1)	(2)	(3)	(4)	(5)	(6)
Two-digit diversification	0.064***		0.034**		−0.070**	0.042**
	(0.015)		(0.016)		(0.030)	(0.020)
Herfindahl		0.154***		0.134**		
		(0.043)		(0.049)		
Age	0.142***	0.142***	0.135***	0.136***	−0.018***	0.135***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.010)	(0.012)
Segment size1			0.167***	0.165***	−0.047	0.168***
			(0.029)	(0.028)	(0.035)	(0.029)
Segment size2			0.158***	0.161***	−0.082	0.157***
			(0.036)	(0.036)	(0.039)	(0.036)
Segment size3			0.080	0.087	0.113*	0.081
			(0.059)	(0.059)	(0.058)	(0.058)
Segment size4			−0.79	−0.066	−0.017	−0.082
			(0.070)	(0.070)	(0.067)	(0.070)
Segment size5			−0.034	−0.017	0.089	−0.036
			(0.072)	(0.072)	(0.083)	(0.072)
Firm size1			0.014	0.010	0.080**	0.010***
			(0.026)	(0.024)	(0.034)	(0.009)
Firm size2			0.016	0.016	0.136**	0.008
			(0.050)	(0.050)	(0.051)	(0.050)
Firm size3			−0.007	−0.008	−0.136*	−0.013
			(0.078)	(0.076)	(0.067)	(0.078)
Firm size4			−0.009	−0.024	0.191**	−0.011
			(0.101)	(0.101)	(0.083)	(0.100)
Firm size5			−0.037	−0.042	0.112	−0.045
			(0.109)	(0.108)	(0.089)	(0.110)
Down						0.025
						(0.035)
Up						0.019
						(0.042)
Plant fixed effects	No	No	No	No	Yes	No
Adjusted R^2	0.035	0.036	0.041	0.042	0.542	0.561
Number of observations	245,006	245,006	245,006	245,006	245,006	245,006

The symbols ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively.

fixed effects: (1) the effect of a firm's diversification on incumbent plants and (2) the effect of ownership changes on plants that move from a more to a less diversified firm or vice versa.[13]

Columns (5) and (6) of Table II show that the effect of changes in diversification on productivity is very different from the effect of variation in levels of diversification. When including plant fixed effects, the coefficient on diversification becomes negative. The findings in this section introduce a recurrent theme of this paper: There is a substantial difference in the static effect of *being* diversified and the dynamic effect of *becoming* more diversified. The positive correlation between diversification and productivity in the model without plant fixed effects is primarily driven by heterogeneity between plants in diversified versus stand-alone firms. In contrast, the specification with plant fixed effects provides a first piece of evidence that there exist dynamic inefficiencies from diversification.

C. Acquisitions of New Plants

The productivity premium found in the cross section may be due to the fact that diversified firms are cash rich and can buy more productive plants, even though subsequently they run their plants down. In contrast, if diversified firms are more efficient at running their operation, the productivity of the assets they acquire should increase.

To differentiate between these alternatives, I analyze the subsample of plants that are acquired between 1977 and 1995. These are diversifying as well as related acquisitions. There are about 12,000 ownership changes in the sample.[14] I choose a three-year window before and after the acquisition event. Included are only acquisitions for which at least one observation in three years before and after the event is available. I estimate the following model:

$$\begin{aligned} TFP_{ijt} = {} & a_i + b(AFTER) + c(AFTER * DIVERS) \\ & + d(DIVERS) + e(SIZE_{it}) + \epsilon_{ijt}. \end{aligned} \tag{3}$$

AFTER is a dummy variable equal to one in each of the three periods after the acquisition and zero in the three periods before the acquisition. *DIVERS* differentiates acquisitions by the type of their acquirer. It is equal to one for a move from a less to a more diversified firm and zero for a move in the other direction. About 60 percent of the acquisitions in the sample involve a move from a less diversified to a more diversified firm.

[13] A concern in this context is that acquisitions might lead to changes in production inputs, which could show up as changes in TFP. In this case, the interpretation of the results should be very different. However, I find no evidence that input levels or factor intensities vary significantly after a change in the level of diversification.

[14] This is the number of individual plants that change owners. Included are acquisitions of single plants as well as ownership changes of multiple plants at the same time.

