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Business Groups, Concentration and Market Power in India

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Abstract

This paper analyses the evolution of market structure in India between 2000 and 2020, using a rich dataset at high levels of disaggregation. In particular, it examines the extent to which family-owned business groups have sustained their strong market position in the Indian economy as the economy has liberalized. It focuses on two key dimensions. The first is market concentration and market shares by industry. The second concerns whether business groups have been consolidating their position by expanding further in specific sectors or diversifying by entering new sectors. It finds that market concentration has been declining, although a bloc of high-concentration sectors remains. Further, diversification has been actively pursued across sectors by most business groups. While this points to greater competition among business groups, the ratio of revenues to variable costs—a measure of the markup—has shifted upwards, particularly after 2013. The paper also finds evidence linking the rising markups of these large businesses with pockets of high market concentration. The weight of these large business groups in the economy, as measured by the ratio of their revenues to GDP, has also increased. The paper proposes policies that can address overall concentration and the enduring prevalence of large business groups. Its analysis suggests that Indian family-owned business groups are entrenching across the economy and exploiting their monopoly power, a worrying dynamic given that this organizational form is widespread in much of Asia and Latin America.

JEL classification D22, L1, L11, O14, O25

Keywords market concentration, India, business groups, Hirschman-Herfindahl Indices, diversification

1. Introduction

Market concentration and the attenuation of competition is a concern in both advanced economies and emerging markets (Tybout 2000; Blair and Sokol 2015; Philippon 2019; De Loecker, Eeckhout, and Unger 2020). High market power can damage consumer welfare and weaken innovation and development by

restricting the entry of new firms (Nickell 1996). In Asia and Latin America especially, the market-power issue is further complicated by the persistence of large business groups, many of which are family-owned (Carney 2008; Colpan, Hikino, and Lincoln 2010; Commander and Estrin 2023). Formed of multiple companies operating across a variety of sectors, such groups have interconnected governance structures designed to maintain family control through concentration in ownership (Bertrand, Mehta, and Mullainathan 2002; Morck, Wolfenzon, and Pandian 2005). This has led to significant degrees of concentration in specific markets, as well as at the level of the economy (Khanna and Yafeh 2007; Commander and Estrin 2022), leading some present-day critics to argue that large business groups' family owners have accumulated excessive market power and have become entrenched.[1]

These concerns are particularly evident in India (Khanna and Palepu 2000; Bhaumik, Estrin, and Mickiewicz 2017) and go back decades. As early as 1958, Hazari (1966) found that nearly 20 percent of the gross capital stock of non-state-owned public companies was controlled by just two Family Business Groups (FBGs)—Tata Sons and the Birlas. Even so, he and the Government of India Commissions[2] in the 1960s believed that because business groups were highly diversified, they were not normally acting as monopolists in particular industries.[3] Indeed, between 1950–1980, industrial policy provided favorable treatment to a limited number of business groups[4] while also giving priority to the state sector (Dreze and Sen 1996), because it was felt that they would provide superior management and access to capital. While policy from the 1990s shifted to promoting market liberalization (Chhibber and Soz 2021; Kapur 2020), there is some evidence that business groups retained their prominent economic position. The revenues of the top 5 and top 10 companies in India still accounted for around 10 percent and 15 percent of GDP, respectively, in 2018 (Commander and Estrin 2022).[5] There has also been considerable persistence in FBGs; 40 percent of the top 20 business families in 1990 retained that ranking in 2016 (Piramal 2003, 2018). Moreover, Acharya (2023) has found that, although the share of assets held by the largest companies did fall in the 1990s,[6] it has risen again since 2016. Consequently, the asset ownership of the top five private business groups exceeded 18 percent of the total by 2021, as against just over 10 percent in 1991.[7] In short, it appears that, despite greater liberalization, business groups have managed to entrench themselves with implications for competition and, ultimately, innovation and growth. Moreover, these characteristics are not unique to India. Across Asia, explicit policy support for business groups, viewed as instruments of development in economies with underdeveloped capital and managerial markets, has remained widespread (Fisman and Khanna 2004).

Given this context, this paper's broad concern is whether the level of concentration and market power associated with the role of large FBGs in India has been materially affected by market liberalization between 2000 and 2020. In particular, the paper asks three related research questions. First, have family-owned business groups sustained their strong market position in terms of market concentration and market shares by industry in India as the economy has liberalized. Second, have business groups been consolidating their position by expanding further in specific sectors or diversifying by entering new sectors. Finally, do the changing levels of market power impact profitability. This study's new and rich dataset makes it possible to undertake this analysis at high levels of disaggregation that capture relevant product markets. The paper observes the evolution of concentration by industry and explores the positioning of the FBGs, specifically whether they have consolidated their initial position in existing sectors or pursued diversification across sectors.[8] The study considers the impact of changing concentration levels on profitability through the markup as measured by the ratio of sales to variable

