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Product market competition and the value of diversification

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ABSTRACT

I examine how industry concentration affects the value of diversification. I find that con- glomerates that operate mainly in concentrated industries (concentrated conglomerates) have higher diversification values. Using tariff reductions as competitive shocks, I show that concentrated conglomerates experience significant decline in their valuations and respond aggressively to threats in less-competitive industries.

1. Introduction

Existing studies on firm diversification mainly focus on the mean effect of diversification on firm values (Stein, 2003). However, the question of how industry characteristics affect the value of diversification is often ignored. The answer to this question is important as industry characteristics that diversified firms operate might have potential strategic implications on firms' commitment strategies and competitive behaviors in product markets. This article attempts to answer this question by investigating the effect of industry concentration on the value of diversification and diversified firms' commitment strategies in response to competitive threats depending on the industry concentration of segments that experience the intensified competition.

The idea that the effect of diversification on firm performance is not homogenous across industries is considered by Santalo and Becerra (2008). The authors replicate Berger and Ofek (1995) and show that diversification creates value in industries with few single-segment competitors, while it destroys value in industries with a large number of single-segment competitors. In this paper, I extend this idea by focusing on industry concentration and demonstrating that there is a causal link between industry concentration and the value of diversification.

I focus on the cross-sectional variation in diversification values and examine the effect of product market concentration on the value of diversification. I find evidence that diversified firms that operate mainly in concentrated industries have higher valuations. These results are robust to the use of econometric models to control for the endogeneity of firms' diversification decisions (Campa and Kedia, 2002; Villalonga, 2004). These results are also robust to alternative industry concentration measure which captures the effect of both public and private firms (Hoberg and Phillips, 2010).

In order to further investigate the effect of industry concentration on the value of diversification, I follow Fresard (2010) and use large import tariff reductions as exogenous shocks to competitive environment in which firms operate. By reducing the cost of entry for foreign competitors into U.S. market, large reduction in import tariffs significantly intensifies the competitive pressure in product

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markets. In particular, I study the change in the value of diversification following exogenous competitive shocks. I find evidence that concentrated conglomerates experience significant decline in their valuations when their segments are hit by competitive shocks. Taken together, these results suggest that concentrated conglomerates enjoy their market positions in less-competitive industries and have higher valuations. When they are hit by competitive shocks, their market positions in less-competitive industries weaken and their value of diversification decrease significantly.

I examine the impact of competitive shocks on concentrated conglomerates further by assessing their response to increased competitive threats at the segment level. I find that concentrated conglom-erates stay in the threatened industry and try to defend their market positions when their segments in less-competitive industries face exogenous competitive threats. Concentrated conglomerates allocate greater portion of their total capital expenditure to the threatened less-competitive industries and increase their sales growth and investment growth in these industries following competitive shocks. These findings are consistent with the notion that conglomerate firms respond aggressively to intensified competition in order to maintain market share (Faure-Grimaud and Inderst, 2005).

This paper is related to the literature on corporate diversification and firm valuations (Lang and Stulz, 1994; Berger and Ofek, 1995; Campa and Kedia, 2002; Graham et al., 2002; Mansi and Reeb, 2002; Villalonga, 2004).[1] It is also connected to theoretical literature that has highlighted various costs (Rajan et al., 2000; Scharfstein and Stein, 2000) and benefits (Lewellen, 1971; Stein, 1997) of diversification. It is also related to papers that examine the effect of internal governance (Hoechle et al., 2012) and external market conditions (Matvos and Seru, 2014; Kuppuswamy and Villalonga, 2016) on the efficiency of conglomerate firms. My study deepens our understanding about the valuation of diversified firms and how industry characteristics affect the value of diversification.

This paper is also related to the literature on the interaction between internal capital markets and product market competition. Conglomerates may respond more aggressively to competitive threats by using their internal resources (Telser, 1966; Faure-Grimaud and Inderst, 2005). Alternatively, they may respond less aggressively because they can easily shift resources to other segments and exit the threatened market (Matsusaka and Nanda, 2002). Cestone and Fumagalli (2005) further study the strategic impact of group membership in product markets and show that affiliation to a monopolistic subsidiary could make other segments of a diversified firm more vulnerable in product markets because if a segment faces a competitive threat, the diversified firm could channel the segment's resources to its monopolistic affiliate and exit the threatened industry. Khanna and Tice (2001) also examine how discount department stores reacted to Wal-Mart's entry into their market and show that diversified firms are quicker to exit, but those that stay invest more aggressively. More recently, Bai (2021) shows that relative to standalone firms, conglomerate firms are more likely to restructure after tariff shocks, focusing on their core competency and improving firm productivity. My work adds to this literature by showing that concentrated conglomerates respond aggressively to competitive threats in order to maintain their market positions in less-competitive industries.

The rest of the paper proceeds as follows. Section 2 develops testable hypotheses. Section 3 discusses the data and empirical methodology. Section 4 analyzes the impact of industry concentration on the value of diversification and provides the results on the effect of competitive shocks. Section 5 provides robustness tests. Section 6 concludes.

