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When the Fog Subsides: Strategic Reallocation in Indian Business Groups Amid Uncertainty Transition

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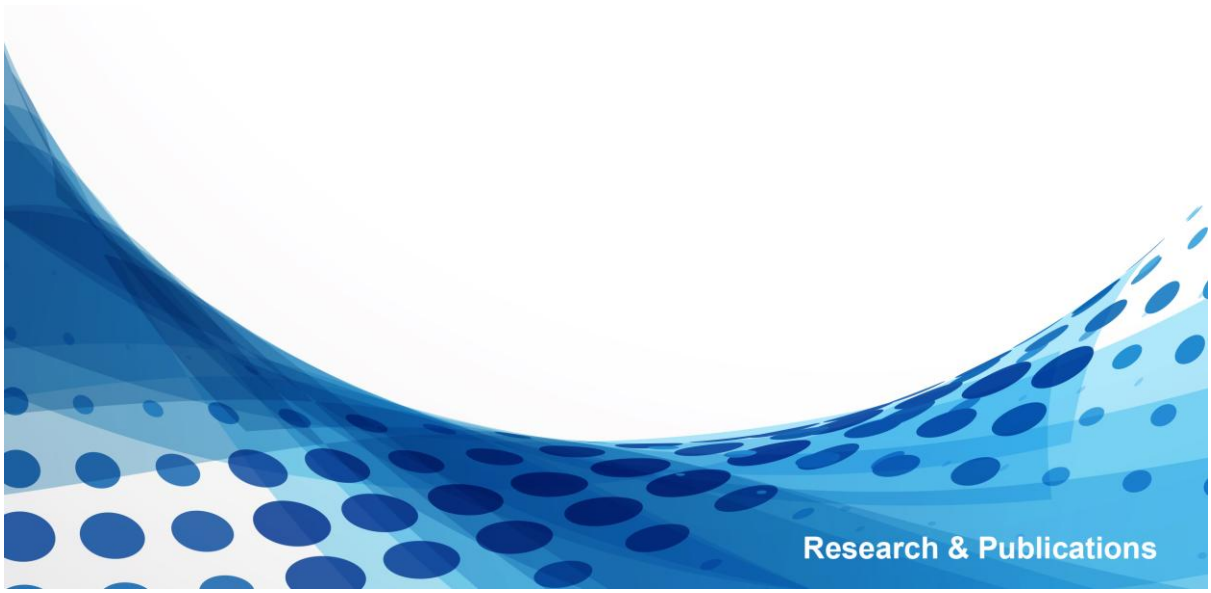

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When the Fog Subsides: Strategic Reallocation in Indian Business Groups Amid Uncertainty Transition[1]

Working Paper

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[1] The working paper is a term paper submission for the Empirical Methods in Corporate Finance course offered by Prof. Balagopal Gopalakrishnan in Term 6 at the Indian Institute of Management Ahmedabad

Abstract

The paper investigates the strategic reallocation of resources by business group (BG) affiliated firms during times of reduced uncertainty and decreased institutional voids in emerging markets. Using a Triple Difference in Difference (DiD) method, aggregated product-level panel data, and significant policy changes in 2015 in India, we examine the response of BG-affiliated firms along historical, sectoral, and regulatory embeddedness to institutional voids. We find that BG-affiliated firms with exposure to past uncertainty and operating in sectors dependent on stable institutions reduce diversification more than their counterparts. In contrast, BG-affiliated firms embedded in regulations increase diversification more than their counterparts, viewing the reduction of uncertainty as an opportunity to secure a diversified portfolio through well-defined rules of control. The findings of the study substantially contribute to finance literature on two fronts. First, we demonstrate how uncertainty reduction through institutional transitions reshapes the role of internal markets, and second, we extend institutional theory by identifying multiple dimensions of firm embeddedness that amplify heterogenous strategic responses of BG-affiliated firms in light of institutional clarity.

Keywords: Institutional Voids, Emerging Markets, Diversification, Uncertainty, Business Groups

When the Fog Subsides: Strategic Reallocation in Indian Business Groups Amid Uncertainty Transition

Business Groups (BG) are the dominant organizational form in emerging markets to fill institutional voids (Khanna & Palepu, 1999; Palepu & Khanna, 1998). Further, BGs are touted to fill the existing institutional voids by serving as providers of internal capital markets for capital, talent, and risk mitigation (Khanna & Palepu, 2000a), especially in the context of India. Further, India has gone through substantial changes towards reducing institutional uncertainty over the last decade with multiple policy changes, such as the implementation of the Companies Act (2013) in 2015, Make in India (2014), and the Insolvency and Bankruptcy Code (2016). While extant literature has predominantly analyzed BG-affiliated firms from the purview of organizational response to institutional voids (Khanna & Palepu, 2000a), less has been mentioned on the response of BGs during a reduction of uncertainty in lieu of the deemed reduction in institutional voids. In this paper, we causally examine the responses of BG-affiliated firms in light of reducing uncertainty in an emerging market context. Furthermore, we quantitatively demonstrate whether BG-affiliated firms respond heterogeneously to historical, geographical, and sectoral embeddedness to institutional voids.

Anecdotal evidence suggests that a sharp decline in institutional uncertainty was already on the cards during 2015 from analyzing multiple indicators. First, market-based indicators such as the NIFTY Volatility Index (India Vix) decreased by more than 50% from circa 37.71 on 9th May 2014 to circa 14.26 on 1st January 2016, indicating the market reflection of uncertainty being on the downhill (Google Finance & NSE, 2025). Second, from a policy transparency perspective, the government of India announced the amendment and implementation of the Companies Act (2013) in 2015 (Ministry of Corporate Affairs, 2015). Further, the Insolvency and Bankruptcy Code (2016), also known as IBC, was tabled in the Indian Parliament in late 2015 before it was passed by both houses in 2016 (IBBI, n.d.),

indicating support for reducing uncertainty and strengthening the institutions. Furthermore, the government announced sectoral-level commitments highlighting institutional support, such as Make in India (late 2014) and Digital India (2015), focused on institutionally embedded sectors such as manufacturing. Third, from a global perspective, uncertainty, and institutional voids, to a large extent, are captured in the ease of doing business score. The ease of doing business rank jumped from 142 in 2014 to 63 in 2019, demonstrating a substantial improvement in institutional certainty for India (World Bank & Ministry of Commerce and Industry, n.d.). Finally, the economic policy uncertainty (EPU) data also indicates a drop in institutional uncertainty in India during 2015 compared to the prior years (Baker et al., n.d., 2016). Furthermore, on average, it can be observed that the value of the EPU index was lower from 2015 to 2020 than from 2010 to 2014, as indicated in **Figure *1***.

The reduction in institutional voids is linked to uncertainty for various reasons. First, institutional voids increase ambiguity in access to capital, regulatory enforcement, and policy stability (Khanna & Palepu, 2000b, 2000a). Second, weak institutions entail high information costs and external transaction costs, therefore elevating environmental uncertainty (Coase, 1993; North, 1986). While BG-affiliated firms solve this conundrum through internal capital markets, the burden of financial and strategic repositioning after the filling of voids falls more on the BG-affiliated firms to improve their organizational performance through strategic realignment post-reduction in uncertainty. However, various forms of embeddedness affect the ex-post responses of firms based on the incumbent firms' institutional embeddedness. For example, BG-affiliated firms with exposure to historical institutional changes can learn from past experience and respond differently than their inexperienced counterparts. Similarly, firms with exposure in institutionally embedded sectors or geographically exposed to certainty signaling might respond heterogeneously than their counterparts who are not exposed to such settings.

In order to examine the phenomenon causally, we opt for aggregated product-level panel data of Indian firms (more information is provided in the data and methods section). We measure the diversification through three measures: Shannon Entropy, Hirschman-Herfindhal Index, and Maximum contribution of the product to sales by value in that firm-fiscal year combination. Furthermore, a flurry of regulatory changes happened from late 2014 to early 2016. The year 2015 saw the most reduction in uncertainty from the lens of regulatory enforcement, institutional support for firms, and increased attention to the business environment in India. Therefore, we consider 2016 to be the first year of treatment, allowing for a lagged effect of assimilation of information and reflection of the changes in the annual firm financials. The study has several findings and implications for the literature on diversification discounts, business groups, and institutional voids.

First, through the DiD analysis, we find that BG-affiliated firms concentrate more than the standalone firms post-reduction in institutional uncertainty. In the window of five years(before 2016 and after 2016), our analysis estimates that, on average, BG-affiliated firms concentrate more than standalone firms by 0.095 units (roughly 25% with respect to the mean value of the sample). While we arrive at the diversification estimates using a causal setting, our findings align directionally with extant literature on the larger theorization of BG-affiliated firms and uncertainty reduction (Gopal et al., 2021).