[1] For example, Ghosh (2023). Concern over competition led India's Competition Commission (CCI) to launch an investigation of seven sectors including pharmaceuticals, telecommunications, airports and ports in 2021.
[2] The main Commissions were the India Planning Commission (1964) and the Hazari Committee (1966). See also Hazari (1966, 305ff).
[3] Although the Monopolies and Restrictive Trade Practices (MRTP) Act, 1969 was introduced to address market power, implementation was limited (Bhattacharjea 2010).
[4] For example, licenses were granted on preferential terms to businesses with close connections to politicians (Bhattacharjea 2010; Ahluwalia 2016).
[5] These shares include state-owned companies, but privately held businesses are a significant component.
[6] Due mainly to the rapid decline in the share of state-owned firms.
[7] Those groups being Ambani (Mukesh), Adani, Tata Sons, Birla (Aditya), and Bharti Telecom.
[8] Analysis in the spirit of Sutton (2007). See also Kato and Honjo (2009).

costs.[9] Finally, given the prevalence and strategic importance of FBGs, the paper considers the implications for policy raised by such strong FBG presence, and, in particular, measures that could be applied to increase competition. This analysis has broader significance than just for India because business groups are also widely prevalent in much of Asia and Latin America, as well as in Russia and the Middle East (Colpan, Hikino, and Lincoln 2010). Moreover, though the evidence is patchy, there is little evidence of their demise as an organizational form (Carney et al. 2011 *).* This paper's robust findings that they have been able to entrench in the face of market liberalization in the Indian context suggests their market power may be continuing or growing in other countries as well. Hence this paper's results have important ramifications for policy makers in other developing economies.

The paper is organized as follows. Section 2 describes the dataset that is used and how it has been assembled, along with its strengths and limitations. Section 3 examines concentration in aggregate using both concentration ratios and Hirschmann-Herfindahl Indices (HHI). The focus is largely on 3-digit industry levels. Section 4 then looks at the extent to which the main family business groups are diversified, along with the evolution and type of diversification since 2000. The evolution of market shares post-entry is also observed. Section 5 analyses the financial performance of the main family business groups, especially the evolution of the mark-ups. Section 6 turns to the weight of the main family business groups in the aggregate economy, including the top five groups. Section 7 concludes, noting that the entrenchment of business groups raises major challenges for competition policy.

2. Focus of the Paper and Data Description

The paper explores the evolution of market concentration and specifically the role of the top 25 Family Business Groups (FBGs) in the Indian economy in a period of market liberalization from 2000 to 2020. For this analysis, the top 25 FBGs are classified using the total income of these business groups in 2019–2020 as the ranking criterion.[10] Total income in turn is measured gross of indirect taxes, rebates, and discounts, and net of income capitalized and transferred to deferred revenues. The analysis uses panel data from CMIE's Prowess database, drawn from the stand-alone financial statements. This is the largest and most comprehensive source of information on the financial performance of Indian business entities, with over 3300 data fields. A unique advantage of this database is that it provides subsidiary-level information as well as details of business group ownership.[11] For the period 2000 to 2020 the study draws on nearly 500,000 observations (CMIE Prowess 2023).

The raw data have, however, needed substantial work to ensure consistency and reliability. For example, 5025 firms were found to be assigned to 20 non-existent or incorrect National Industrial Classification (NIC-3) codes. This required reclassification using the companies' financial statements and product-level revenues to identify the primary goods produced. Information from Zauba Corp on companies based on records from the Indian Ministry of Corporate Affairs were then used to cross-check.[12] The dataset also contained occasional multiple financial statements for a given firm within the same year (Ghosh and Gupta 2025). The study resolved these inconsistencies by retaining only annual, 12-month statements and, where multiple filings occur in a single month, selecting the most recent submission.

Given the paper's focus on FBGs, subsidiary-level data were aggregated to the FBG level using the CMIE Prowess database's classification of companies by ownership and grouping under parent enti-

[9] Although exploring market power normally requires a focus on concentration along with pricing and profits over time (De Loecker et al. 2020), Indian data limitations mean that it is not possible to observe profits sufficiently robustly. The data also do not permit an analysis at a regional level, a deficiency since in many sectors the Indian market is not fully integrated. This may mean that the study's data understate the true extent of market concentration as felt by consumers.

[10] In Prowess, total income has four components: income from sales, income from financial services, other income, and prior period and extraordinary income.

[11] This contrasts with the Annual Survey of Industries (ASI) which only provides anonymous plant-level information.