2. Hypothesis development

Previous research considers how industry characteristics affect firms' organizational forms and their decisions to diversify (Campa and Kedia, 2002; Villalonga, 2004; Maksimovic and Phillips, 2008). However, existing work does not examine the impact of product market characteristics on the value of diversification. Santalo and Becerra (2008) is an exception; they focus on competition from specialized firms and study the impact of the number of single-segment firms in a given industry on diversified firms' performance. In this paper, I build on their study by examining how product market characteristics (industry concentration) that diversified firms operate affect diversification values.

Transaction cost theory provides theoretical motivation for why conglomerates that operate mainly in concentrated industries might have higher diversification values. The theory states that small number of alternative business partners (small numbers bargaining condition) makes contractual arrangements more difficult since this condition creates concern about contractual hold-up problems (Williamson, 1975, 1985). In such cases, vertical integration reduces transaction costs. Hence, vertically integrated firms might have competitive advantage in more concentrated industries. Note that, this study does not consider only vertically integrated firms as diversified firms. Transaction cost theory provides an intuition for my hypothesis and there could be other mechanisms that lead to higher diversification values for concentrated conglomerates. This argument leads to my first hypothesis:

Hypothesis 1 (H1). Conglomerates that operate mainly in concentrated industries have higher diversification values.

The use of large tariff reductions as exogenous competitive shocks helps to demonstrate that industry concentration has a causal impact on the value of diversification. I expect exogenous competitive shocks to cause significant decline in the value of concentrated conglomerates. I specifically focus on the valuations of concentrated conglomerates since these conglomerates will be more motivated to protect their market positions in less-competitive industries instead of shifting their resources to another segment and exiting the threatened industry, and as a result, will be adversely affected by competitive shocks. This leads to following hypothesis:

Hypothesis 2 (H2). The value of diversification declines significantly when concentrated conglomerates are hit by competitive

[1] See Martin and Sayrak (2003) for review.

shocks.

Existing theories suggest competing hypotheses on whether conglomerates act as more or less aggressive competitors in response to competitive threats. Conglomerates may respond more aggressively to competitive threats compared to stand-alone firms as a result of financial flexibility (Telser, 1966; Faure-Grimaud and Inderst, 2005). On the other hand, investment flexibility limit conglomerates' ability to respond to competitive threats. In other words, conglomerates may respond less aggressively as they can easily shift their resources to other segments and exit the threatened industry (Matsusaka and Nanda, 2002). Since conglomerates' response to entry threats may depend on which of their segments experience intensified competitive pressure; I focus on the reaction of concentrated conglomerates to competitive shocks in their less-competitive industries. I expect that concentrated conglomerates will try to defend their positions in less-competitive product markets since these concentrated industries provide more rents to enjoy. From this argument I derive the following hypothesis:

Hypothesis 3 (H3). Concentrated conglomerates tend to protect their market positions in less-competitive industries in response to competitive threats.

3. Data and empirical methods

3.1. Sample selection and definition of variables

The sample includes all firms that have available segment-level data in Compustat for the period of 1990–2006.[2] Following Berger and Ofek (1995), I eliminate firms with at least one division in the financial sector (SIC codes between 6000 and 6999). I further exclude all firm-year observations for which I do not have each segment's industry (SIC code). Following the literature, I require total sales from the Compustat annual files to be greater than $20 million and within 1% of the sum of segment sales. Since my analysis is based on sales and asset-based multiples, I exclude firms whose sales or assets at the segment level are unavailable on Compustat.

Following Berger and Ofek (1995), I compute excess values as the natural logarithm of a firm's market to sales/ market to book ratio divided by the imputed market to sales/ market to book ratio of the firm. For each firm, imputed market to sales/ market to book ratios are computed as weighted average of the industry median market to sales/ market to book ratios in which the firm operates, using segment sales/total sales or segment asset/total assets as relative weights. The industry median values are computed by using single segment firms in each industry, and industries are defined based on the narrowest SIC grouping that includes at least five single segment firms. Excess values based on asset multipliers (excess market to book) are calculated by excluding those firms for which the sum of segment assets deviates from the firm's total assets by more than 25%. Finally, following Berger and Ofek (1995) extreme excess values which are greater than 1.386 in absolute value are eliminated from the sample. Table 1 provides descriptive statistics for the sample.

My main measure of industry concentration is the standard Herfindahl-Hirschman index (HHI). A higher HHI implies weaker competition. The HHI is defined as the sum of squared market shares;

$$HHI_{jt} = \sum_{i=1}^{N_j} s_{ijt}^2$$

where s_{ijt} is the market share based on sales of segment i that operates in industry j in year t. Consistent with excess value calculations, HHI is also based on the narrowest SIC grouping that includes at least five single segment firms. This HHI is based on information from public firms in Compustat, in robustness tests I also use fitted HHI based on three-digit SIC-codes suggested by Hoberg and Phillips (2010).[3] Fitted HHI combines Compustat data with Herfindahl data from the U.S. Commerce Department and captures the effect of both public and private firms.