First, I estimate the model without the interaction term to get a benchmark for the full sample of acquisitions. The first column of Table III shows that after the change in ownership, the productivity of the acquired plants increases slightly. This positive effect may result from a reallocation of plants to the owners that have superior management abilities. This result is consistent with Maksimovic and Phillips (2001), who use a different sample of plants. Interestingly, column (2) of Table III shows a positive coefficient on the interaction term. Plants that move into a diversified firm experience a stronger positive effect on productivity after an acquisition than do plants that move from a diversified into a stand-alone firm. This change in productivity of about 0.4 percent translates to almost a one percent increase in profits at the plant level.

Moreover, I find (not reported here) that, on average, the productivity of acquired plants in the three periods prior to an ownership change is declining and lower than the mean productivity of plants in the sample. It is also lower than the productivity of the acquirer. These results correspond to the findings of Graham et al. (1998) showing that the market value of acquisition targets is declining in the periods before the ownership change. Moreover, there is no significant difference in the ex ante productivity between plants that are bought by diversified firms and those bought by stand-alone firms. These findings do not support the hypothesis that higher productivity in diversified firms is achieved by buying very productive plants and running them down subsequently.

III. Dynamic Effects of Diversification

These results indicate that diversified firms have higher productivity than stand-alone firms. However, this finding is driven by cross-sectional differences between firms. In this section, I analyze the dynamic implications on firm productivity of *becoming* more diversified, that is, diversification as a corporate strategy.

A. Incumbent Plants after Diversification

To isolate the effect on the incumbent plants of a diversifying firm, I estimate a before–after estimator on the subsample of plants that were owned by the firm before the diversifying move. These are benchmarked with the effect of related acquisitions on the incumbents. Without this comparison group, a simple before–after estimator might just be picking up the fact that any major acquisition leads to a drop in firm productivity; the effect need not be specific to diversification. I estimate the following model:

$$TFP_{ijt} = a_i + b(AFTER) + c(AFTER * DIVERS) + d(DIVERS) + e(SIZE_{it}) + \epsilon_{ijt}. \tag{4}$$

Table III

Effect of Ownership Changes on Acquired Plants

The sample contains only observations for plants that change owners in the three periods before and after the acquisition. Columns (1) and (2) include diversifying as well as related acquisition events, column (3) is based on the subsample of diversifying acquisitions. A diversifying move is characterized as an acquisition of a plant in a two-digit industry other than the existing industries of the firm. Only acquisitions that constitute at least 10 percent of the firm's preexisting capital stock are included. The dependent variable is total factor productivity (TFP) at the three-digit SIC level (as described in Table II). After is a dummy variable equal to one in the three periods after the acquisition and zero in the three periods before. Divers is a dummy variable equal to one, if the acquired plant moves from a less to a more diversified firm, and zero otherwise. Controls for Segment size and Firm size are constructed as the number of plants at the segment level or the firms level, respectively. The size variables are splined. Heteroskedasticity-robust standard errors are in parentheses. Standard errors are corrected to allow for group effects within firms, since diversification varies only at the firm level.

	Specification		
	All Acquisitions		Only Diversifications
	(1)	(2)	(3)
After	0.004***	0.000	0.029**
	(0.000)	(0.004)	(0.013)
Divers ∗ After		0.006***	
		(0.002)	
Segment size1	0.031*	0.033**	0.033
	(0.016)	(0.016)	(0.027)
Segment size2	0.010	−0.009	−0.087*
	(0.021)	(0.021)	(0.046)
Segment size3	−0.006	−0.003	0.033*
	(0.029)	(0.037)	(0.019)
Segment size4	−0.007	−0.004	−0.071***
	(0.028)	(0.029)	(0.017)
Segment size5	0.040	0.048	0.045
	(0.042)	(0.042)	(0.050)
Firm size1	−0.011	−0.012	−0.060
	(0.013)	(0.013)	(0.039)
Firm size2	0.011	0.012	0.052
	(0.017)	(0.018)	(0.039)
Firm size3	−0.006	−0.009	−0.013
	(0.010)	(0.010)	(0.025)
Firm size4	−0.014	−0.016	−0.039
	(0.011)	(0.011)	(0.030)
Firm size5	0.013	0.010	0.024
	(0.010)	(0.010)	(0.023)
Plant fixed effects	Yes	Yes	Yes
Adjusted R^2	0.467	0.421	0.507
Number of observations	28,118	28,118	3,542

The symbols ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively.