[12] For robustness, the analysis checks the correlation of CR5 (concentration ratios of the top five businesses in an industry) and CR10 (concentration ratios of the top 10 businesses in an industry) measures for the Prowess database and the ASI for NIC-2 level for each year and find that the correlation is generally high for the manufacturing sector considering that Prowess data is at the level of the firm and ASI at plant level. This exercise restricts itself to manufacturing for the robustness check as this is the primary coverage of the ASI. The correlation coefficients are available on request.

ties, such as Tata Sons or the Birla Group. Each subsidiary in the data set is mapped to an ownership group that reflects its equity structure and management control. CMIE distinguishes government-owned companies (central or state) from privately owned entities.[13] Within Indian companies, CMIE identifies FBGs and their subgroups, particularly among the top 50, and tracks ownership changes arising from mergers, demergers, acquisitions, sales, and spin-offs. Given the complex ownership patterns, CMIE employs both available data and its own internal intelligence and expert judgement to associate companies with business groups or ownership classes. As a result, the classification remains partly inferential. The data were then aggregated to the FBG level in two stages. In the first step, subsidiary-level information for each business group was aggregated to the NIC-3 industry level using the group ID and group name provided in the database. Financial indicators were summed across companies within the same NIC-3 category, yielding two types of entities: Stand-alone Businesses (SBs) and Business Groups (BGs). In the second stage, BGs that were offshoots of the same extended family business, where principals were close relatives and business linkages existed, were consolidated into single FBG entities. This step relied primarily on the CMIE Prowess Master Records for ownership classification. Of the top 50 business groups, 9 contained such subgroups (a total of 38 branches) that were merged into unified FBGs,[14] while the remaining groups were already consolidated. The resulting dataset spans 20 financial years (2001–2020) and provides a longitudinal panel of financial and structural indicators aggregated at the NIC-3 level across three categories: SBs, BGs, and FBGs.

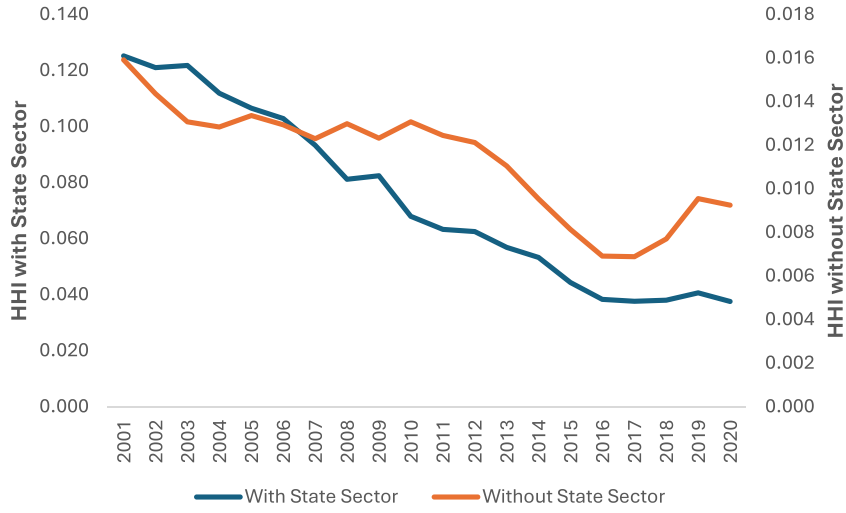
3. Concentration in India

The paper first explores whether there has been persistence among the largest business groups between 2000 and 2020. The list of the top 25 FBGs and top 25 BGs based on total income in 2019–20 is reported in table A1.1 in appendix A1 . There is relatively little difference between the two categories, with only three non-FBGs[15] in the top 25 BG list. There is, however, some turnover—eight FBGs present in 2000/1 were no longer found in the top 25 by 2010/11. The list remained largely unchanged between 2010/11 and 2019/20, with the FBGs occupying the top 5 and top 10 unchanged. This suggests a considerable degree of persistence over the reference period.

The analysis next examines the extent and evolution of market concentration in India. The study follows the traditional industrial organization literature (e.g., Philippon 2019) in using two measures of market power: the first is the Hirschman-Herfindahl Index (HHI),[16] which is based on the market shares of all the firms in an industry and the concentration ratio (CRs), which looks at the share of revenue (measured by total income) generated by the largest firms. The former is calculated by squaring the revenue share of each firm[17] (or group) in a market and summing the resulting numbers. For reference, U.S. markets are considered to be unconcentrated when the HHI is less than 0.15, and highly concentrated when the HHI $>$ 0.25. The second measure is the concentration ratio, which computes the share of total market revenues accounted for by the largest 5 (CR5) or 10 (CR10) firms or groups. Appendix A2 explains how we construct these indices. Again, in the United States, concentration is considered to be low in a market where CR5 $<$ 40 percent and high when CR5 $>$ 70 percent. The analysis starts at an aggregate (economywide) level and then moves on to consider concentration at the NIC-3 level, which conforms more closely to the concept of market level.[18] The analysis finds a sharply declining trend in concentration during the early 2000s, although less marked than reported by others.[19] The changes are in part driven by a declining state share but also by new firm entry into markets. Later, the