In order to compute the industry concentration at the firm-level, following Santalo and Becerra (2008), I use concentration variable, *CONC*, which is defined as the weighted average of different HHIs of different industries in which a firm operates. Weights are calculated as the ratio of segment sales to total firm sales. Hence;

$$CONC_{kt} = \sum_{j=1}^{N} w_{i(k)jt} HHI_{jt}$$

where $w_{i(k)jt}$ is the sales weight of segment i that belongs to firm k and operates in industry j in year t. In order to identify firms that operate mainly in concentrated industries, I define the dummy variable *Concentrated*, which equals one if a firm's concentration variable, *CONC*, is above the annual median, and equals zero otherwise. This dummy variable instead of the continuous concentration measure allows for an intuitive economic interpretation of coefficient estimates.

[2] Data on import tariffs span the period 1974-2005. The sample period ends in 2006 because of this constraint on the tariff data.
[3] Fitted HHI data is available at Hoberg and Phillips' website.-

Table 1
Descriptive statistics
This table presents summary statistics for the sample. Total capital is the sum of book value of debt and market value of equity. *Multi* is a dummy variable that equals one if a firm has more than one segment. Following Santalo and Becerra (2008), industry concentration index, *Conc*, is defined as the weighted average of the Herfindahl-Hirschman index (HHI) of different industries in which the firm operates, using segment sales over total firm sales as relative weights. HHI is computed as the sum of squared market shares in a given industry. Industry definitions are based on the narrowest SIC grouping that includes at least five single segment firms. *Concentrated* is a dummy variable that equals one if the firm-level concentration index, (*Conc*), is above the annual median. Tariff reductions at the firm-level are defined using three different alternatives: *Cut* equals one if a firm owns a segment; or *Cut(*max*)* a segment with maximum sales share within the firm; or *Cut(50%)* a segment with more than 50% of sales share within the firm that experiences a competitive shock in that year. Import tariff data is available for only manufacturing industries. The sample period is from 1990 to 2006.

	N	Mean	Min	Median	Max	S.D.
Assets ($ millions)	45,262	1238	0.86	165	244,160	5136
Sales ($ millions)	45,262	1092	20.00	172	172,913	4306
Total capital ($ millions)	45,262	1748	1.34	222	205,004	7318
Capital expenditures/Sales	45,262	0.10	0.00	0.04	13.32	0.25
EBIT/Sales	45,262	0.04	-0.99	0.07	3.62	0.26
Multi	45,262	0.16	0.00	0.00	1.00	0.36
Industry concentration index *(Conc)*	45,262	0.14	0.01	0.11	1.00	0.12
Concentrated	45,262	0.50	0.00	0.00	1.00	0.50
Cut	19,195	0.52	0.00	1.00	1.00	0.50
Cut (max)	19,195	0.48	0.00	0.00	1.00	0.50
Cut (50%)	19,195	0.46	0.00	0.00	1.00	0.50

3.2. Empirical methodology

To examine the effect of industry concentration that diversified firms operate on the value of di- versification, I estimate the following difference-in-difference specification which is a variant of Berger and Ofek (1995) regressions:

$$y_{kt} = \beta_1 \times Multi_{kt} + \beta_2 \times Concentrated_{kt} + \beta_3 \times (Multi_{kt} \times Concentrated_{kt}) + \gamma X_{kt} \quad (1)$$

where k indexes firms, t indexes years, the dependent variable y_{kt} is firms' sales-based and asset-based excess values. *Multi* is a dummy variable that equals one if a firm has more than one segment, *Concen- trated* is a dummy variable that equals one if the firm-level concentration index (*CONC*) is above the annual median, and the vector X includes the same control variables used by Berger and Ofek (1995): natural logarithm of total assets, EBIT divided by sales, and the ratio of capital expenditures to sales in order to control for firm size, profitability and growth opportunities. The coefficient of interest is β_3, which measures the difference in firm valuations between diversified firms and single segment firms that operate mainly in concentrated industries.[4]

Campa and Kedia (2002) and Villalonga (2004) argue that the organizational form of a firm is not exogenous; the firm chooses the extent of its operations and decides whether to diversify or not. In order to address this self-selection biases and control for the endogeneity of the diversification decision, in robustness tests I follow Santalo and Becerra (2008) and use firm fixed effect regressions for firms that change their number of segments during the sample period.

4. Competition and the value of diversification

In this section, I examine the effect of industry concentration that diversified firms operate on their valuations. Then, I investigate how the diversification value of a concentrated conglomerate changes following an exogenous competitive shock to an industry it operates and study the response of a concentrated conglomerate to competitive shocks.