Second, we find that BG-affiliated firms incorporated pre-1991 (historically embedded in institutional changes) concentrated 0.095 (circa 36% with respect to mean) units more than the firms incorporated post-1991 in the light of uncertainty reduction. The findings indicate that past experience of being exposed or embedded during times of uncertainty reduction possibly helps incumbent firms formulate higher capital reallocation in the internal markets, incorporate previously learned organizational routines, sense the changes in

institution voids better through experience, and reconfigure according to the requirement of the changes in the uncertainty.

Third, we find that BG-affiliated firms in the manufacturing sector reduced diversification by 0.122 (circa 46% with respect to mean) units relative to firms in other sectors. Our findings point towards the push towards reduced institutional uncertainty from the government through announcements of sectoral support such as Make in India and Digital India. Additionally, the findings indicate that standard processes of manufacturing firms might aid in capital allocation efficiency. More so for BGs, indicating the benefits of structural reallocation and internal coordination within BGs in process-intensive sectors.

Finally, we find that some firms in regulated industries demonstrate different behavior than their unregulated counterparts. BG-affiliated firms in regulated industries, in fact, increased diversification by 0.071, thereby bringing down the net effect to a nominal 5% (approximately) change in diversification units compared to their counterparts. Our findings highlight that BG-affiliated firms in regulated industries view institutional clarity as an opportunity to diversify along with their access to substantial relational capital. While BGs are built to have self-sustainable internal capital markets and extensive resources, these firms in regulated industries might diversify to gain access to insured projects in times of increased institutional clarity and, therefore, demonstrate different behavior than their unregulated counterparts.

Further, we present the possible mechanism that BG-affiliated firms can adopt in such scenarios. We analyze the heterogeneity in income and expense of Related Party Transactions (RPT) with respect to 2016. BGs are strong on RPTs due to their internal market structure; therefore, changes in capital reallocation must ideally be reflected in the RPTs as well (Kushwaha et al., 2024). We find that BG-affiliated firms have increased entropy of RPTs (for

both income and expenditure), indicating that they substitute product diversification with more distributed internal capital flows. These findings indicate that BG-affiliated firms do not dissolve the BG structure after reducing uncertainty but possibly focus on supporting priority areas, keeping the structure of BGs intact while reducing diversification. The above finding reaffirms that BGs can have an efficient internal support mechanism in light of institutional changes.

We further augment our results with heterogeneity analysis to explain the nature of the reduced diversification of BG-affiliated firms post-uncertainty reduction under different scenarios. We analyze the differences in capital reallocation in BG-affiliated firms registered in states that have the same ruling political party as the central government (as of 2016), often labeled as "double engine government," and firms registered in Gujarat. This state saw its Chief Minister become India's Prime Minister in 2014, and hence, we use the above two scenarios to test the strength of signaling due to ex-ante exposure of BGs to certainty signaling in those states. We do not find a significant difference in diversification between BG-affiliated firms in both of the above scenarios. However, we find that firms registered in "double engine" states exhibit an increased level of concentration as opposed to their counterparts registered in non "double engine" states.

We also perform robustness tests to support our main findings. First, we use two alternate measures of diversification in the form of the maximum sales contribution of a single product and the Hirschman-Hefindhal Index (HHI). Second, while we consider all the private firms present in the data sources for analysis, we still perform entropy balancing to ensure that selection bias is addressed and covariates are balanced. Finally, we perform a placebo test in the pre-uncertainty reduction period by introducing an alternative intervention in 2013 before the actual treatment in 2016. The results indicate that there is no significant

difference between the capital reallocation of BG-affiliated firms and standalone firms in that timeline.

Overall, we demonstrate that BG-affiliated firms opt for a reduction in diversification (or capital reallocation) post-reduction in institutional voids using a DiD framework. Our analysis highlights the heterogeneity of responses of BGs exposed to different types of embeddedness in institutional settings. We also demonstrate the mechanism through which BG-affiliated firms opt for capital reallocation while keeping the BG organization structure intact and relevant even during times of lesser institutional voids and reduced uncertainty.

Our research contributes to mainstream finance and strategy literature on multiple fronts. First, our study provides a robust identification strategy to evaluate the impact of the reduction of institutional voids and uncertainties on BG-affiliated firms in a causal setting. Second, we open a new avenue of research in BG literature by bringing out the nuances of heterogeneity in capital reallocation in events of different institutional exposure in emerging markets. We also demonstrate that BG-affiliated firms in regulated and unregulated industries do not perceive institutional changes similarly while formulating product market strategies. Third, while Khanna and Palepu (2000) provided arguments linking the necessity of BGs in emerging markets during institutional voids, we evaluate BGs 2 decades later to find that BG-affiliated firms organize themselves to keep the structure intact through reconfiguring RPTs and cash flows to obtain benefits of the organization structure even when the voids are filled to a certain extent.

The paper proceeds in the following manner. In the next section, we provide the conceptual background and formulate the hypotheses of our research. Further, we delve into explaining the data and methodology, followed by the results, robustness tests, heterogeneity

analysis, and key findings. Finally, we conclude the study by analyzing the implications of the findings.

2. Conceptual Background and Hypotheses

2.1 Institutional Voids and Business Groups

Institutions are the backbone of an economy. Institutions are regularities where people interact repeatedly and provide frameworks for people to have certain confidence regarding the determination of outcomes (North, 1986). The institution-based theoretical perspective focuses on explaining the performance of firms in light of the influence of formal and informal institutions (Kim et al., 2010). In the context of emerging markets, firms are exposed to uncertainty due to a lack of robust, formal institutional foundations. Firms from such environments are often plagued by inconsistent enforcement of contracts, underdeveloped financial systems, and volatile regulations (Milliken, 1987; North, 1986), therefore strategically adapting differently than their counterparts operating in developed economies (substitute for developed institutions). In the face of such "institutional voids" (Khanna & Palepu, 2000b; Palepu & Khanna, 1998), firms respond in multiple ways. First, firms in emerging markets develop organizational structures and routines to maneuver the uncertainty (Scott, 2008). Second, firms look to create institutional substitutes, such as internal capital markets, labor markets, or cross-affiliation coordination mechanisms, to replicate the functions of defunct institutions (Khanna & Palepu, 2000a). The organizational substitutes are often manifested in the form of business groups (BGs), with a network of firms being created with a holding structure, described by Williamson as "H-forms" or "M-forms" (Williamson, 1975).

Extant research in BG literature on diversification has been analyzed from multiple lenses, such as internationalization (Kumar et al., 2012), institutional voids (Khanna &

Palepu, 2000b), unrelated expansion of product portfolio (Gopal et al., 2021), international diversification (Gaur & Kumar, 2009), corporate social responsibility (Choi et al., 2018) and firm performance (Khanna & Palepu, 2000a). BG-affiliated firms are characterized by unique privileges such as preferential access to idiosyncratic knowledge, experience, and resources through interlocks, interdependencies, and interconnectedness (Manikandan & Ramachandran, 2015) which help them combat institutional uncertainty in emerging markets. However, there is a downside cost to BG affiliation as well. Firstly, BG-affiliated firms have to invest in safeguarding the implicit and explicit agreements between the affiliate firms since institutions are not developed to contain agency costs. Secondly, BGs need extensive monitoring and governance to curtail firms from moving towards opportunistic behaviors, such as catering to influential stakeholders (Khanna & Palepu, 2000b). Therefore, while the dominant narrative is BG affiliation in emerging markets, some firms choose not to opt for the same when the costs overshoot the benefits.

While BG-affiliation is a widespread strategic adaption in the events of institutional voids and uncertainty, diversification is a third mode of organizational response. In uncertain environments, diversification is often viewed to be sustainable and profitable for BG-affiliated firms (Chang & Hong, 2002; Kumar et al., 2012). The dominant narrative in literature follows Khanna and Palepu's (2000) view that diversification helps firms hedge themselves during turbulent, uncertain times, especially in emerging market scenarios. However, diversification entails organization costs from the perspectives of both administrative and cognitive capacities. First, diversification increases costs related to managerial attention since they have to spend more time to understand and respond coherently (Gopal et al., 2021; Prahalad & Bettis, 1986). Second, diversification requires internal compatibility and capital reallocation from the incumbent firms (Markides,1995). While extant literature has analyzed diversification from pro-market reforms to find a

negative relationship (Gopal et al., 2021), we also align with the dominant view due to the aforementioned reasons. Therefore, in the first hypothesis, we posit that:

Hypothesis 1. *BG-affiliated firms reduce diversification more than their standalone counterparts post-reduction in institutional voids and uncertainty.*

2.2 Impact of Past Experience of Institutional Change and Uncertainty

Past experience, in general, enables firms in multiple ways. Firstly, past experience helps firms respond in a well-thought-through manner with the help of organizational routines that are derived from previous experience. Secondly, specifically in the context of BG-affiliated firms, they are known to accumulate learnings from peer companies and their subsidiaries (Colli & Colpan, 2016). Third, the interlinkages in BG setup act as an impetus for the firms to exchange learnings through the regulation of capital flows and resources, especially during institutional changes. Finally, BG-affiliated firms in emerging markets also complement their learnings from market indicators and their external partners, such as unaffiliated suppliers and customers.