AFTER is a dummy variable equal to one in the three periods after an acquisition and zero otherwise. *DIVERS* indicates whether an event is a diversifying (*DIVERS* equals one) or related expansion (*DIVERS* equals zero). A diversifying move can take the form of either an acquisition or plant birth in an industry that the firm did not operate in previously.[15]

I choose a three-year window before and after the acquisition event and require at least one observation in the three years before as well as after the event. Incumbent plants that are divested by a firm within three years after an acquisition are excluded from the sample. Furthermore, if a firm diversifies more than once within the three years following the first diversification, only the first event is considered. In fact, these selection criteria should bias the sample against finding a decline in productivity in incumbent plants, since plants that are divested have deteriorating productivity. Finally, I exclude events for which the capital stock of the new addition is less than 10 percent of the firm's capital stock prior to the event. The results are unchanged when I include the observations that are omitted in this specification.

Table IV, column (2), shows that diversifying events have a much larger negative effect on the incumbent plants of a firm than expansions into related industries. The coefficient on the interaction term is negative and statistically significant. This indicates a differential impact of diversification on firm performance. If the decline in productivity were common to any change in the firm's organization, the development of TFP would not differ between related and diversifying expansions. Additionally the results in Table IV show that firms which choose to diversify have slightly higher productivity than those that undertake related acquisitions. The coefficient on the direct effect of *DIVERS* in column (2) is positive but not significant.

To identify the size of the drop in productivity, column (3) of Table IV reestimates the model only for the sample of diversifying acquisition. The results of this before–after estimator show that the productivity of incumbent plants in the three periods after a diversifying event is three percent lower on average than in the three periods before. Column (4) of Table IV repeats this estimation at the *firm* level. Plant level TFP measures are aggregated up to the firm level by weighting these TFP measures with the capital stock of the plant. This includes the incumbent as well as the acquired plants of the firm. The findings suggest that the overall productivity of a diversifying firm declines by more than two percent relative to the three periods before the diversification.[16]

[15] A third source of increased diversification results from firms changing the SIC code of existing plants. I exclude these types of diversifying moves, since they seem most prone to measurement errors. When I include these types of diversifying moves in the estimation, the results are qualitatively similar to the ones reported here.

[16] To get a more detailed understanding of the productivity dynamics after a diversifying move, I reestimate the same model with separate dummies for each year in the event window. This specification (not reported) shows that productivity rises in each of the three years before diversification, but decreases afterwards. The most pronounced drop in productivity happens, however, in the two periods after the diversifying move.

Table IV

Effect of Diversification on TFP of Incumbent Plants

The dependent variable is total factor productivity (TFP) at the three-digit SIC level (as described in Table II). After is a dummy variable equal to one in the three periods after a diversifying move and equal to zero in the three periods before. Controls for Segment size and Firm size are constructed as the number of plants at the segment level or the firm level, respectively. The size variables are splined. The sample in columns (1) and (2) contains observations for the incumbent plants of a firm in the three periods before and after a related or diversifying acquisition. The results in column (3) are based only on the subsample of diversifying acquisitions. The sample in column (4) contains *firm* level observations, where firm TFP indexes are formed as the weighted average of the plant level TFP measures. A diversifying event is defined as an acquisition of a plant in a two-digit industry other than the firm's existing industries. Heteroskedasticity-robust standard errors are in parentheses. Standard errors are corrected to allow for group effects within firms.

	Specification			
	All Acquisitions		Only Diversifications	
	(1)	(2)	(3)	(4)
After	−0.002	0.001	−0.026***	−0.023***
	(0.002)	(0.003)	(0.004)	(0.006)
Divers		0.002		
		(0.005)		
Divers * After		−0.010**		
		(0.005)		
Segment size1	0.025**	0.024*	0.032*	
	(0.012)	(0.012)	(0.018)	
Segment size2	−0.001	−0.001	−0.026	
	(0.016)	(0.017)	(0.024)	
Segment size3	−0.010	−0.010	0.001	
	(0.007)	(0.007)	(0.009)	
Segment size4	0.007	0.006	0.016	
	(0.008)	(0.009)	(0.012)	
Segment size5	0.017*	0.016*	0.013	
	(0.009)	(0.009)	(0.013)	
Firm size1	−0.003	−0.003	−0.006	0.009
	(0.011)	(0.011)	(0.039)	(0.015)
Firm size2	0.006	0.006	0.052	−0.052**
	(0.016)	(0.016)	(0.039)	(0.019)
Firm size3	0.003	0.004	−0.013	0.002
	(0.008)	(0.008)	(0.025)	(0.013)
Firm size4	−0.008	−0.006	−0.039	−0.006
	(0.009)	(0.009)	(0.030)	(0.016)
Firm size5	−0.003	−0.002	0.024	0.007
	(0.011)	(0.011)	(0.023)	(0.017)
Plant fixed effects	Yes	Yes	Yes	No
Firm fixed effects	No	No	No	Yes
Adjusted R^2	0.537	0.536	0.572	0.545
Number of observations	51,313	51,313	23,065	2,855

The symbols ***, **, and * indicate statistical significance at the 1, 5, and 10 percent level, respectively.