4.1. Main results

I study the effect of industry concentration on the value of diversification by estimating Eq. (1) which is a variant of Berger and Ofek (1995) regressions. The results of the OLS regressions are presented in Table 2 both with excess market to sales and excess market to book as dependent variables. In column 1, the coefficient on *(Multi × Concentrated)* is 0.033 and significant at the 5% confidence level, indicating that conglomerates that operate mainly in concentrated industries have 3.3% higher valuations. Note that, the co-efficient on *Multi* is negative and significant at the 1% level suggesting that diversified firms trade at a discount compared to single-segment firms consistent with the diversification discount literature (Berger and Ofek, 1995).

Column 2 reports the coefficient estimates using excess market to book as a dependent variable. It reports the coefficient of 0.022 on *(Multi × Concentrated)* and it is statistically significant. Overall, these results support the hypothesis that conglomerates that operate mainly in concentrated industries have higher valuations.[5]

[4] I obtain similar results when I use industry and year fixed effects.
[5] I obtain similar results if I estimate the regressions for the subsample of manufacturing firms.

Table 2
Industry concentration and the value of diversification
This table presents the results of Berger and Ofek (1995) regressions including industry con- centration measure. Excess market to sale is the natural logarithm of a firm's market to sale ratio divided by the imputed market to sale ratio of the firm. A firm's imputed market to sale is the weighted average of the industry median market to sales ratios in which the firm operates, using segment sales over total firm sales as relative weights. Excess market to book values are also calculated in the same way, using segment assets over total firm assets as relative weights. *Multi* is a dummy variable that equals one if the firm has more than one segment. *Concentrated* is a dummy variable that equals one if the firm level concentration index (*Conc*) is above the annual median. Industry concentration index, *Conc*, is the weighted average of the HHIs of different industries in which the firm operates, using segment sales over total firm sales as relative weights. HHI is computed as the sum of squared market shares in a given industry. Industry definitions are based on the narrowest SIC grouping that includes at least five single segment firms. The sample period is from 1990 to 2006. Standard errors that are clustered at the firm level are reported in parentheses. Significance at the 1%, 5%, and 10% level is represented by ***, **, and *, respectively.

Dependent variable:	Excess market to sale (1)	Excess market to book (2)
Multi	-0.158***	-0.055***
	(0.011)	(0.009)
Multi × Concentrated	0.033**	0.022*
	(0.015)	(0.013)
Concentrated	0.031***	-0.004
	(0.006)	(0.005)
Log of assets	0.066***	0.007***
	(0.002)	(0.001)
Capex/sales	0.283***	0.022**
	(0.011)	(0.009)
EBIT/sales	0.106***	0.310***
	(0.010)	(0.009)
Constant	-0.397***	-0.032***
	(0.009)	(0.008)
N	45,262	43,639
R^2	0.064	0.031

4.2. The effect of competitive shocks

4.2.1. Reductions of import tariffs

In order to show the impact of intensified competition on the value of diversification, I follow Fre- sard (2010) and use large import tariff reductions as exogenous shocks to the competitive environment of product markets.[6] Reductions of import tariff rates reduce the cost of entering the U.S. market and, as a result, increase the competitive pressure from foreign competitors.

To measure significant reductions in import tariffs at the four-digit SIC level, I use U.S. import data compiled by Feenstra (1996), Feenstra et al. (2002), and Schott (2010). The tariff data only covers manufacturing industries (SIC codes between 2000–3999). Hence, the sample is restricted to manufacturing firms where I examine the impact of competitive shocks. For each industry-year, tariff rates are computed as the total duties collected divided by the total customs. Competitive shocks are identified as large tariff cuts in terms of the deviation of the annual change in tariff rates from the same industry's median change. I classify a large tariff cut in a specific industry-year if a negative change in the tariff rate is greater than the median absolute change in that industry. To ensure that the identified cut is not a transitory change, I exclude tariff cuts that are followed by equivalently large increases in tariff rates over the following two years period.

Next, in order to examine the impact of competitive shock on the value of concentrated conglom- erates, I define *CUT* dummy variable at the firm-level. Tariff reductions (*CUT*) at the firm-level are defined using three different alternatives: *CUT* equals one if a firm owns a segment; or a segment with maximum sales share within the firm; or a segment with more than 50% of sales share within the firm that experiences a competitive shock in that year.

4.2.2. The value of diversification following competitive shocks

To investigate the effect of intensified competition on the value of concentrated conglomerates, I estimate a variant of Eq. (1) in which I include *CUT* dummy and its interactions with *Multi* and *Concentrated* dummies. Specifically, I estimate the following model:

$$y_{k(j)t} = \beta_1 \times Multi_{kt} + \beta_2 \times Cut_{kt} + \beta_3 \times Concentrated_{kt} + \beta_4 \times (Multi_{kt} \times Cut_{kt}) + \beta_5 \times (Multi_{kt} \times Cut_{kt} \times Concentrated_{kt}) + \beta_6 \times (Multi_{kt} \times Concentrated_{kt}) + \beta_7 \times (Cut_{kt} \times Concentrated_{kt}) + \gamma X_{kt} + \alpha_j + \alpha_t + \epsilon_{kt} \quad (2)$$