[13] The latter include Indian, foreign, cooperative, and joint-sector firms.
[14] Nine of the top 50 FBGs traced by CMIE Prowess have branches or sub-groups, Bangur has 6 branches; Birla 8; Singhania 3; Mafatlal 3; Modi 7; Piramal 4; Reliance 2; Shriram 3, and Walchand 2. The details are drawn from the CMIE Prowess Master Records for Ownership. Note that the Birla group has Yash Birla in addition to those listed by the database. Detailed information available from the authors.
[15] Larsen and Toubro, Infosys, and ITC.
[16] From the resulting calculation in a range of 0–1, a value for the HHI $>$ 0.25 is commonly considered to indicate high concentration.
[17] Here, firm and company are used interchangeably.
[18] The study also implements the same analysis at the NIC-2 level. The results are available on request from the authors.
[19] This paper's estimates are lower than those of Acharya (2023), who uses more aggregate evidence.

Figure 1 Overall Concentration as Measured by HHI (with and without State Sector) 2001–2020



Source: Authors' calculations based on CMIE PROWESS.

paper argues that some of this entry represents expansion by existing family business groups into new sectors.

Overall Concentration

The study begins with overall concentration, which is necessarily lower than market-concentration due to aggregation effects. Figure 1 reports the HHI for all industries and ownership types (state and private) for the period 2000 to 2020. It is evident that there is a large decline in this measure of concentration from 0.125 in 2000/1 to 0.038 in 2019/20, with most of the change occurring by 2014/15. The figure also reports the HHI when excluding the state sector. Although the trend is similar, the values are very significantly lower, as is the Size of decline from 0.016 in 2000/1 to 0.009 in 2019/20.[20]

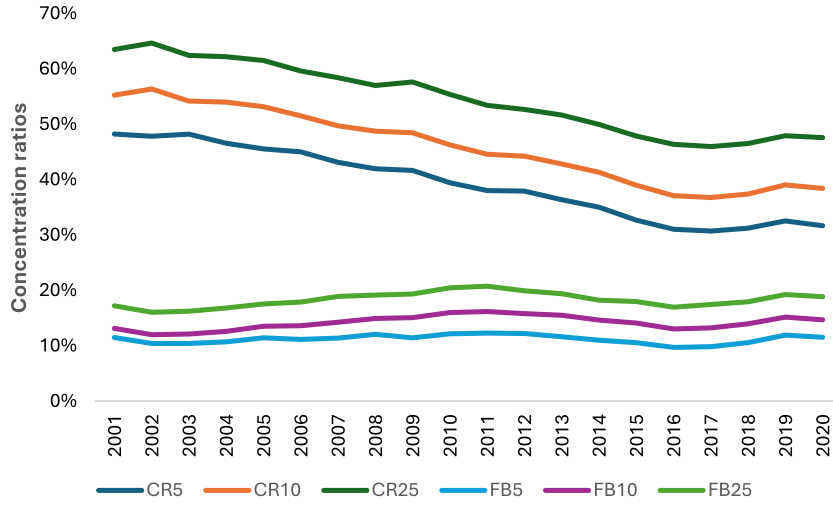
The upper part of fig. 2 then shows the evolution of concentration ratios for the top 5, 10, and 25 firms between 2001 and 2020. For each of these concentration ratios, there is a sharp decline in the value. The overall CR5 falls from 48.3 percent to 31.7 percent while the CR10 drops from 55.3 percent to 38.4 percent. The lower part of fig. 2 reports the share of revenues for only the leading FBGs (as ranked in 2019–20). This shows a different trajectory. Between 2001 and 2010, the respective CRs increased before falling back slightly in the subsequent decade. By 2020, the three CRs still lie at, or slightly above, those in 2001. Clearly, changes to the state sector and its policy-driven downsizing have been significant factors in explaining the evolution of overall concentration.

Concentration at NIC-3 Level

The analysis now turns to measures of market-level concentration. Starting with NIC-3 industries, of which there are 209 in the dataset, the study finds that nearly 77 percent of sectors reported a decline in concentration measured by the HHI between 2001 and 2020, but that decline was relatively small. Further, 15 percent of the sectors experienced increasing concentration.[21] When applying the same analysis at a higher level of aggregation, to NIC-2 industries, one sees a similar pattern, although a larger proportion of sectors displayed a decline in the HHI, and their declines were more substantial.