B. The "New Toy" Effect

Two theories of managerial behavior seem most promising for explaining the decline in productivity of incumbent plants after a firm diversifies and how this effect relates to the acquisition of new plants.

Imagine that once a firm diversifies managers shift their focus towards the new segments, while incumbent segments receive less attention. This behavior, which I call the "new toy" effect, predicts that productivity in incumbent plants suffers, while the new segments improve. Similarly, Prahalad and Hamel (1990) argue that diversification leads to the neglect of "core competencies." A slightly different theory argues that an addition of new segments increases the sheer number of tasks dealt with by the firm's management. Since a manager's time is limited, diversification forces managers to spread themselves too thin (see Rosen (1982) on the optimal allocation of managerial talent in corporate hierarchies). Both theories predict a decline in the productivity of the incumbent plants but differ in their predictions about the productivity development of new plants.

To distinguish between these two possible explanations, I estimate the change in productivity for the plants that are acquired by a diversifying firm. The diversifying events coincide with the ones in Table III. Table III column (3) presents the results from the before–after regression of productivity on an *AFTER* dummy for the plants that are acquired in a two-digit industry not previously operated in by the acquirer. The coefficient on the *AFTER* dummy is positive and significant. On average the productivity of the new plants is about three percent higher after an ownership change. This is a substantial increase in productivity and is much larger than the rise in productivity after a related acquisition. These results support the "new toy" effect. Diversification is accompanied by an increase in the productivity of the new segments, yet a decline in the productivity of the incumbent segments. One can speculate that the foundations for this productivity pattern are that new segments receive either more attention from top management or that more talented managers get transferred to these segments.

Is this shift of focus rational? Put differently, is the move into "new toys" the *cause* of lower productivity in the incumbent plants, or merely a *response* of managers to a decline in their original segments? If the goal of diversification is to move away from declining industries, one would expect growth opportunities to be higher, on average, in the new industries. I measure the growth opportunities of an industry as the median Tobin's Q at the level of two-digit SIC codes. The results are qualitatively unchanged when using industry Q at the three- and four-digit SIC code level. I find (not reported) that the industry Q of the new segments is below the average industry Q of the firm's initial segments and also below the average Q within the full sample. Graham et al. (1998) find similar results for a sample of merger and acquisition transactions. This does not support the hypothesis that diversification is an optimal response to low growth opportunities in the initial segments.

Another source of endogeneity occurs, if management moves into new industries, when the firm is losing its competitive edge *within* its industry, even though the industry might be doing well. In this case, firms should be discounted relative to other firms in their industry before the diversification, but improve afterwards. However, the observed patterns of market valuations are exactly opposite. Firms that undertake diversifying moves experience a decline in market value only *after* the event. This drop in valuation after diversification is consistent with the results in Graham et al. (1998), which show that the decline in excess value is due partly to buying already discounted assets. A similar pattern can be found for productivity. Before diversification, the performance of the incumbent plants is increasing, but after the acquisition, it is declining, with the sharpest decrease occurring in the first two periods after the event.

In summary, the evidence suggests that the "new toy" effect is more likely to be a symptom of agency problems at the management level than an optimal refocusing of corporate strategy. Although diversified firms are not bad per se, diversification reduces the productivity advantage these firms have in the cross section.

IV. Robustness Checks

A couple of concerns may arise that are due to the *plant* level nature of the data. I perform several robustness checks to rule out the most serious concerns.

A. Corporate Overhead

The LRD does not include information on firm facilities that are located away from a manufacturing establishment, for example, administrative headquarters or off-site marketing and sales departments. This might be of particular concern for diversified firms, if they tend to centralize administrative functions and locate them separately from any of the manufacturing establishments. Resulting productivity measures would systematically overstate the efficiency of diversified companies.

The Bureau of the Census, in a separate survey, collects information on auxiliary facilities of manufacturing plants. The Central Auxiliary Organizations (CAO) survey is conducted every five years and contains information on the nonproduction facilities of manufacturing firms in the LRD. The variables that are of interest to this study are employment, physical assets, and material inputs at auxiliary facilities. The sample contains 3,625 firm-year observations for the four years surveyed. I can match over 80 percent of the firms in each of the four years in which CAO data is available. I only include pure manufacturing firms in this sample so that resources from the LRD are representative of the whole firm.