Subscripts k, j, and t represent firms, industries, and years, respectively. The dependent variable $y_{k(j)t}$ is excess market to sales

[6] Other papers that exploit the reductions of import tariffs in quasi-natural experiment setting include Frésard and Valta (2016),Valta (2012), Xu (2012).

measure. α_j and α_t are industry and year fixed effects. *Multi* is a dummy variable that equals one if a firm has more than one segment, *Concentrated* is a dummy variable that equals one if a firm-level concentration index (*CONC*) is above the annual median. CUT_{kt} is a dummy variable that equals one if a firm k owns a segment; or a segment with maximum sales share within the firm; or a segment with more than 50% of sales share within the firm that experiences a competitive shock in year t. The vector X includes the control variables which are natural logarithm of total assets, EBIT divided by sales, and the ratio of capital expenditures to sales. Standard errors are clustered at the firm level.

The coefficient on ($Multi_{kt} \times CUT_{kt} \times Concentrated_{kt}$) captures the effect of competitive shock experienced by segments of concentrated conglomerates on the value of diversification and it is (β_5) the main parameter of interest in Eq. (2). Table 3 displays the results. Regardless of which definition of *CUT* dummy I use, the coefficient on ($Multi_{kt} \times CUT_{kt} \times Concentrated_{kt}$) is always negative and significant. Column 1 of Table 3 shows that the excess value of concentrated conglomerates declines significantly when one of their segments is hit by a competitive shock. The coefficient of interest (β_5) is -0.109 indicating 10.9% decline in excess value of concentrated conglomerates following exogenous competitive shocks and it is statistically significant at the 5% confidence level.

In columns 2 and 3 of Table 3, I use alternative definitions of *CUT* dummy. Column 2 shows the effect of intensified competition when a segment with maximum sales share within the firm is hit by a competitive shock while Column 3 presents the impact when a segment with more than 50% of sales share within the firm is affected by a tariff cut. For these alternative definitions of *CUT* dummies, the parameters of interest are -0.116 and -0.087 in columns 2 and 3, indicating significant decline in excess value of concentrated conglomerates after competitive shocks. Consistent with the second hypothesis, these results indicate that concentrated conglomerates experience significant decline in their valuations when competitive shocks hit the industries they operate.

4.3. Segment-level evidence

The evidence presented thus far shows that concentrated conglomerates have higher valuations, and their value of diversification decrease significantly following competitive shocks. In this sub- section, I present segment-level evidence on how concentrated conglomerates respond to competitive threats. In particular, I study whether concentrated conglomerates defend their market positions in less-competitive industries in case of entry threats.

In order to examine the reaction of concentrated conglomerates to competitive threats, I estimate the following specification:

$$y_{ikjt} = \beta_1 \times Multi_{kt} + \beta_2 \times Cut_{jt} + \beta_3 \times Concseg_{it} + \beta_4 \times \left(Multi_{kt} \times Cut_{jt}\right) + \beta_5 \times \left(Multi_{kt} \times Cut_{jt} \times Concseg_{it}\right) + \beta_6 \times \left(Multi_{kt} \times Concseg_{it}\right) + \beta_7 \times \left(Cut_{jt} \times Concseg_{it}\right) + \gamma X_{it} + \alpha_i + \alpha_t + \epsilon_{it} \quad (3)$$

where i indexes segments, k indexes firms, j indexes industries, t indexes years, y is the dependent variable, α_i and α_t are segment and year fixed effects,[7] X is the control of vector variables and includes segment size and segment profitability. Segment size is measured by the natural logarithm of seg- ment's total identifiable assets and segment profitability is defined as the ratio of segment's operating profit to segment's assets. *Multi* is a dummy variable that equals one if a segment belongs to a firm that has more than one segment, *Cut* is a dummy variable that equals one if the segment's industry experiences a tariff cut in year t. Continuous control variables are winsorized at the 1% tails. Standard errors are clustered at the segment level.

In order to better understand whether concentrated conglomerates defend their market positions in less-competitive industries instead of shifting their resources to different segments in case of competitive threats, I define *Concseg* dummy variable which identifies segments that operate in concentrated industries as well as owned by concentrated firms. Specifically, *Concseg* is a dummy variable that equals one if the segment operates in a concentrated industry and belongs to a concentrated firm. To classify industries as concentrated, I sort for each year all industries into two groups based on whether an industry's HHI lies above or below the median in that year. Similarly, if a firm's concentration index (*CONC*) lies above the median in that year, the firm is categorized as a concentrated firm.

Dependent variables are the change in the segment share of total firm investment, segment sales growth and segment investment growth. Change in the segment share of total firm investment reflects whether a firm allocates a greater portion of its total capital expenditure to the threatened industry. For each year, I calculate each segment's share of the firm's total capital expenditures and use the change in the ratio as a dependent variable. Sales growth is the growth in segment sales and investment growth is the growth in segment capital expenditures. In order to mitigate the effect of outliers, all dependent variables are winsorized at the 1% tails.