Based on the above thesis, we posit that BG-affiliated firms with past exposure to such institutional changes are well aware of the advantages, disadvantages, and market setup. Therefore, such learnings can enable BG-affiliated firms to react more intensely than inexperienced firms to reallocate capital efficiently, exploit the opportunity, and adjust themselves to the changing uncertainty equilibrium in similar future scenarios. Therefore, we posit:

Hypothesis 2. *BG-affiliated firms with experience in witnessing drastic institutional changes reduce diversification more than their inexperienced counterparts post-reduction in institutional voids and uncertainty.*

2.3 Impact of Institutional Uncertainty on Manufacturing

Material processing operations characterize the manufacturing sector compared to the service counterparts (Morris & Johnston, 1987). Since product standardization is a common feature of this sector, firms operating in this sector opt to utilize technology and automation (Brownell & Merchant, 1990) to meet their targets and enhance the efficiency of operations. Further, BG-affiliated firms in such sectors can share the technologies from the perspective of innovation, specialization, communalization, and exploitation (Sköld & Karlsson, 2012). Therefore, reconfiguring the product portfolio is more feasible for BG-affiliated firms in this sector.

Furthermore, manufacturing firms are capital-intensive and are more reliant on institutional setups around them. Therefore, when the institutional uncertainty is high, BG-affiliated firms need to rely more on the internal capital market to access capital in order to exploit the economies of scope and reduce their risk. Once the uncertainty decreases and institutions improve, the transaction costs decline, enabling them to arbitrage more from economies of scope. Therefore, BG-affiliated firms in this sector rationalize their product portfolio much more intensely than their counterparts in other sectors to facilitate the reduction in cost structures and shift towards economies of scale of profitable products. Further, BG-affiliated firms are motivated to respond more strongly than their standalone firms in this sector because BG-affiliated firms have a higher incentive to cut cost structures and move to external markets from both technology and capital perspectives after uncertainty reduction. Therefore, we posit that:

Hypothesis 3. *BG-affiliated firms in the manufacturing sector reduce diversification more than their counterparts in other sectors post-reduction in institutional voids and uncertainty*

2.4 Impact of Institutional Uncertainty on Regulated Sectors

Institutional changes affect some sectors more than others. Firms in regulated sectors are often characterized by government oversight and control across various dimensions, such as sales, access to raw materials, and managerial administration (Awasthi et al., 2019). They are expected to align with many restrictions pertaining to trade, tariff barriers, and foreign investments, to name a few (Awasthi et al., 2019). Therefore, BG-affiliated firms in such industries cannot freely utilize internal capital as that of their unregulated counterparts. Since such firms have increased intervention from the government, they can be expected to be more risk-averse than their unregulated counterparts for multiple reasons. First, intervention from the government in strategic affairs is a requirement for such firms to meet noneconomic and economic goals (Benito et al., 2016). Second, in conditions of declining uncertainty in the environment, disassociating from economies of scope to move into economies of scale among the profitable product mix might be challenging to justify in the realm of noneconomic goals.

In contrast, BG-affiliated firms in such sectors have advantages in moving to economies of scope once uncertainty clears. The increase in clarity of the environment allows a clear definition of control from administrative purview, more precise enforcement of laws and regulations, and access to guaranteed projects with their relational capital and previous experience of operating in the regulated sector. Since firms in regulated sectors have a need to meet noneconomic goals and cannot afford to make decisions solely on economic terms like their unregulated counterparts, we posit that:

Hypothesis 4. *BG-affiliated firms in the regulated sector increase diversification more than their counterparts in other sectors post-reduction in institutional voids and uncertainty*

3. Methodology and Data

3.1 DiD Analysis and Variables

We examine the effects of the reduction in institutional uncertainty in 2015 on diversification across BG-affiliated firms and unaffiliated firms in the Indian context. The generalized DiD framework allows us to arrive at a quasi-natural setting to make causal inferences (Card & Krueger, 1993) on whether BG-affiliated firms diversified differently than their standalone counterparts. Furthermore, the DiD setup provides us with opportunities to match the relevant covariates, control for confounders of the relationship, and effectively calculate the Average Treatment Effect of the Treated (ATT).

The timeline of the analysis is from the Indian fiscal years[2] (FY) 2010-2020. There are significant reasons why we rely on this time period. First, we start with 2010 to alleviate the impending influences of the global financial crisis of 2008 on the firm's strategy to diversify. Second, the impact of COVID-19 was observed on firm variables from the fiscal year 2021 onwards. Therefore, we restrict the timeline to 2020. Since we are interested in understanding the product market response through the diversification of BG-affiliated firms, we consider them to be the treated group, while the rest of the private standalone firms form the control group. We estimate the effect pertaining to the firms' past experience of withstanding uncertainty, belonging to the manufacturing sector and belonging to the regulated industries, using dummy encoded variables and interaction between them. In effect, we aim to unfold the diversification responses across the treatment and control groups before and after the reduction in uncertainty, along with three different dimensions of a firm's embeddedness in institutional uncertainty. Therefore, in line with previous work in the finance literature, we used a triple difference estimator to arrive at our findings (Mian & Sufi, 2011; Olden & Møen, 2022). The DiD estimation equations are given below. The first

[2] Indian fiscal year is different from the calendar year. FY starts from April 1 and ends on March 31 in the subsequent year.

Equation corresponds to the main regression estimates of BG-affiliated firms post-uncertainty reduction, and the second Equation corresponds to the triple difference framework.

$$Y_{it} = \beta_0 + \beta_1 Post_t + \beta_2 BG_i + \beta_4 (Post_t \text{ x } BG_i) + \theta X_{it-1} + \alpha_i + \gamma_{jt} + \varepsilon_{it} \quad (1)$$

$$Y_{it} = \beta_0 + \beta_1 Post_t + \beta_2 BG_i + \beta_3 Z_i + \beta_4 (Post_t \text{ x } BG_i) + \beta_5 (Post_t \text{ x } Z_i) + \beta_6 (BG_i \text{ x } Z_i) + \beta_7 (Post_t \text{ x } BG_i \text{ x } Z_i) + \theta X_{it-1} + \alpha_i + \gamma_{jt} + \varepsilon_{it} \quad (2)$$

where Y_{it} is the dependent variable, capturing the firm-level outcome at firm-year granularity. Y_{it} can take any one of the outcomes that are examined, namely, Shannon Entropy, the maximum contribution to sales by a single product, and the Hirschman Herfindahl Index (HHI). Shannon Entropy[3] is defined as the entropy of the distribution of product-wise sales by value for a firm-year (Gopal et al., 2021). The maximum contribution to sales by a single product is calculated as the percentage contribution of the maximum selling product by value to total sales in that fiscal year for every firm. Finally, the HHI is calculated as the square of the market share of the product by its sales value for every firm-fiscal year combination.

The dummy variable $Post_t$ takes a value of one for the years post reduction in uncertainty, i.e., 2016 onwards. The variable BG_i takes a value of one if the firm is a BG-affiliated firm. The term Z_i can take one of the three dummies of historical, sectoral, and regulatory exposure to institutions. The estimation for all three is done independently. For historical exposure to uncertainty, the variable Z_i takes the value of one if the firm was incorporated before 1991. For sectoral exposure, we code the variable Z_i as one if the firm's two-digit NIC code value lies between ten and thirty-four (both included). For regulatory exposure, we refer to the work by Awasthi et al. (2019) to classify industries as regulated and

[3] Shannon Entropy is calculated using the Python package Scipy and adding a small value of 1e-10 to account for correcting the logarithm of zero.

unregulated. The variable Z_i takes a value of one if the firm belongs to a regulated industry, else zero.

Further, we use a set of firm-level controls affecting the relationship, which are denoted by the vector X_{it-1} and lag the control variables by one fiscal year to mitigate reverse causality partially and to acknowledge that the decisions made by the firms in the current fiscal year are based on the outcomes of the previous fiscal year. First, we control for firm size, computed as the natural logarithm of total assets. Second, we control for firm age, which is computed as the difference between the current fiscal year and the year the firm was incorporated. Third, we control for the firm's leverage, operationalized as the ratio of debt to equity. Fourth, we control for the firm's return on assets, operationalized as the ratio of net income to total assets. Finally, we also control for the firm's internationalization experience with the export ratio, operationalized as the ratio of total exports to total sales.