Since it is impossible to allocate overhead costs in the CAO to specific plants, I aggregate capital, labor, and material inputs up to the firm level for each year that is available in the CAO. I form a measure of excess over-

Table V

Overhead Costs

Data on overhead inputs are obtained from the CAO (Central Auxiliary Organizations) database at the Bureau of the Census for the years 1977, 1982, 1987, and 1992. Separate information on labor, capital, and material used are available. The dependent variables, Excess overhead costs, are measured as the difference between the ratio of productive inputs in auxiliary facilities and the LRD and compared to a benchmark of imputed inputs. The benchmark of imputed inputs is constructed as the weighted sum of inputs from the median stand-alone firm in the corresponding industry. Two-digit diversification is the logarithm of the number of segments at the two-digit SIC level. Firm size is measured as the total value of capital at the firm level. Heteroskedasticity-robust standard errors are in parentheses.

	Specification					
	Labor		Capital		Material	
	(1)	(2)	(3)	(4)	(5)	(6)
Two-digit diversification	−0.018***	−0.016***	−0.003**	−0.003*	−0.001*	−0.001*
	(0.003)	(0.004)	(0.001)	(0.002)	(0.000)	(0.000)
Firm size		−0.002		−0.001		−0.001**
		(0.002)		(0.001)		(0.000)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.073	0.074	0.069	0.069	0.089	0.089
Number of observations	3,625	3,625	3,625	3,625	3,625	3,625

The symbols ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively.

head costs for each firm and type of input, similar to the excess value measures of Lang and Stulz (1994). These are constructed as the difference between the actual ratio of inputs from the CAO to inputs from the LRD relative to a benchmark of imputed overhead cost. The latter is formed as the size-weighted sum of input ratios from the median stand-alone firm in the corresponding industry. This method controls for differences in the utilization of overhead facilities due to industry differences.

Excess overhead indices are regressed on the measure of diversification and controls for firm size and year fixed effects. Table V shows that the fraction of inputs outside of manufacturing plants is negatively correlated to the level of diversification. This holds for all types of inputs: employment, capital, and material. Columns (2), (4), and (6) of Table V show that even after controlling for firm size, diversified firms use less overhead inputs than stand-alone firms. These findings illustrate that omitted overhead costs do not explain the productivity premium for diversified firms in the LRD.[17]

[17] I also performed several additional robustness checks to rule out that diversified firms report lower inputs in the LRD. For example, the ratio of white collar to blue collar workers' hours might be lower for diversified firms indicating that they locate administrative jobs more frequently at auxiliary facilities. However, I do not find significant differences in this ratio for diversified relative to stand-alone firms.

B. Transfer Pricing

Another problem with plant-level data is that transfer-pricing between segments might distort productivity measures. A large fraction of inputs in diversified firms might be supplied by other segments of the same firm. If prices for these transfers are strategically distorted, productivity measures of the downstream segments might be biased upward (or vice versa).

Unfortunately, comprehensive information about the actual transfers is not available from the LRD. Instead, I use the input–output tables at the Bureau of Economic Analysis to create a matrix of vertical relatedness at the *industry* level. Industries are considered vertically related if they receive at least five percent of their inputs from another industry or supply more than five percent of their own outputs to one other industry. For each firm, I form a dummy variable, *Down*, equal to one if a plant belongs to a downstream segment in a vertically integrated firm, and zero otherwise. Similarly, *Up* is a dummy variable indicating a plant in an upstream segment. The diversification measure used here is corrected for segments that are vertically integrated.

I repeat the basic productivity regression specified in Section III, including controls for whether plants belong to a downstream or upstream segment within a diversified firm. Column (6) of Table II shows that the coefficient on diversification remains positive even after controlling for vertical relatedness. Moreover, the coefficients on the dummies are positive but not significant. Productivity is not significantly higher in related industries that are integrated within a diversified firm.

Additionally, I compare material productivity (output per unit of material) of plants in diversified firms to plants of stand-alone firms in the same downstream industry. If diversified firms benefit from lower input prices, they should display higher output per dollar of materials used. Again, I do not find that diversified firms differ in their use of material inputs (results are not reported). It seems that transfer prices do not systematically distort productivity measures in diversified firms.

V. Stock Market Valuations and the Productivity Premium

The productivity premium for diversified firms seems surprising given that, on average, these firms trade at a discount in the stock market. Therefore, it is important to determine whether information about the underlying productivity of a firm is embedded in its market value. Moreover, there might be a differential effect for diversified and stand-alone firms if the former are more difficult for the market to evaluate.