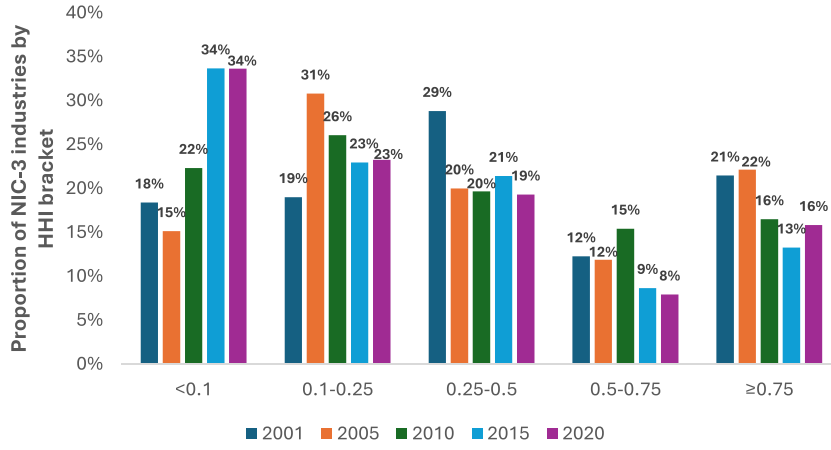
[20] Plotting the HHI for all industries for each 1-digit sector over the full period confirms across-the-board declines, many of which are significant.
[21] Data for each NIC-3 industry are available on request.

Figure 2 Concentration Ratios for Business Groups and Family Business Groups, 2000–2020



Source: Authors' calculations based on CMIE PROWESS.

Figure 3 Proportion (percent) of NIC-3 Industries by HHI Bracket, 2001–2020



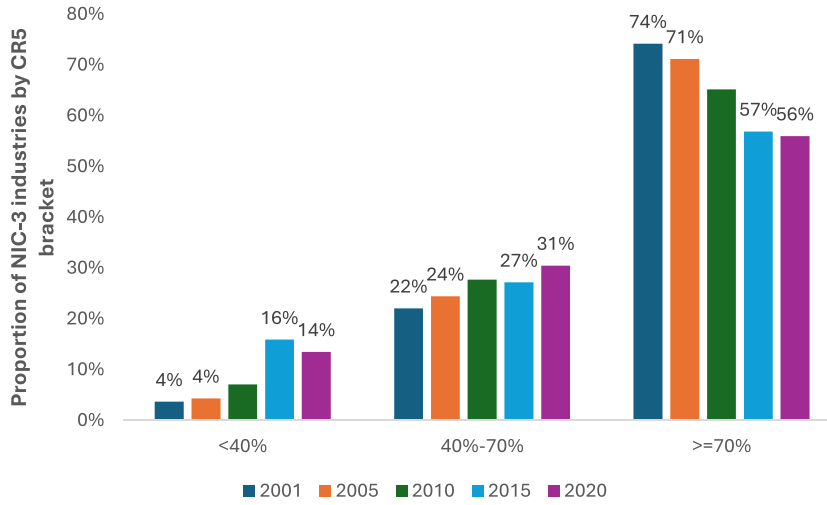
Source: Authors' calculations based On CMIE PROWESS.

For the analysis using the HHI, the study initially groups the data into five brackets (namely, HHI < 0.1; 0.1–0.25; 0.25–0.50; 0.50–0.75, and ≥ 0.75),[22] and reports the shares for each five-year interval in fig. 3. The share of NIC-3 industries in the most concentrated category (HHI$\geq$0.75) declined relatively modestly from about 21 percent in 2001 to 16 percent in 2020, while the least concentrated (HHI < 0.1) rose from around 18 percent to 34 percent.

Concentration ratios provide an alternative measure of market power, and fig. 4 reports the proportion of NIC-3 industries in each CR5 bracket for the same five-year intervals. At the start of the period, only 4 percent of sectors had CR5 ratios below 40 percent, with 74 percent having very high ($\geq$70 percent) CR5 Ratios. By 2020, the former had jumped to 14 percent of sectors while the highest-concentration bracket had slipped back to just over one-half. In short, at NIC-3 level, the share of low-concentration NIC-3 industries rose considerably between 2000 and 2020, and there was a marked decline in the

[22] The lower limit of each bracket is included, and the upper limit is Excluded.

Figure 4 Proportion (percent) of NIC-3 Industries by CR5 bracket, 2001–2020



Source: Authors' calculations based on CMIE PROWESS.

Table 1. Percent Contribution of Top 25 FBGs, Other Private & State Sector to HHI at NIC-2 Level for 2001, 2010, and 2020

	Other private	Top 25 FBGs	State
2000/2001	0.5	3.3	96.2
2009/2010	0.7	7.1	92.2
2019/2020	1.8	10.4	87.8

Source: Authors' calculations based on CMIE PROWESS.

share of high-concentration sectors. Nevertheless, a bloc of high-concentration industries remained in place.

Contributions to Concentration

Acharya (2023) has previously identified declining market power, with an analysis based on assets rather than revenues as used in the present paper. He has suggested that much of the decline in asset concentration has been associated with the reduction in the size of the state sector. To explore this further, the paper uses NIC-2 level data to decompose the contribution to the Hirschman-Herfindahl Index of three categories of organization, namely, state firms,[23] top 25 FBGs, and other private firms (namely, non–top 25 FBGs). The analysis undertakes this decomposition for three years: 2001,2010, and 2020.[24] The methodology for decomposing the Hirschmann-Herfindahl index into its respective contributions from sub-sectors is described in appendix A3. Table 1 shows that the non-FBG private-sector contribution was small (0.5–2 percent) throughout. However, the contribution of the top 25 FBGs jumped from just over 3 percent to 10 percent. For some sectors—metals mining, food products, basic metals, air transport, telecommunications, and insurance—the contribution of the top FBGs increased very substantially. Regarding the state sector's contribution, in nearly 50 percent of NIC-2 sectors, there was

[23] State-owned firms include enterprises with government ownership, whether by the Central government or by State governments.