Further, to test the mechanism, we replace the dependent variable with related party transactions (RPT_{it}) for a firm in a particular year in Equation (1). We estimate the baseline DiD to understand the mechanism of the diversification changes happening in BG-affiliated firms. We use two measures of RPTs – total income and total expenses. First, we aggregate the income and expenses of RPTs at the granularity of RPT type for that firm year. Then, we compute the diversification of RPTs using Shannon Entropy for the particular fiscal year for the focal firm.

In our DiD estimation, we use firm fixed effects α_i to mitigate all firm-level time-invariant heterogeneity. We further saturate the model with interactive *industry* x *time* fixed effects γ_{jt} for industry j at time t to control for industry and time-invariant effects. The estimations with interactive fixed effects help address concerns pertaining to time-variant unobserved characteristics of the firm (Gormley & Matsa, 2014). We also two-way cluster the

standard errors at the firm and fiscal year to ensure that our estimations are robust. In alternate specifications, we run our estimations with robust variance as well[4]. The DiD estimation is carried out over a ten-year window ranging from 2011 to 2020, with 2016 as the first treatment year.

Further, we carry out multiple robustness tests. First, we match covariates to ensure that the data is balanced and the selection bias is addressed. We carry out entropy balancing (Hainmueller, 2012) across all covariates using two methods of moments (mean and variance). We use BG_i as the treatment variable to balance the covariates. Second, we also re-estimate our results by balancing covariates with the traditional propensity score matching (Caliendo & Kopeinig, 2008) (PSM) and performing the DiD analysis. We use both the linear term and the quadratic term of the covariates to estimate the propensity scores to allow for multiple functional forms.

For the heterogeneity analysis of double-engine government, we hand-coded the data based on the information in popular business press[5]. We encode the double engine variable as one if there is a presence of the same government in the registered state of the firm as that of the central government after the 2016 assembly elections; otherwise, the variable takes the value of 0. Along similar lines, we encode the variable Gujarat as one if the firm is registered in Gujarat; otherwise, the variable takes a value of zero.

3.2 Data

3.2.1 Sample Description

The data for the study is obtained from the Prowess CMIE database (Kahraman & Tookes, 2017). Prowess CMIE provides product-level data for every firm annually. The

[4] The results of the calculation with robust variance will be made available upon request.
[5] We hand-coded data from the Times of India (indicated in **Table 1)**.
https://timesofindia.indiatimes.com/india/bjp-vs-congress-in-2014-2016/articleshow/52345623.cms

database also provides firms' annual financial statements. We obtain 2.3 million product-level data points from 1988 onwards from the database. Further, we apply multiple levels of filtering to arrive at our final sample. First, we remove records that have duplicated product-level data at a firm-year granularity. Second, we filter the records that have twelve months of data rather than cumulative records. Third, we remove the records that have missing or negative sales values at the product level. Fourth, we remove non-core products before calculating different measures of diversification. We use regular expressions to remove products that do not necessarily correspond to the offering by the firm but rather auxiliary sources of income[i]. Finally, we calculate the product diversification measures on the remaining 1.29 million product-level records by aggregating them to firm-year granularity.

Further, we obtain the standalone annual financial statements. In the annual financial statements data, we filter for records that have twelve months of data and remove duplicates, if any. Second, we merge the data from annual financial statements with the product data, leaving us with 516,383 firm-year records. Third, we filter for only Indian private sector firms and business groups to make our sample comparable for analysis. We use owner code 20101 for identifying Business Groups and 20102 for identifying private-sector Indian firms. Fourth, we include the above-mentioned firms from 2010 to 2020 for whom the values of dependent variable and lagged covariates are present at least twice pre-treatment and post-treatment. Finally, we arrived at a sample size of 135,786 firm-year records to proceed with the analysis. Finally, we winsorize the variables at the 1st and 99th percentile to ensure that the outlier effect is mitigated to a certain extent, and after removing missing values from all variables, we have a final sample size of 112,641.

The variables used in the study are mentioned in **Table 1**, along with the respective definitions. **Table 2** provides the summary statistics of the data. The summary statistics indicate that the average entropy of diversification is around 0.264 units, indicating that there

is concentration of sales across the sample over all time periods, also indicated by high values of HHI sales and maximum contribution of a single product towards sales for a firm (0.895 and 0.854 respectively). The other key finding from summary statistics suggests that the sample has 25% of BG-affiliated firms and 75% of standalone firms. Furthermore, from **Table *3***, we see that the alternate forms of dependent variables are all highly correlated, indicating that they capture similar explanations of diversification in different forms. Furthermore, we do not see high correlations between other covariates, indicating a lower chance of inflated multicollinearity concerns.

3.2.2 Univariate Trend Analysis

The trend analysis in the univariate chart clearly demonstrates that there was a change in FY 2016. The diversification of sales on entropy terms for BG-affiliated firms is observed to fall by more than 0.05 units (approximately) from FY 2015 - FY 2017, while for standalone firms, it has marginally decreased after going up, indicating that BG-affiliated firms indeed felt the effect of institutional uncertainty more. Similarly, we see a jump of more than 0.03 units (approximately) for BG-affiliated firms in HHI-sales and maximum contribution to sales by a single product, as opposed to a marginal change for Standalone firms from FY 2015- FY 2017. While these numbers do not reflect the change when controlling for other confounding factors, the graphs in **Figure 2** suggest that there is a clear difference between the response of BG-affiliated firms and standalone firms.

4. Baseline Findings and Discussion

4.1 Impact on BG-Affiliated Firms

The regression estimates of Equation (1) are in **Table 4**. Columns (1) – (4) present the results for the overall timeline, with the dependent variable being the entropy of product-level sales aggregated at a firm-year granularity. The estimated impact in all the columns is the

average treatment effect of the treated for five years pre-2016 and post-2016 (including 2016). All estimations control for firm fixed effects and *Industry* x *Fiscal Year* fixed effects with two-way clustering at the firm and fiscal year level. The results of **Table 4** for BG-Affiliated firms are in relation to the control group consisting of standalone firms. As indicated by the variable *Post* x *BG*, the BG-affiliated firms concentrate on average by 0.066 units more than the standalone firms post uncertainty reduction. In other words, BG-affiliated firms reduce diversification by approximately 25% (0.066/0.264) from the average entropy level in the sample, indicating a substantial shift in product concentration by BG-affiliated firms post-uncertainty reduction. Furthermore, we see that BG-affiliated firms with past experience of uncertainty concentrate more than their counterparts on average by 0.095 (0.04+0.055) units, as represented by the significant coefficient of *Post* x *BG* x *Learning* in Column (2). In Column (3), we see that firms embedded in sectors requiring more substantial institutional stability and clarity, such as manufacturing, increase concentration by approximately 46% from the average sample entropy indicated by the negative significant coefficient of *Post* x *BG* x *Mfg*. Finally, from column (4), we find that BG-affiliated firms in regulated industries have a different response to the ones observed in Column (1) – Column (3). We find that such firms increase product diversification on average by 0.071 units incrementally compared to their unregulated counterparts, bringing the net effect of concentration to approximately 5% with respect to the sample mean as indicated by the significant positive coefficient corresponding to *Post* x *BG* x *Regulated* in Column (4).

While we see an impact at the average level, we need to understand the validity of the estimates by verifying if the data had no effect of the pre-trend effect on the treatment. In other words, we use coefficient plots to demonstrate that our findings do not suffer from pre-treatment bias. From **Figure 3**, we find that the estimates of BG-affiliated firms are not significantly different from zero at the 95% confidence interval until 2016. Post -2015, we

find that the difference is significant for BG-affiliated firms, and the same is observed for triple interactions for the estimates provided in **Table 4**. The graphs here are plotted for the primary dependent variable, the Entropy of Sales (Shannon Entropy). We find that there is no significant deviation from the parallel trends for our estimates of the primary DiD difference equation. We see that a similar insignificant trend is observed for the triple difference estimation of BG-affiliated with past learning experience from facing significant pro-market reforms and a slight deviation in the opposite direction for BG-affiliated firms operating in the regulatory sector. Similarly, for BG-affiliated firms in the manufacturing sector, we see that there is a significant difference in the pre-trends before institutional uncertainty reduction from the zero line in the opposite direction.