To relate market values back to the underlying productivity of a firm, I aggregate plant level TFP measures up to the firm level. Individual plants are weighted by their relative size within the firm, measured as the capital stock or the total value of shipments. I only include pure manufacturing firms and firms that have all of their operations in the United States. This

Table VI

Excess Value and Productivity

The dependent variable is excess value (the logarithm of the ratio of a firm's individual Tobin's q to its imputed benchmark of size weighted industry qs from COMPUSTAT industry segment files). Two-digit diversification is the logarithm of the number of segments at the two-digit level. Herfindahl is an assets-weighted measure of diversification. Firm TFP is the weighted average of plant level total factor productivity (TFP) at the two-digit SIC level. Controls for Firm size are constructed as the number of plants at the firm level. Heteroskedasticity-robust standard errors are in parentheses.

	(1)	(2)	(3)	(4)	(5)	(6)
Firm TFP	0.374***	0.365***	0.106***	0.108***	0.276***	0.280***
	(0.021)	(0.021)	(0.021)	(0.021)	(0.028)	(0.024)
Two-digit diversification					−0.043***	
					(0.009)	
Two-digit div * TFP					0.178***	
					(0.038)	
Herfindahl						−0.100***
						(0.022)
Herfindahl * TFP						0.756***
						(0.110)
Firm size		0.012**		0.016**	0.024***	0.018***
		(0.004)		(0.006)	(0.005)	(0.004)
Firm fixed effect	No	No	Yes	Yes	No	No
Adjusted R^2	0.053	0.054	0.567	0.567	0.061	0.065
Number of observations	8,561	8,561	8,561	8,561	8,561	8,561

The symbols ***, **, and * indicate statistical significance at the 1, 5, and 10 percent level, respectively.

ensures that the productivity measures present a comprehensive picture of the firms' operations. I follow Lang and Stulz (1994) in constructing excess value measures.

I regress excess values on these aggregate TFP measures controlling for firm size.[18] Columns (1) and (2) of Table VI show that the correlation is positive and highly significant. The coefficient on average TFP at the firm level is 0.374. TFP measures calculated from LRD data are cross-sectionally related to financial measures of economic performance. Similarly, I find that market prices track *changes* in productivity over time: When including firm fixed effects in the specification, the coefficient on TFP remains positive and significant, though it becomes somewhat smaller. Table VI, columns (3) and (4), shows that the coefficient on average TFP now is 0.106. The positive and high significance of the coefficient on aggregate TFP is particularly surprising, because TFP is constructed as a regression residual and thus, by defi-

[18] The results do not change when using other measures of firm performance like return on capital or operating profits.

Table VII

Excess Value and Diversification

The dependent variable is excess value (calculated as the logarithm of the ratio of a firm's individual Tobin's q to its imputed benchmark of size weighted industry qs). Two different sources of segment measures are used: Excess Value1 is based on segment measures from the LRD and Excess Value2 uses information from COMPUSTAT industry segment files. Two-digit diversification is the logarithm of the number of segments at the two-digit level. Herfindahl is an assets-weighted measure of diversification. Segnum is the number of segments at the two-digit SIC level according to COMPUSTAT. Controls for Firm size are constructed as the number of plants at the firm level. Heteroskedasticity-robust standard errors are in parentheses.

	Dependent Variable					
	Excess Value1 (LRD)			Excess Value2 (COMPUSTAT)		
	(1)	(2)	(3)	(4)	(5)	(6)
Two-digit diversification	−0.045***			−0.072***		
	(0.009)			(0.018)		
Herfindahl		−0.081***			−0.141***	
		(0.022)			(0.044)	
Segnum			−0.095***			−0.147***
			(0.009)			(0.018)
Firm size	0.036***	0.029***	0.039***	0.009	0.003	0.012
	(0.005)	(0.004)	(0.004)	(0.010)	(0.009)	(0.008)
Adjusted R^2	0.110	0.101	0.110	0.069	0.068	0.068
Number of observations	8,561	8,561	8,561	8,561	8,561	8,561

The symbols ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively.

nition, contains measurement error. Due to attenuation bias, the resulting coefficient on TFP is biased towards zero, making it more difficult to find an effect.

I also interact aggregate TFP with the measure of diversification in the regressions of excess values on mean firm productivity. The interaction term captures differences in the sensitivity of stock market values to productivity in diversified firms relative to stand-alone firms. If stock prices of diversified firms contain less information about firm fundamentals, one should expect the coefficient on the interaction term to be negative. However, Table VI, columns (5) and (6), shows that the coefficient on the interaction term is positive, and significant. Stock prices of diversified firms are more sensitive to the firm's underlying productivity than stock prices of stand-alone firms. But the coefficient on the direct effect of diversification in columns (5) and (6) is negative and significant, suggesting there exists a diversification discount in this sample. These results make it difficult to rely solely on lack of transparency to explain the diversification discount.