[24] For this exercise, the analysis uses information on 85 of 99 NIC-2 sectors for 2000/1,2009/10, and 2019/20 for which information is reported in the data set.

an unambiguous decline, with nearly 40 percent of sectors reporting little or no change between 2000 and 2020.

When decomposing the change in the HHI over the full period from 2000 to 2020 for all NIC-2 sectors, the total change was −0.88, with almost all of that accounted for by the state sector. In short, these decompositions highlight the central role played by a declining state sector in the falling market concentration. Even so, the largest FBGs have clearly contributed significantly to the change in HHI level over the past couple of decades.

Summary

The analysis suggests that the period from 2001 to 2020 was one of declining concentration in India. However, the story has some important nuances. Although the HHI has declined in many industries since 2001, only around a third of NIC-3 industries could be regarded as highly competitive (HHI < 0.1) and by 2020 over 40 percent were still highly concentrated (HHI > 0.25). Using concentration ratios and again focusing on NIC-3 sectors, the share with a low CR5 ($<$40 percent) rose from 4 percent to 14 percent, while those with high and very high shares ($\geq$70 percent) fell from 74 percent to 56 percent between 2001 and 2020. Nevertheless, in 2020 over half of NIC-3 sectors still had a CR5 greater than 70 percent.

4. Family Business Groups and Diversification

The analysis so far makes clear that concentration has declined since 2000, although remaining relatively high, especially at disaggregated levels. In addition, there is the question of diversification. Concentration and diversification are often treated as substitutes for one another. Yet this assumption may be unwarranted in the Indian context where many business groups have long been highly diversified. Indeed, this is a common and striking attribute of FBGs across Asia. Although the textbook model of the firm suggests that there are few or no reasons to diversify, Khanna and Palepu (2000) have argued that business group structures can reduce the costs of diversification as they can deploy their internal capital markets to launch new ventures. Diversification has also been linked to the governance objectives of these groups, as well as their ability to leverage political connections. Even so, the literature also suggests that shifting into related industries that share resources is more likely to improve performance compared to a strategy of specializing within an industry or diversifying to unrelated industries (Mahoney and Pandian 1992; Wan et al. 2011). In this and subsequent sections, the study thus examines not only the extent of diversification among Indian FBGs but also the dynamics, notably whether FBGs have continued to diversify—and if so in what manner—and with what consequences, especially as regard to the accumulation of market shares.

The analysis starts with table 2, which gives the number of NIC-3 sectors in which the top 25 FBGs have been operating, reporting 5 observations between 2000 and 2020. The first thing to note is that the total number of sectors of operation for all 25 FBGs jumped from 344 in 2000/1 to 658 in 2009/10 before reaching 685 by 2019/20. The average number of NIC-3 sectors of operation for the largest FBGs increased from 14 in 2000 to 26 in 2010 and 27 in 2020. Further, between 2000 and 2020, sectors in which more than three of these FBGs were operating more than doubled. Consequently, by 2020 nearly a fifth of all NIC-3 sectors had six or more FBGs present. Over half of all NIC-3 sectors experienced entry of between one and five FBGs, with most of that entry occurring between 2000 and 2010. The largest increases in entry were in sectors where FBGs were already present, but their market shares were low. The timing can be linked to the corporate credit-fueled boom that occurred between 2003 and 2008. The slower pace of diversification post-2010 has, in turn, been linked to credit tightening, which, among other things, led to the failure of a couple of over-leveraged FBGs (Nagaraj 2013).

What is also striking is that long-established incumbents, such as Tata Sons and Birlas, not only started the period operating in many sectors but have subsequently continued to expand sharply their sectors of operation. At the same time, relative newcomers, such as Adani or Reliance, have also expanded into