4.2 Impact on RPTs

The estimates from **Table 5** correspond to the mechanism tests of RPT income and expenses. We evaluate the mechanism by which BG-affiliated firms aim to restructure their product portfolio by analyzing RPTs. We find that BG-affiliated firms diversify their RPTs post-reduction in uncertainty. The estimates from Column (1) in **Table 5** indicate that post-reduction in institutional uncertainty, BG-affiliated firms remain relevant and, owing to institutional clarity, engage more in transacting with BG structure to respond effectively to the market. The results in Column (2) and Column (5) are insignificant, while the estimate pertaining to HHI in Column (3)[6] is very close to being marginally significant, and (6) is marginally significant at 10% significance. The significant change in the RPT for entropy indicates that BG-affiliated firms reconfigure themselves to adjust to the market changes rather than dismantle the entire BG structure once the void is filled. The number of records

[6] The p-value of the Post x BG estimate in column (3) is close to 0.1 as per the results.

changes in comparison with baseline specifications because RPT data is not available for all firms in our dataset[ii].

4.3 Robustness Tests

We carry out a battery of robustness tests to check the validity of our estimates, as indicated in **Table 6** and **Table 7**. First, we carry out regression estimates against the alternate dependent variables of HHI sales and the maximum contribution of a single product to annual sales. The results are similar to those of the initial findings in **Table 4** in terms of directionality. Second, we perform covariate balancing using the entropy balancing technique at two methods of moments (mean and variance), indicated in Columns (1)-(4) in **Table 7**. The results of the DiD hold and estimates are in the same direction as that of the baseline estimates. The result from Column (1) indicates that the reduction in diversification of BG-affiliated firms is 0.065 as compared to their counterparts, and it is close to the estimate of 0.066 from the baseline results. Post-balancing, the estimates of BF-affiliated firms in the manufacturing sector post-uncertainty reduction indicate that such firms reduce diversification by 0.085 units as opposed to the initial 0.1 units in the unbalanced setup. However, the direction remains the same and reflects the findings obtained in the baseline results. Third, we carry out a one-on-one propensity score matching (PSM) with no replacement based on the year 2015 and scale the weights to the respective firms in the data. The results from PSM DiD are in Columns (5) - (8) in **Table 7**. These results also reinforce the baseline relationship with estimates being in the same direction. The strength of the support slightly changes; however, it continues to reinforce the findings in our baseline analysis.

4.4 Heterogeneity Analysis

Finally, we carry out two sets of heterogeneity analyses to see if BG-affiliated firms perceived proximity to institutional signaling clarity to act on changing their product portfolio. **Table *8*** provides estimates for the analysis of heterogeneity in balanced data since unbalanced data have inherently significant differences in the number of registered firms across states. We find that firms registered in Gujarat exhibit no significant differences when determining their product portfolio. However, we find significant results for firms registered in states with double-engine governments (where the ruling party in the central government and the ruling party of the state governments are the same as in 2016). The results from **Table 8** indicate that, on average, all firms registered in double-engine governments concentrate more than firms registered outside these states. In contrast, BG-affiliated firms perhaps respond to more concrete policy-level changes rather than relying on signaling.

5. Conclusion

In this study, we examine the effect of uncertainty transition on BG-affiliated firms in the Indian context. Notably, we estimate the differential impact of increased institution strength on a firm's product market strategy. We also bring out the nuances of how BG-affiliated firms are embedded in different institutional contexts, such as historical embeddedness with learning from past experience, sectoral embeddedness in relatively high institutional reliance sectors like manufacturing, and regulatory embeddedness respond differently to changes in institutional uncertainty in emerging markets like India. Further, we also demonstrate the mechanism of how BG-affiliated firms adapt to keeping their group structure diversified in the wake of growing certainty through RPTs. Finally, we investigate and find that BG-affiliated firms do not respond to political signals of certainty from the perspective of product market decisions, reinforcing that BG-affiliated firms rely on more concrete market and institution-based signals in the light of increased institutional certainty.

We employ aggregated panel data for Indian firms to estimate the impact of uncertainty reduction.

Our findings are as follows. First, we find that BG-affiliated firms reduce their diversification once uncertainty is reduced in the external environment. The findings align directionally with the work by Gopal et al.(2021), indicating that our causal estimates are not spurious. Second, we find that BG-affiliated firms that faced pro-market reforms in 1991 concentrated much more than their inexperienced counterparts. The findings suggest that the experience of going through a pro-market reform helps such BG-affiliated firms strengthen their responses, learn effectively from peers, and recalibrate their portfolios more than their inexperienced counterparts. Third, we find that BG-affiliated firms dependent on institutional support, such as the manufacturing sector, rationalized their product portfolio potentially due to the commitment by the Government of India through Make in India (2014) and the reduction in uncertainty that followed around the same period. Finally, we find that BG-affiliated firms that are under increased control of the government through regulations view institutional certainty as an opportunity to reinvest in multiple sectors owing to explicit definitions of rules, regulations, and norms once the uncertainty fog clears.

Finally, while the study is robustly designed, it can be extended along different dimensions. First, one can extend the study to a qualitative dimension to gain a deeper understanding of why BG-affiliated firms in regulated industries respond to product markets entirely in an opposite manner than unregulated industries. Second, future researchers can look at other dimensions of ownership, resources, and capabilities to understand how BG-affiliated firms continue to strategize with more intent than standalone counterparts during institutional transitions, even with their interdependent group structures.

Our findings are not limited to academic literature but have increased relevance to practitioners and policymakers. First, our findings align with the dominant view and provide suggestions that diversification might not be the best strategy for unregulated BG-affiliated firms in emerging markets like India. However, on the contrary, BG-affiliated firms in the regulated sector can continue to receive merit by pursuing diversification, indicating that business leaders cannot opt for a blanket solution when it comes to product market response. Second, leaders need to respond by noting that BG-affiliated firms undergo stronger "imprinting" (Marquis & Tilcsik, 2013) of their past learning experience than their counterparts, possibly because of their group structure, increased access to information, and relational capital. Third, BG-affiliated firms continue to rely on internal capital markets through RPTs, indicating that such firms manage liquidity and investment priorities within the group structure, especially during transitions. Therefore, leaders and policymakers can infer that group structures are here to stay for the long term and strategize their responses accordingly.

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Figure 1

The image gives the month-wise EPU scores for India from the calendar year 2010-2020. We can observe a clear declining trend in uncertainty from 2012-2015. Further, the average value of uncertainty post-2015 can be found to be lesser than the period before 2015.