The estimates of segment-level regressions are presented in Table 4. The coefficient on ($Multi_{kt} \times CUT_{jt} \times Concseg_{it}$) measures the effect of competitive shocks on concentrated conglomerates' segments that are also active in less-competitive industries. As is shown in column 1, when one of their segments that operates in a less-competitive industry is hit by a competitive shock, concentrated conglomerates allocate more resources to the threatened industry. The coefficient on the triple-interaction term is positive and statistically significant at the 10% level, indicating 2.5% increase in the investment share of the threatened segment.

Columns 2 and 3 display a similar pattern with respect to sales growth and investment growth. As column 2 shows, the parameter on the triple-interaction term is positive and statistically significant at the 10% level. The sales growth of concentrated conglomerate segments in threatened industries increases by 6.1%. Similarly, Column 3 presents that investment growth of concentrated conglomerate segments increases by 3.8% in threatened industries, although it is not statistically significant at the conventional confidence levels.

[7] Using industry (instead of segment) fixed effects does not alter the results.

Table 3
The value of diversification following competitive shocks
This table presents the effect of competitive shocks on the value of diversification. Tariff reductions (Cut) at the firm level are defined using three different alternatives. Specifically, Cut equals one if a firm owns a segment (column 1); or a segment with maximum sales share within the firm (column 2); or a segment with more than 50% of sales share within the firm (column 3) that experiences a competitive shock in that year, and zero otherwise. Competitive shocks are defined at the 4-digit SIC level. *Multi* is a dummy variable that equals one if the firm has more than one segment. *Concentrated* is a dummy variable that equals one if the firm level concentration index (*Conc*) is above the annual median. Industry concentration index, *Conc*, is the weighted average of the HHIs of different industries in which the firm operates, using segment sales over total firm sales as relative weights. HHI is computed as the sum of squared market shares in a given industry. Industry definitions are based on the narrowest SIC grouping that includes at least five single segment firms. The sample period is from 1990 to 2006. The sample covers manufacturing firms. Standard errors that are clustered at the firm level are reported in parentheses. Significance at the 1%, 5%, and 10% level is represented by ***, **, and *, respectively.

Dependent variable:	Excess market to sale		
	Cut (1)	Cut(max) (2)	Cut(50%) (3)
Multi	-0.251***	-0.241***	-0.241***
	(0.031)	(0.028)	(0.027)
Cut	-0.016	-0.016	-0.015
	(0.015)	(0.015)	(0.015)
Concentrated	0.005	0.004	0.004
	(0.020)	(0.020)	(0.020)
Multi x Cut	0.079**	0.082***	0.093***
	(0.033)	(0.031)	(0.033)
Multi x Cut x Concentrated	-0.109**	-0.116***	-0.087*
	(0.045)	(0.042)	(0.045)
Multi x Concentrated	0.120***	0.102***	0.084**
	(0.040)	(0.034)	(0.033)
Cut x Concentrated	0.007	0.007	0.007
	(0.019)	(0.019)	(0.019)
Constant	-0.456***	-0.457***	-0.456***
	(0.032)	(0.032)	(0.032)
Controls	Yes	Yes	Yes
Industry F.E.	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes
N	19,195	19,195	19,195
R^2	0.107	0.107	0.107

Note that this analysis only captures the reaction of concentrated conglomerates to increased competitive threats in their less-competitive industries rather than whether conglomerate firms are more aggressive competitors on average. Hence, these results are not inconsistent with the contradictory theories that conglomerate firms might be weaker competitors because of resource flexibility within firms. Diversified firms' response to competitive threats may depend on which of their segments experience increase in competitive pressure.

Overall, these results suggest that concentrated conglomerates try to defend their market positions in less-competitive industries when their segments are hit by competitive shocks. Instead of exiting the threatened industry and shifting resources to other segments, concentrated conglomerates allocate larger portion of their total investment to the threatened industry and respond more aggressively by using their internal resources in case of competitive threats to their concentrated industries.

5. Robustness tests

5.1. Controlling for self-selection

As Campa and Kedia (2002) and Villalonga (2004) point out, observed organizational structures are not exogenous because firms choose to diversify. There might be unobserved firm characteristics that affect both diversification decision and performance. In order to control for the self-selection bias, Campa and Kedia (2002) and Villalonga (2004) use alternative econometric techniques. Campa and Kedia (2002) identify industry instruments that affect firms' decision to diversify and estimate instrumental variable model. In order to capture the attractiveness of a given industry to conglomerates, they use industry characteristics such as the fraction of diversified firms in the industry.

Santalo and Becerra (2008), on the other hand, show that diversified firms have higher values in industries with a small number of single segment competitors. Their results indicate that industry characteristics also affect the value of diversified firms. In order to satisfy the exclusion restriction, an ideal instrument should affect the decision to diversify but not have a direct effect on relative valuation. As a result, Santalo and Becerra (2008) argue that some of the industry instruments could be questionable considering the effect of industry heterogeneity on valuations and point out that other self-selection correction techniques such as the inclusion of firm fixed effects are not affected by such potential concerns.