Table 2. Presence of Top 25 FBGs (2019–20 Ranking) in NIC-3 Industries

Name of FBG	2000–01	2004–05	2009–10	2014–15	2019–20
Adani Group	5	12	27	32	38
Bajaj Group	15	21	27	28	28
Bharti Telecom Group	9	10	12	13	12
Birla Group	44	56	68	68	65
Essar (Ruia) Group	12	16	25	21	16
Future Group	2	9	26	28	29
Godrej Group	15	18	19	16	17
HCL Group	4	8	12	10	13
Hero (Munjals) Group	6	10	14	16	19
Hinduja (Ashok Leyland) Group	12	21	29	23	23
J.K. Singhania Group	17	26	32	30	31
Mahindra & Mahindra Group	18	27	37	45	47
Murugappa Chettiar Group	15	19	22	21	22
Om Prakash Jindal Group	9	13	30	38	37
Piramal Group	16	17	20	20	22
Rajesh Exports Ltd.	1	1	1	1	1
RPG Enterprises Group	23	34	33	35	29
Reliance Group	17	33	55	63	63
Ruchi Group	5	6	6	11	11
Shapoorji Pallonji Group	15	20	28	26	26
T.V.S. Iyengar Group	22	26	31	36	36
Tata Sons Group	43	50	67	70	69
UB Group	11	18	15	10	9
Vedanta Group	7	8	15	14	15
WIPRO Group	1	7	7	7	7

Source: Authors' calculations based on CMIE PROWESS.

new sectors and at an even more rapid pace. In 2000, Adani was operating in only five sectors; by 2020, the number had increased by 750 percent. In the same period, the number of sectors in which the Reliance Group was operating increased by nearly four times.

Diversification: Across or Within Sectors?

To determine whether diversification occurs across or within industries, this paper employs an entropy measure of diversification. This accounts for the number of industries into which firms diversify, and the incomes generated from them and makes it possible to quantify how activities are distributed across sectors, with a higher value indicating greater diversification. This entropy measure also allows decomposition into additive elements for within and across industry diversification, something that is not possible with an HHI-based measure (Jacquemin and Berry 1979).

The entropy measure of diversification is given by;

$$Entropy = \sum_{i=1}^{n} \ln\left(\frac{1}{S_i}\right) S_i$$

where S_i is the market share of the ith firm or industry, and n is the number of firms or industries. The entropy measure allows decomposing the diversification of a FBG at the NIC-3 industry level into diversification across industries at the NIC-2 level and diversification within the NIC-2 level (Jacquemin and Berry 1979). Assuming that there are n NIC-3 industries and m NIC-2 industries ($n \geq m$) in which a FBG operates, $Entropy_{NIC3}$ is the measure calculated for diversification across the NIC-3 level and $Entropy_{NIC2}$

Table 3. Diversification of the Top 25 FBGs (Ranked in 2019–20)

Measure of diversification	2000–01			2009–10			2019–20		
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Entropy at NIC-3	1.25	0	2.58	1.35	0	2.72	1.33	0	2.64
Across NIC-2 Entropy	1.10	0	2.29	1.23	0	2.53	1.18	0	2.43
Weighted Within NIC2 Entropy $(\sum_{j=1}^{m} S_i WEntropy_{NIC2})$	0.15	0	0.63	0.12	0.	0.59	0.15	0	0.54

Source: Authors' calculations based on CMIE PROWESS data.

diversification across the NIC-2 level.

$$Entropy_{NIC3} = \sum_{i=1}^{n} \ln\left(\frac{1}{S_i}\right) S_i$$

For a firm, S_i is the share of the income from the ith NIC-3 industry.

$$Entropy_{NIC2} = \sum_{j=1}^{m} \ln\left(\frac{1}{S_j}\right) S_j$$

For the same firm, S_j is the share of the income that comes from the jth NIC-2 industry. Jacquemin and Berry (1979) show that $Entropy_{NIC3}$ and $Entropy_{NIC2}$ are related as follows:

$$Entropy_{NIC3} = Entropy_{NIC2} + \sum_{j=1}^{m} (S_j \times WEntropy_j)$$

$WEntropy_j$ measures the NIC-3 diversification of the firm within the jth NIC-2 industry,

$$WEntropy_j = \sum_{i \in j} \frac{S_i}{S_j} \ln\left(\frac{S_j}{S_i}\right)$$

Table 3 reports the entropy measure at the NIC-3 level along with the within and across industry entropy at the NIC-2 level. At the NIC-3 level, most of the top 25 Indian FBGs are highly diversified. However, the decomposition of the entropy measure reveals that Indian FBGs are far more diversified across rather than within NIC-2 industries. Note also that, on average, NIC-2 diversification accounts for a stable share (88–91 percent) of NIC-3 level diversification in 2000–01,2009–10 and 2019–20.

A closer examination of the diversification of the leading FBGs offers some additional insights. Table 4 gives the entropy measure of diversification for the Top 25 FBGs at the NIC-3 level. It shows that over 50 percent of the Top 25 FBGs were highly diversified (Entropy > 1) in each year. Diversification peaks in 2010, declines somewhat until 2014–15 before recovering by 2019–20. Looking at the intensity of diversification between 2000–2010 and 2010–2020, nearly 70 percent of the Top 25 FBGs became more diversified in the first decade, as against 56 percent in the second decade. This suggests that diversification has been a prominent feature, regardless of changes in the broader macroeconomic context.