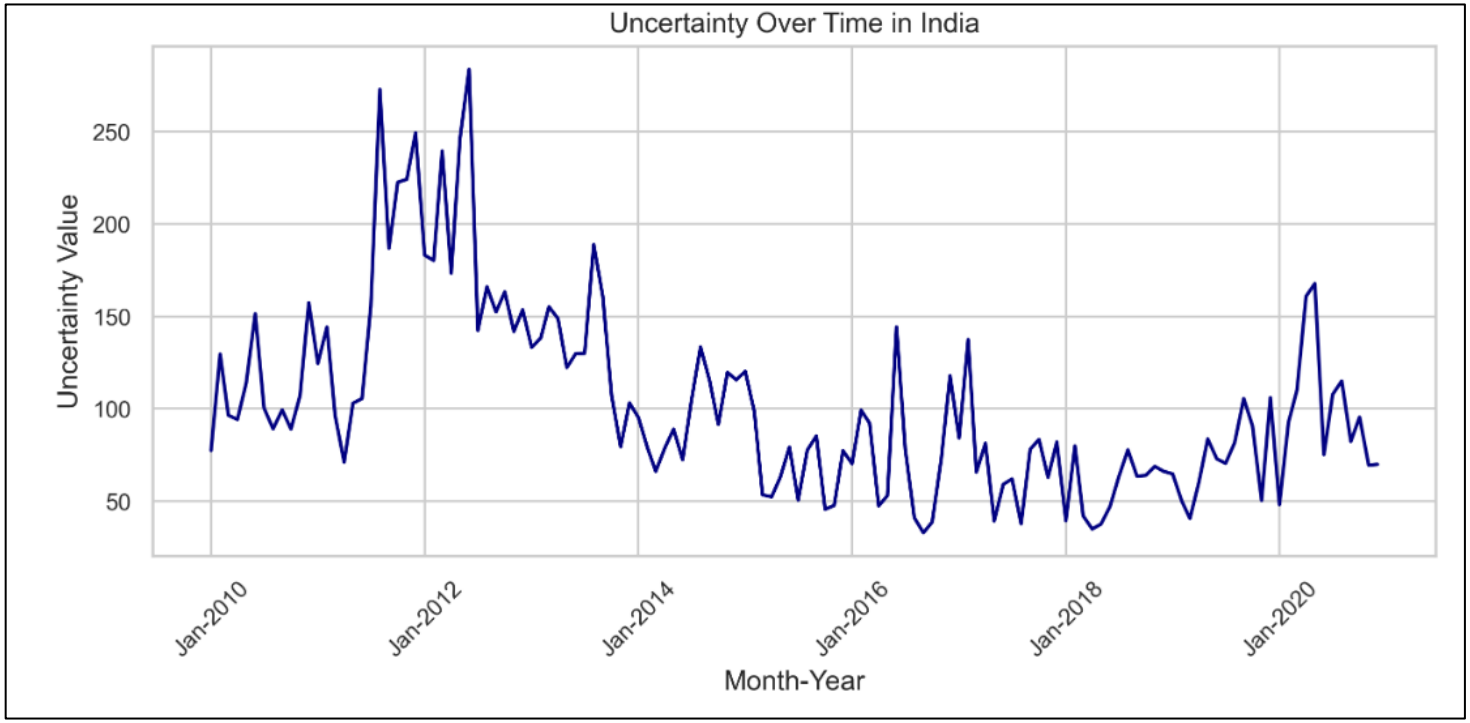


Table 1

Variable definitions and data sources

Variable	Definition and Construction	Data Source
Entropy-Sales	Computed as the Shannon entropy of product level sales per firm per fiscal year (FY) plus a small value of 1e-10 to account for a logarithm of zero	Prowessdx CMIE
Post	A dummy variable taking the value zero for years with increased uncertainty, that is, preceding FY 2016 and 1 in years following the reduction in uncertainty (otherwise)	India Vix - NSE
BG	A dummy variable taking the value 1 for firms belonging to the owner code of 20101 and zero otherwise	Prowessdx CMIE
Max-Sales	Computed as the maximum value of percentage of sales contributed by a single product per firm per FY	Prowessdx CMIE
HHI-Sales	Computed as the square of the sum of market shares of product-wise contribution to sales per firm per FY	Prowessdx CMIE
Firm Size	Computed as the natural logarithm of total assets per firm per FY	Prowessdx CMIE
Firm Age	Computed as the difference between the current FY and the incorporated year of the firm	Prowessdx CMIE
ROA	Computed as the ratio of profits before depreciation, interest, tax, and amortization to total assets of the firm per FY	Prowessdx CMIE
Leverage	Computed as the ratio of debt to equity per firm per FY, as obtained from the database	Prowessdx CMIE
Exports	Computed as the percentage of exports to total sales per firm per FY	Prowessdx CMIE
Entropy-RPT Income	Computed as the Shannon entropy of RPT income - first aggregated to type per firm per fiscal year (FY) plus a small value of 1e-10 to account for a logarithm of zero	Prowessdx CMIE
Max-RPT Income	Computed as the maximum value of percentage of RPT income - first aggregated to RPT type and then aggregated per firm per year	Prowessdx CMIE
HHI-RPT Income	Computed as the square of the sum of shares of RPT income - first aggregated to RPT type and then aggregated per firm per FY	Prowessdx CMIE
Entropy-RPT Expense	Computed as the Shannon entropy of RPT expense -first aggregated to type and then per firm per fiscal year (FY) plus a small value of 1e-10 to account for the logarithm of zero	Prowessdx CMIE
Max-RPT Expense	Computed as the maximum value of percentage of expense - first aggregated to RPT type and then aggregated per firm per FY	Prowessdx CMIE

HHI-RPT Expense	Computed as the square of the sum of shares of RPT expense - first aggregated to RPT type and then aggregated per firm per FY	Prowessdx CMIE
Learning	A dummy variable taking the value 1 for firms incorporated before 1991 and 0 otherwise	Prowessdx CMIE
Manufacturing	A dummy variable taking the value 1 for firms who are classified under Section C, that is. 2 digit National Industry Code (NIC) from 10-33 (both included) and zero otherwise	National Industry Classification[7] (2008) Document - NCS Prowessdx CMIE
Regulated	A dummy variable taking the value 1 for firms who are classified as regulated as per classification by Awasthi et al. (2019) and zero otherwise	Awasthi et al. (2019) Prowessdx CMIE
Gujarat	A dummy variable taking the value 1 for firms registered in Gujarat and zero otherwise	Prowessdx CMIE
Double Engine	A dummy variable taking the value 1 for firms registered in states where the ruling party and central government were the same political party post-2016 assembly elections and zero otherwise	Times of India Prowessdx CMIE

[7] The NIC 2008 document was obtained from the following link: https://www.ncs.gov.in/Documents/NIC_Sector.pdf

Table 2

Summary Statistics

Variable	Observations	Mean	SD	Min	Max	P(10)	Median	P(90)
Entropy-Sales	112641	0.264	0.391	0.000	1.639	0.000	0.025	0.851
Max-Sales	112641	0.895	0.172	0.339	1.000	0.592	0.996	1.000
HHI-Sales	112641	0.854	0.216	0.238	1.000	0.499	0.993	1.000
BG	112641	0.252	0.434	0.000	1.000	0.000	0.000	1.000
Firm Size	112641	6.599	1.903	2.067	11.668	4.193	6.526	9.062
Firm Age	112641	22.547	16.284	2.000	91.000	7.000	20.000	40.000
ROA	112641	0.112	0.197	-5.111	23.983	0.011	0.101	0.220
Leverage	112641	1.468	2.790	0.000	19.816	0.000	0.619	3.326
Exports	112641	10.378	24.396	0.000	100.000	0.000	0.000	43.796
Entropy-RPT Income	57931	1.108	0.147	0.637	1.541	1.040	1.040	1.353
Max-RPT Income	57931	0.470	0.071	0.252	0.667	0.353	0.500	0.500
HHI-RPT Income	57931	0.356	0.051	0.227	0.556	0.271	0.375	0.375
Entropy-RPT Expense	88788	1.112	0.295	0.637	1.676	0.637	1.126	1.479
Max-RPT Expense	88788	0.477	0.124	0.256	0.667	0.305	0.480	0.667
HHI-RPT Expense	88788	0.372	0.109	0.204	0.556	0.248	0.356	0.556
Double Engine	112641	0.462	0.499	0.000	1.000	0.000	0.000	1.000
Gujarat	112641	0.098	0.297	0.000	1.000	0.000	0.000	0.000
Regulated	112641	0.220	0.414	0.000	1.000	0.000	0.000	1.000
Learning	112641	0.339	0.473	0.000	1.000	0.000	0.000	1.000
Mfg	112641	0.444	0.497	0.000	1.000	0.000	0.000	1.000

The control variables are lagged by one fiscal year. The P(x) refers to the xth percentile of the distribution.

Table 3

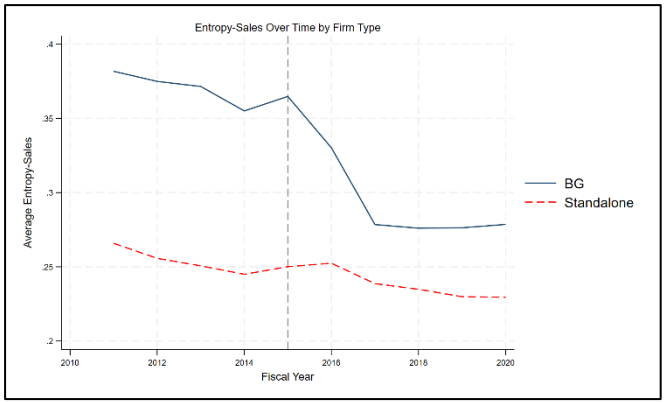
Correlation of main variables

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1) Entropy-Sales	1.000													
(2) Max-Sales	-0.966	1.000												
(3) HHI-Sales	-0.985	0.986	1.000											
(4) Firm Size	0.175	-0.147	-0.161	1.000										
(5) Firm Age	0.116	-0.100	-0.108	0.134	1.000									
(6) ROA	0.007	-0.004	-0.005	0.035	-0.018	1.000								
(7) Leverage	-0.005	0.005	0.005	0.058	-0.093	-0.064	1.000							
(8) Exports	0.014	-0.010	-0.010	0.066	-0.029	0.076	-0.070	1.000						
(9) Entropy-RPT Income	0.086	-0.073	-0.080	0.262	0.042	0.007	-0.016	0.018	1.000					
(10) Max-RPT Income	-0.075	0.064	0.070	-0.225	-0.041	-0.003	0.014	-0.014	-0.959	1.000				
(11) HHI-RPT Income	-0.080	0.068	0.075	-0.233	-0.039	-0.008	0.017	-0.022	-0.984	0.965	1.000			
(12) Entropy-RPT Expense	0.108	-0.088	-0.098	0.331	0.051	0.041	-0.008	0.027	0.300	-0.266	-0.285	1.000		
(13) Max-RPT Expense	-0.090	0.073	0.081	-0.287	-0.037	-0.035	0.002	-0.018	-0.271	0.242	0.258	-0.967	1.000	
(14) HHI-RPT Expense	-0.098	0.081	0.089	-0.307	-0.033	-0.036	0.000	-0.021	-0.273	0.242	0.263	-0.988	0.979	1.000

The table provides the correlation of continuous variables used in the study. The control variables are lagged by one fiscal year and winsorized at the 1st and 99th percentile. The dependent variable, entropy-sales, is observed to have a high correlation only with alternate dependent variables while having less correlation with other covariates used in the study. Similarly, a high correlation can be observed between alternate measures of RPT and their respective entropy measures.