There is widespread concern that segment reporting in COMPUSTAT distorts the extent of the diversification discount, since segment accounting standards allow managers to group together different industries into one segment. In fact, I find that manufacturing firms that are reported as single-segment firms in COMPUSTAT on average have plants in four different industries in the LRD. Thus the measures of diversification derived from COMPUSTAT grossly understate the true extent of conglomeration. Also, it seems problematic to use these firms as benchmarks for industry Tobin Qs.

To address these worries I use the much more precise information on industry segments from the LRD to recalculate the discount. Ideally I would like to form median industry Tobin's Q based on firms that are stand-alone according to the LRD. However, this restriction largely reduces the number of observations in each industry year cell and leads to a very noisy industry benchmark. Instead I use median industry Qs from COMPUSTAT. Table VII, columns (1) through (3), shows that the discount based on LRD segment measures is about 10 percent. It is smaller than the one computed purely from COMPUSTAT in columns (4) to (6) of Table VII. However, the magnitude of the discount is similar to the one generally reported for the full COMPUSTAT universe. So even for the presumably more accurate segment measures from the LRD, the diversification discount still holds.

VI. Wage Premium for Workers in Diversified Firms

To explore the coexistence of a productivity premium with lower market valuation of diversified firms, I analyze the distribution of rents between the different stakeholders of the firm. Even if diversified firms create more value at the production level, shareholders might receive a smaller fraction of these cash flows. Stein (1997) describes a model where managers can divert rents from the firm's operation, but still have an incentive to maximize efficiency, since the total rents they can divert is positively related to the revenues of the company.[19]

Employees make up one of the largest constituencies of a firm. I estimate a standard wage regression at the plant level to analyze whether workers in diversified firms receive rents relative to workers in stand-alone firms. Hourly wages for production workers are regressed on a measure of diversification. I control for the usual firm and plant level characteristics that are known to affect wages. These are firm size (again measured as number of plants), plant age, and capital inputs, as well as industry and year fixed effects. Several studies have shown that workers in large firms enjoy a wage premium relative to workers with similar observable characteristics in smaller firms (see, e.g., Idson and Oi (1999)).

[19] Several papers have documented a different avenue of value destruction in diversified firms. Scharfstein (1997) argues that internal capital markets in diversified firms practice "socialism" by channeling funds from high-growth to low-growth segments. Similarly, Lamont (1997) or Shin and Stulz (1998) show investment patterns that are consistent with cross-subsidization of segments within diversified firms. Rajan, Servaes, and Zingales (1998) find that greater heterogeneity in the investment opportunities of segments within a firm lead to a greater discount in the market.

Table VIII

Wages

Dependent variable: production worker wages. Hourly Wage is constructed at the plant level as total wage bill for production worker divided by hours worked in production. Hourly Wage2 includes wages plus additional labor costs measured as the sum of legally required and voluntary supplementary labor costs. Two-digit diversification is the number of segments at the two-digit industry level. Firm size and Segment size are measured as the number of plants per firm or segment, respectively. Age is measured as years since a plant was set up. If the setup date precedes the first year of the sample (1977), that year is taken as the setup year. Total value of shipments per hour worked is calculated at the plant level. Heteroskedasticity-robust standard errors are in parentheses. Standard errors are corrected to allow for group effects within firms, since diversification varies only at firm level.

	Specification			
	Hourly Wage		Hourly Wage2	
	(1)	(2)	(3)	(4)
Two-digit diversification	0.023***	0.022***	0.041***	0.039***
	(0.005)	(0.005)	(0.006)	(0.006)
Segment size	0.016***	0.015***	0.014***	0.013***
	(0.002)	(0.002)	(0.002)	(0.002)
Firm size	0.011***	0.012***	0.002	0.004
	(0.003)	(0.003)	(0.003)	(0.003)
Plant age	0.063***	0.057***	0.054***	0.050***
	(0.002)	(0.002)	(0.003)	(0.003)
Capital	0.084***	0.085***	0.093***	0.093***
	(0.001)	(0.001)	(0.001)	(0.001)
Total value of shipment/hours worked		0.179***		0.160***
		(0.004)		(0.005)
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Adjusted R^2	0.539	0.544	0.508	0.509
Number of observations	245,006	245,006	245,006	245,006

The symbols ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively.