In order to show the robustness of the results to self-selection biases, I follow Santalo and Becerra (2008) and use firm-fixed effect regressions for firms that change their number of segments during the sample period. Table 5 presents the results of fixed effect

Table 4
Segment-level evidence
This table presents the results of segment-level regressions. The dependent variable in Column 1 is the change in the segment share of total firm capital expenditure. In Column 2 and 3, dependent variables are sales growth and investment growth of the segment, respectively. *Cut* equals one if a segment experiences a competitive shock in that year, and zero otherwise. Competitive shocks are defined at the 4-digit SIC level. *Multi* is a dummy variable that equals one if the firm has more than one segment. *Congseg* is a dummy variable that equals one if a segment operates in concentrated industry and is owned by a concentrated firm. Concentrated industries are categorized by using annual median values of industry HHIs. HHI is computed as the sum of squared market shares in a given industry. Industry definitions are based on the narrowest SIC grouping that includes at least five single segment firms. Concentrated firms are defined by using annual median values of firm-level concentration measures (*Conc* index) which is the weighted average of the HHIs of different industries in which the firm operates, using segment sales over total firm sales as relative weights. All dependent variables and continuous control variables are winsorized at 1% in each tail. The sample period is from 1990 to 2006. The sample covers manufacturing firms. Standard errors that are clustered at the segment level are reported in parentheses. Significance at the 1%, 5%, and 10% level is represented by ***, **, and *, respectively.

Dependent variable:	Δ in segment share of total firm investment (1)	Sales growth (2)	Investment growth (3)
Multi	-0.054***	0.019	-0.283**
	(0.012)	(0.030)	(0.115)
Cut	0.000	0.027***	0.02
	(0.001)	(0.009)	(0.038)
Concseg	0.002	0.001	-0.031
	(0.001)	(0.011)	(0.049)
Multi x Cut	-0.014*	-0.038**	-0.018
	(0.008)	(0.016)	(0.070)
Multi x Cut x Concseg	0.025*	0.061*	0.038
	(0.015)	(0.032)	(0.145)
Multi x Concseg	-0.016	-0.047**	-0.095
	(0.010)	(0.021)	(0.101)
Cut x Concseg	-0.001	-0.026*	-0.012
	(0.002)	(0.014)	(0.065)
Profitability	0.006	0.797***	1.454***
	(0.010)	(0.043)	(0.144)
Segment size	0.008***	0.104***	0.044
	(0.002)	(0.011)	(0.039)
Segment F.E.	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes
N	18,502	18,919	18,471
R^2	0.244	0.481	0.267

regressions for a subsample of 951 firms that report a change in their number of segments during the sample period (7702 firm-year observations) using excess market to sales as dependent variable.

In Panel A, I estimate the baseline model (Eq. (1)) by including firm fixed effects. Column 1 shows that concentrated conglomerates have 5.6% higher excess values, which is consistent with previous results. The coefficient on (*Multi* × *Concentrated*) is statistically significant at the 5% level.

Similarly, Panel B of Table 5 shows the robustness of results regarding import tariff shocks. I estimate Eq. (2) by including firm and year fixed effects for the same subsample of firms that report a change in their number of segments during the sample period. Consistent with previous findings, concentrated conglomerates experience significant decline in their valuations when one of their segments is hit by a competitive shock. The parameter on (*Multi* × *CUT* × *Concentrated*) is -0.130 and is statistically significant at the 5% level.

5.2. *Alternative measure of industry concentration*

My main industry concentration measure is Compustat HHI based on segment-level data. Compu- stat HHI covers only public companies. In order to capture the effect of both public and private firms, I use the fitted HHI industry concentration measure at the 3-digit SIC codes level suggested by Hoberg and Phillips (2010).

Hoberg and Phillips (2010) calculate the fitted HHI using Herfindahl data from the Commerce Department which only covers manufacturing industries, employee data from the Bureau of Labor Statistics (BLS) (covers both public and private firms) and Compustat data on the number of employees for each public firm. First, they regress industry HHI from the Commerce department on Compustat HHI, the average number of employees per firm using the BLS data and number of employees per firm using Compustat data. Next, they use the coefficient estimates from this regression to calculate fitted HHI for all industries. Hence, this fitted HHI measure covers both public and private firms and it is available for all industries.

In order to test the robustness of my findings to alternative industry concentration definition, I calculate firm-level concentration index (*CONC*) by using fitted HHIs and create *Concentrated* dummy variable, as previously defined, that equals one if the firm-level concentration index (*CONC*) based on fitted HHIs is above the annual median. Table 6 presents the results of baseline model (Eq. (1)) both with excess market to sales and excess market to book as dependent variables.