Figure 2

Trend plots of the dependent variable and its alternate forms are plotted from FY 2010 to FY 2020. The blue line corresponds to BG, and the red dashed line corresponds to standalone firms. The vertical dotted line corresponds to 2015 and 2016 is the first treatment year



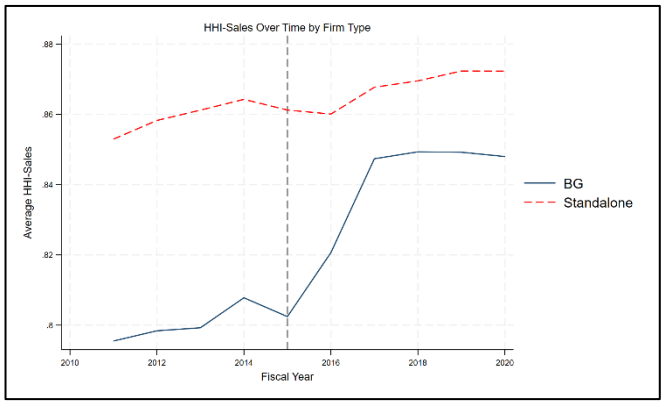


Table 4

Main Regression Results – Difference in Differences Framework

	(1) Entropy-Sales	(2) Entropy-Sales	(3) Entropy-Sales	(4) Entropy-Sales
Post x BG	-0.066***	-0.040***	-0.020*	-0.084***
	(0.009)	(0.008)	(0.008)	(0.011)
Firm Size	0.032***	0.031***	0.032***	0.032***
	(0.003)	(0.003)	(0.003)	(0.003)
Firm Age	-0.002	-0.005	-0.002	-0.002
	(0.004)	(0.004)	(0.004)	(0.004)
ROA	-0.002	-0.003	-0.002	-0.002
	(0.004)	(0.005)	(0.005)	(0.005)
Leverage	-0.000	-0.000	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Exports	0.000*	0.000*	0.000*	0.000*
	(0.000)	(0.000)	(0.000)	(0.000)
Post x BG x Learning		-0.055**		
		(0.016)		
Post x BG x Mfg			-0.102***	
			(0.016)	
Post x BG x Regulated				0.071***
				(0.013)
Intercept	0.116	0.174	0.117	0.118
	(0.101)	(0.100)	(0.100)	(0.101)
Adj R^2	0.6675	0.6680	0.6684	0.6678
Observations	112641.000	112641.000	112641.000	112641.000
Firm FE	Yes	Yes	Yes	Yes
Ind x Year FE	Yes	Yes	Yes	Yes

The dependent variable in the estimations of columns (1) - (4) is the Shannon entropy of product level sales aggregated to firm-year. The value of BG takes 1 if the firm is a BG-affiliated firm, and the value of post takes 1 if FY is greater than 2015. All controls are lagged by one fiscal year. Firm fixed effects and industry x FY fixed effects employed. The estimates are obtained from the *reghdfe* package in STATA version 18. The standard errors are clustered at firm and fiscal year. The values are indicated in parentheses and the symbols of significance are as follows: $^{+}\ p < 0.10$, $^{*}\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$

Table 5

Related Party Transactions as a mechanism test for group structure prevalence and reconfiguration

	(1) Entropy-RPT Income	(2) HHI-RPT Income	(3) Max-RPT Income	(4) Entropy-RPT Expense	(5) HHI-RPT Expense	(6) Max-RPT Expense
Post x BG	0.009*	-0.002	-0.003	0.017**	-0.003	-0.005^{+}
	(0.003)	(0.001)	(0.002)	(0.005)	(0.002)	(0.002)
Firm Size	0.015***	-0.005***	-0.006***	0.038***	-0.012***	-0.014***
	(0.002)	(0.001)	(0.001)	(0.003)	(0.001)	(0.001)
Firm Age	-0.001	0.000	0.000	0.005	-0.002	-0.002
	(0.002)	(0.001)	(0.001)	(0.004)	(0.002)	(0.002)
ROA	-0.000	-0.000	0.001	0.017^{+}	-0.006^{+}	-0.007^{+}
	(0.004)	(0.002)	(0.002)	(0.009)	(0.003)	(0.004)
Leverage	-0.001^{+}	0.000^{+}	0.000^{+}	-0.002*	0.001*	0.001*
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
Exports	-0.000	-0.000	0.000	0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Intercept	1.029***	0.382***	0.511***	0.741***	0.505***	0.626***
	(0.058)	(0.020)	(0.028)	(0.102)	(0.037)	(0.042)
Adj R^2	0.4951	0.4695	0.4339	0.5951	0.5830	0.5417
Observations	56909.000	56909.000	56909.000	88420.000	88420.000	88420.000
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Ind x Year FE	Yes	Yes	Yes	Yes	Yes	Yes

The dependent variable in the estimations of columns (1) - (3) is the RPT income first aggregated to RPT type and then aggregated to firm year based on entropy, HHI, and maximum contribution. Similarly, the DV of columns (3) – (6) is the RPT expense first aggregated to RPT type and then aggregated to firm year based on entropy, HHI, and maximum contribution. The value of BG takes 1 if the firm is a BG-affiliated firm, and the value of post takes 1 if FY is greater than 2015. All controls are lagged by one fiscal year. Firm fixed effects and industry x FY fixed effects employed. The estimates are obtained from the *reghdfe* package in STATA version 18. The standard errors are clustered at firm and fiscal year. The values are indicated in parentheses and the symbols of significance are as follows: $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

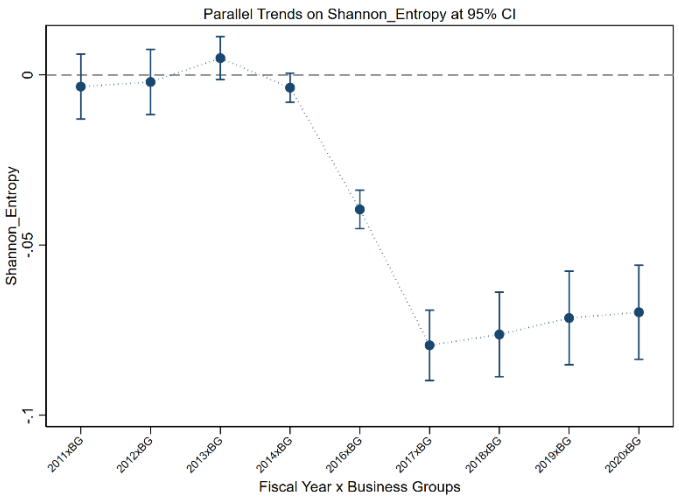
Table 6

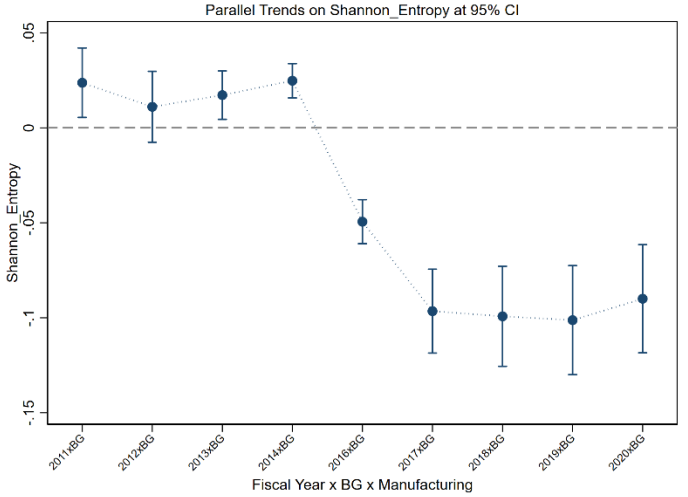
Robustness Tests – Difference in Difference estimates for alternate dependent variables