Table VIII, columns (1) to (4), documents that the coefficient on diversification is positive and significant in all specifications. The point estimate in column (1) is 0.023. Column (2) of Table VIII shows that, even after controlling for labor productivity at the plant level, the coefficient on diversification does not change substantially.

Additionally, columns (3) and (4) in Table VIII report the results using a more comprehensive measure of hourly wages which include legally required and voluntary supplementary labor costs. The LRD has information on supplementary labor costs only in the form of total expenditures, but not separately broken down by white collar or blue collar workers. I impute supplementary labor costs for production workers in proportion to the total wage bill of production workers. Again the coefficient on diversification is positive and significant. In fact, the gap between wages in diversified and stand-alone firms almost doubles; the coefficient on the diversification measure increases to 0.04. It seems intuitive that workers receive a large fraction of rents in the form of fringe benefits or supplementary labor costs. Moreover, the magnitude of the wage difference between diversified and stand-alone firms is economically significant. A move of one standard deviation in the diversification distribution increases this measure by two. So, on average, diversified firms pay their workers roughly eight percent higher wages than stand-alone firms with similar characteristics.

What fraction of the diversification can be explained by this wage differential? From the results above, we know that diversified firms on average are about 7 percent more productive than stand-alone firms, which translates into 10 percent higher profits per year under the assumptions in Section III. At the same time, a discount of 10 percent implies roughly 10 percent lower annual profits in diversified firms. On net, diversified firms would have to dissipate more than 20 percent of their profits. As an extreme example, assume that rent dissipation was the sole source of inefficiency in diversified firms. To justify a 10 percent diversification discount, conglomerates would have to incur 10 percent higher input costs, given our assumptions about the revenue–cost margin. Let's go further to assume that higher labor costs alone were responsible for the difference in the firms' cost structures. If labor constitutes about 30 percent of total costs, wages in diversified firms should be 33 percent higher than in stand-alone firms. Therefore, the 8 percent wage gap that I estimated for the firms in my sample can potentially explain a large part of the discount, but not the entire amount.

However, the results from these plant level wage regressions should only be interpreted as suggestive evidence for the hypothesis that workers in diversified firms earn rents. For a cleaner test of the rent dissipation hypothesis, one would ideally want to use exogenous controls of labor quality for individual workers within a plant, for example, years of schooling or experience on the job. Unfortunately the LRD does not provide this information. Therefore, it is not possible to fully rule out the alternative explanation that wage levels in diversified firms are higher due to differences in the labor force composition within these plants. Moreover, this limitation of the data does not allow me to causally link rent dissipation to measures of excess value.[20]

VII. Conclusion

In summary, this paper shows that diversified firms are not bad per se, but diversification as a corporate strategy is. In fact, diversified firms are more productive than stand-alone firms. This productivity difference is not

[20] I thank an anonymous referee for alerting me to this issue. In future work, I hope to explore these questions in greater detail.

the result of conglomerates' *buying* into high productivity plants. But it seems that diversified firms actually add value to the plants they acquire. Given this productivity premium, I argue that lower efficiency cannot be the primary explanation for the level of the diversification discount. Differences in productivity do, however, explain a large fraction of the variance in the diversification discount between firms. Stock prices closely track differences in productivity between firms and within firms across time.

I identify two sources of value destruction in diversified firms. First, the dynamic effects of diversification are negative. The productivity of the incumbent plants of a firm decreases in the aftermath of a diversifying move, while the new plants experience an increase in their productivity. Yet the net effect on productivity from the acquisition of the "new toys" is negative. This indicates that diversifying moves on average are not optimal for the firms in question. Even though becoming more diversified reduces firm productivity relative to the ex ante level, in the cross section, diversified firms still are more productive than stand-alone firms.

Second, I offer suggestive evidence that diversified firms distribute a larger fraction of revenues to employees by paying higher wages and fringe benefits than stand-alone firms. One can argue that pure redistribution does not need to be inefficient from a social welfare point of view, as long as it does not lead to a distortion in the allocation of resources. From the point of view of existing shareholders, however, this behavior seems to be suboptimal.

This paper provides a glimpse into the internal workings of diversified firms. Clearly, much more needs to be done to develop a precise understanding of how value is created and distributed between the different stakeholders in diversified firms. The results suggest that higher productive efficiency does not automatically translate into more value creation for shareholders. In particular, it seems crucial to understand how governance structures within a firm interact with managerial decisions at different levels of the corporate hierarchy.

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