Table 5
Controlling for self-selection
This table presents the results of firm-fixed effect regressions. This alternative specification includes only observations from 951 firms that report a change in the number of segments during the sample period of 1990–2006. Panel A replicates the baseline regression (Table 2) and Panel B replicates the competitive shock test (Table 3) for excess market to sales values. *Multi* is a dummy variable that equals one if the firm has more than one segment. *Concen-trated* is a dummy variable that equals one if the firm level concentration index (*Conc*) is above the annual median. Industry concentration index, *Conc*, is the weighted average of the HHIs of different industries in which the firm operates, using segment sales over total firm sales as relative weights. HHI is computed as the sum of squared market shares in a given industry. Industry definitions are based on the narrowest SIC grouping that includes at least five single segment firms. *Cut* equals one if a firm owns a segment that experiences a com-petitive shock in that year, and zero otherwise. Standard errors that are clustered at the firm level are reported in parentheses. Significance at the 1%, 5%, and 10% level is represented by ***, **, and *, respectively.

Panel A: Main results		Panel B: Import tariff shock	
Dependent variable:	Excess market to sale (1)	Dependent variable:	Excess market to sale (1)
Multi	-0.100***	Multi	-0.139***
	(0.014)		(0.028)
Multi x Concentrated	0.056**	Cut	-0.032
	(0.026)		(0.033)
Concentrated	-0.014	Concentrated	0.011
	(0.019)		(0.028)
Log of assets	-0.002	Multi x Cut	0.087**
	(0.009)		(0.044)
Capex/sales	0.354***	Multi x Cut x Concentrated	-0.130**
	(0.039)		(0.059)
EBIT/sales	0.280***	Multi x Concentrated	0.072**
	(0.038)		(0.037)
Constant	-0.071	Cut x Concentrated	0
	(0.049)		(0.045)
Firm F.E.	Yes	Log of assets	0.059***
Year F.E.	Yes		(0.017)
N	7702	Capex/sales	1.169***
$_R2$	0.568		(0.164)
		EBIT/sales	0.459***
			(0.066)
		Constant	-0.319***
			(0.088)
		Firm F.E.	Yes
		Year F.E.	Yes
		N	3848
		$_R2$	0.599

As is shown, the results become stronger when I use fitted HHI measure and include the impact of private firms in product market competition. In column 1, the coefficient on (*Multi* × *Concentrated*) becomes 0.058 and it is statistically significant at the 1% level, suggesting that concentrated conglomerates have 5.8% higher excess values. In column 2, where the dependent variable is excess market to book, the coefficient on the interaction term becomes 0.040 and it is again statistically significant at the 1% level. These results are consistent with the previous findings showing that conglomerate firms that operate mainly in concentrated industries have higher diversification values.[8]

6. Conclusion

In this paper, instead of focusing on the mean value of diversification, I study the cross-sectional variation in the value of diversification and explore its relation with the degree of industry concen-tration. In particular, I provide evidence that conglomerates that operate mainly in concentrated industries have higher diversification values. This result is robust to the use of different econometric model that controls for self-selection of the diversification decision. The results are also robust to the use of alternative industry concentration definition which captures the effect of both public and private firms in product markets (Hoberg and Phillips, 2010).

Using tariff rate reductions as exogenous competitive shocks, the paper shows that concentrated conglomerates experience significant decline in their valuations when their segments are hit by competitive shocks. Furthermore, concentrated conglomerates try to defend their market positions in less-competitive industries by allocating larger portion of their total investment to the threatened segments and they increase their sales growth and investment growth in these industries in response to competitive shocks. These findings suggest that concentrated conglomerates enjoy higher valuations in less-competitive industries, and they commit to tougher investment strategies in case of competitive threats to their less-competitive industries.

[8] I obtain similar results when I use industry and year fixed effects.

Table 6
Alternative measure of industry concentration
This table presents the results of the baseline regression (Table 2) where Compustat HHIs are replaced by fitted HHIs based on both public and private firms (Hoberg and Phillips, 2010). *Multi* is a dummy variable that equals one if the firm has more than one segment. *Concentrated* is a dummy variable that equals one if the firm level concentration index (*Conc*) based on fitted HHIs is above the annual median. Industry concentration index, *Conc*, is the weighted average of the fitted HHIs of different industries in which the firm operates, using segment sales over total firm sales as relative weights. The sample period is from 1990 to 2006. Standard errors that are clustered at the firm level are reported in parentheses. Significance at the 1%, 5%, and 10% level is represented by ***, **, and *, respectively.

Dependent variable:	Excess market to sale (1)	Excess market to book (2)
Multi	-0.199***	-0.081***
	(0.014)	(0.012)
Multi × Concentrated	0.058***	0.040***
	(0.019)	(0.015)
Concentrated	-0.027***	-0.007
	(0.007)	(0.005)
Log of assets	0.086***	0.018***
	(0.002)	(0.002)
Capex/sales	0.326***	0.052***
	(0.013)	(0.010)
EBIT/sales	0.081***	0.269***
	(0.011)	(0.009)
Constant	-0.470***	-0.089***
	(0.011)	(0.009)
N	40,993	39,197
$_R2$	0.073	0.032

Author statement

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Data will be made available on request.

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