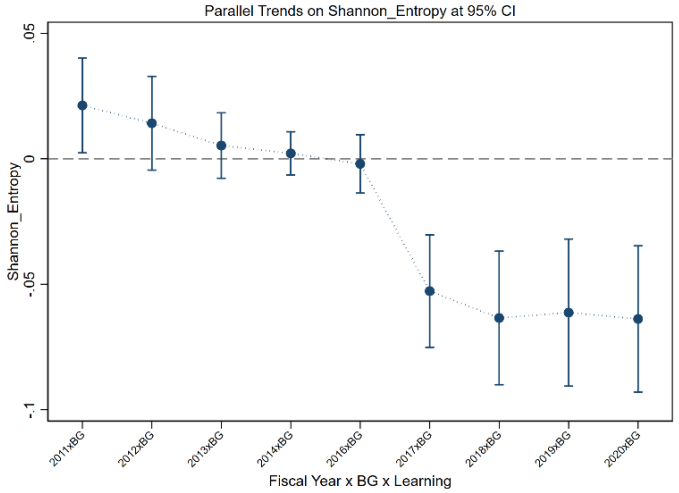
	(1) HHI-Sales	(2) HHI-Sales	(3) HHI-Sales	(4) HHI-Sales	(5) Max-Sales	(6) Max-Sales	(7) Max-Sales	(8) Max-Sales
Post x BG	0.034***	0.022***	0.011*	0.043***	0.026***	0.018***	0.010*	0.033***
	(0.005)	(0.005)	(0.004)	(0.006)	(0.004)	(0.004)	(0.004)	(0.005)
Post x BG x Learning		0.025*				0.018*		
		(0.009)				(0.007)		
Post x BG x Mfg			0.051***				0.038***	
			(0.008)				(0.006)	
Post x BG x Regulated				-0.035***				-0.026***
				(0.007)				(0.006)
Intercept	0.899***	0.871***	0.898***	0.897***	0.922***	0.900***	0.922***	0.922***
	(0.051)	(0.051)	(0.051)	(0.051)	(0.041)	(0.041)	(0.041)	(0.041)
Adj R^2	0.6478	0.6481	0.6485	0.6480	0.6285	0.6288	0.6291	0.6287
Observations	112641.00	112641.000	112641.000	112641.000	112641.000	112641.000	112641.000	112641.000
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind x Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

The dependent variable in the estimations of columns (1) – (8) are alternate dependent variables. Columns (1) – (4) represent the HHI of Sales calculated at the product level and aggregated to firm FY granularity as the dependent variable. Columns (5) – (8) use Maximum contribution by a single product to total sales as the dependent variable. The value of BG takes 1 if the firm is a BG-affiliated firm, and the value of post takes 1 if FY is greater than 2015. All controls are lagged by one fiscal year. Firm fixed effects and industry x FY fixed effects employed. The estimates are obtained from the *reghdfe* package in STATA version 18. The standard errors are clustered at firm and fiscal year. The values are indicated in parentheses and the symbols of significance are as follows: $^{+}\ p < 0.10$, $^{*}\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$

Figure 3 - The figures indicate parallel trends test for regression estimates of double and triple difference (estimates in Table 1)







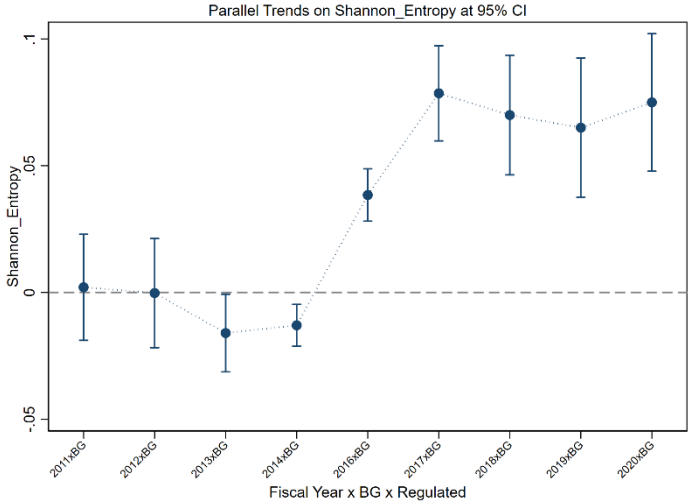


Table 7

Robustness Tests – Difference in Difference Estimates with entropy matching and propensity score matching (PSM)

	(1) Entropy-Sales	(2) Entropy-Sales	(3) Entropy-Sales	(4) Entropy-Sales	(5) Entropy-Sales	(6) Entropy-Sales	(7) Entropy-Sales	(8) Entropy-Sales
Post x BG	-0.065***	-0.044***	-0.028*	-0.081***	-0.068***	-0.051***	-0.023*	-0.082***
	(0.009)	(0.009)	(0.010)	(0.011)	(0.011)	(0.010)	(0.009)	(0.013)
Post x BG x Learning		-0.045*				-0.034+		
		(0.018)				(0.017)		
Post x BG x Mfg			-0.085***				-0.094**	
			(0.016)				(0.019)	
Post x BG x Regulated				0.063**				0.057**
				(0.017)				(0.016)
Intercept	0.126	0.197	0.160	0.167	0.139	0.213	0.137	0.144
	(0.115)	(0.114)	(0.115)	(0.117)	(0.130)	(0.130)	(0.131)	(0.131)
Adj R^2	0.6840	0.6845	0.6846	0.6843	0.6750	0.6755	0.6758	0.6752
Observations	112630.00	112630.000	112630.000	112630.000	52801.000	52801.000	52801.000	52801.000
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind x Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

The dependent variable in the estimations of columns (1) – (8) is the Shannon entropy of product-level sales aggregated to firm FY. Estimates of Columns (1) – Columns (4) are computed after entropy matching on all control variables along with two-digit NIC and registered state. Estimates of Columns (5) – (8) are computed after PSM with linear terms and quadratic control variables along with the registered state for the year 2015, and weights are replicated to respective firms. The ATT of entropy of product level sales had lesser significance compared to that when the two-digit NIC was added in PSM; hence, we removed the two-digit NIC. The value of BG takes 1 if the firm is a BG-affiliated firm, and the value of post takes 1 if FY is greater than 2015. All controls are lagged by one fiscal year. Firm fixed effects and industry x FY fixed effects employed. The estimates are obtained from the *reghdfe* package in STATA version 18. The standard errors are clustered at firm and fiscal year. The values are indicated in parentheses and the symbols of significance are as follows: $^{+}\ p < 0.10$, $^{*}\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$

Table 8

Heterogeneity Analysis – Difference in Difference analysis for firms registered in Gujarat and Double Engine Government

	(1) Entropy-Sales	(2) Entropy-Sales	(3) Entropy-Sales Guj	(4) Entropy-Sales ROI	(5) Entropy-Sales Double	(6) Entropy-Sales No Double
Post x Guj	-0.005					
	(0.016)					
Post x Double Engine		-0.031***				
		(0.008)				
Post x BG			-0.055+	-0.065***	-0.063***	-0.065***
			(0.027)	(0.009)	(0.012)	(0.013)
Intercept	0.166	0.165	-0.007	0.103	-0.064	0.236+
	(0.118)	(0.117)	(0.220)	(0.126)	(0.215)	(0.127)
Adj R^2	0.6825	0.6828	0.6338	0.6891	0.6618	0.7069
Observations	112630.000	112630.000	10937.000	101610.000	51989.000	60599.000
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Ind x Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Subsample	No	No	Yes	Yes	Yes	Yes

The dependent variable in the estimations of columns (1) – (6) is the Shannon entropy of product-level sales aggregated to firm FY. Estimates of all columns are after entropy balancing. Columns (1) – (2) present the results of DDD analysis. Columns (3) – (6) represent the sub-sample analysis of the regression estimates for Gujarat, the Rest of India, the Double engine government, and no double engine, respectively. The value of BG takes 1 if the firm is a BG-affiliated firm, and the value of post takes 1 if FY is greater than 2015. All controls are lagged by one fiscal year. Firm fixed effects and industry x FY fixed effects employed. The estimates are obtained from the *reghdfe* package in STATA version 18. The standard errors are clustered at firm and fiscal year. The values are indicated in parentheses and the symbols of significance are as follows: $^{+}\ p < 0.10$, $^{*}\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$

[i] The list of keywords used to identify auxiliary sources of sales are income, dividend, investment, sale of license, sale of licenses, sales of license, sales of licenses, rent, others, profit, and interest. We identify the singular and plural forms of these phrases and remove those rows in the product name that contain the above phrases before computing the diversification measure.

[ii] The related party transaction data used in this analysis does not correspond to the entire universe of the raw data. Only non-negative transactions in income and expense are considered for the computation of diversification of RPT. Furthermore, the negative values were less than 1% of the entire raw data from FY 2010-FY2020.