In sum, not only were most of the top 25 FBGs in India highly diversified at the start of the period, but their diversification has subsequently increased. Most FBGs have engaged in across-industry

Table 4. Entropy Measure of Diversification at NIC-3 Industry Level for the Top 25 FBGs (Ranked in 2019–20)

Name of FBG	2000–01	2004–05	2009–10	2014–15	2019–20
Tata Group	2.44	2.42	2.72	2.68	2.64
Birla Group	2.58	2.50	2.60	2.50	2.60
T.V.S. Iyengar Group	1.95	1.82	2.11	2.11	2.02
RPG Enterprises Group	1.96	2.07	2.14	2.11	1.98
J.K. Singhania Group	1.71	1.95	1.88	1.96	1.95
Murugappa Chettiar Group	1.73	1.83	1.84	1.85	1.95
Adani Group	0.84	1.00	1.53	1.92	1.93
Bajaj Group	1.14	1.25	1.56	1.80	1.82
Godrej Group	1.82	1.74	1.77	1.71	1.80
Mahindra & Mahindra Group	1.40	1.58	1.70	1.64	1.78
Piramal Group	2.14	1.76	1.69	1.54	1.67
Reliance Group	0.73	1.07	1.22	1.24	1.52
Hinduja (Ashok Leyland) Group	1.24	1.13	1.52	1.48	1.43
Shapoorji Pallonji Group	1.65	1.26	1.48	1.71	1.17
Hero (Munjals) Group	0.73	0.61	0.71	0.93	1.13
Future Group	0.63	0.46	1.22	1.24	1.09
HCL Group	0.70	0.86	0.89	0.75	0.98
Om Prakash Jindal Group	1.11	0.60	0.79	0.94	0.95
Vedanta Group	0.46	0.57	0.83	0.84	0.88
WIPRO Group	0.00	0.68	0.21	0.51	0.60
Bharti Telecom Group	0.81	0.27	0.22	0.34	0.46
Essar (Ruia) Group	1.04	1.42	1.08	0.87	0.43
Ruchi Group	1.13	1.48	1.15	0.88	0.27
UB Group	1.24	0.97	0.89	0.45	0.09
Rajesh Exports Ltd.	0.00	0.00	0.00	0.00	0.00
% of Highly Diversified Groups in list (Entropy$>$1)	64%	60%	68%	60%	64%

Source: Authors' calculations based on CMIE PROWESS data.

diversification. It seems likely that they have done this by leveraging business group governance and financing structures, as well as exploiting political connections.[25]

Entry and Dynamics of Market Shares

Large-scale entry into new sectors by FBGs has been a major feature. To get a sense of what has been happening, of the 160 NIC-3 sectors in which at least one of the top 25 FBGs was operating in 2019–20, over a third had none operating in 2000–1, while nearly half of FBG entry was either where no top 25 FBGs operated or those that did had very low market shares. This raises obvious questions concerning the impact on entry of incumbents as well as the post-entry impact on market shares.

With respect to the former, to evaluate whether the start period market shares of other large businesses have deterred entry, the study regresses the change in the number of top 25 FBGs between 2000 and 2020 against initial concentration levels measured by the HHI. This gives a strong negative and significant association between concentration and new FBG entry for NIC-3 (and NIC-2) levels.[26]

[25] See Khanna and Palepu 2000, Commander and Estrin 2022, and Dasgupta and Jayadev 2025.
[26] Results available on request.

Table 5. Revenue Shares for FBGs at 5 & 10 Years after Entry (Number of Cases & Shares)

Share	After 5 years	After 10 years	Change between 5 and 10 years
<5%	253 (89.7%)	194 (86.6%)	216 (96.4%)
5%–10%	11 (3.9%)	12 (5.4%)	2 (0.9%)
10%–25%	7 (2.5%)	11 (4.9%)	3 (1.3%)
25%–50%	7 (2.5%)	4 (1.8%)	0
50%–100%	4 (1.4%)	3 (1.3%)	3 (1.3%)

Source: Authors' calculations based on CMIE PROWESS.
Note: For the column labeled "Change between 5 and 10 years," 58 percent of the 216 cases under <5% were 0 or negative.

What happened post-entry in terms of the market shares (as measured by revenues) that the Top 25 FBGs subsequently built in NIC-3 sectors?[27] To capture the dynamics, the analysis focuses on market shares at two points in time—namely, 5 and 10 years respectively—after the initial entry.[28] Table 5 shows that in just under 90 percent of cases, revenue shares of less than 5 percent had been accumulated five years after entry. Further, when able to observe revenue shares at both points in time (in other words, when entry occurred before 2010 and the FBG continued to operate in the sector of entry), there are only limited increases. In 42 percent of the cases, there was some positive shift, but with almost all that increase being under 5 percent, while for the remaining 58 percent, there was either no increase or some decrease. In other words, widespread entry by FBGs into new sectors has delivered small market shares, when measured 5 or 10 years after entry. In only 11 NIC-3 sectors have substantial revenue shares, applying a 25 percent revenue share cut-off, been achieved five years after entry.

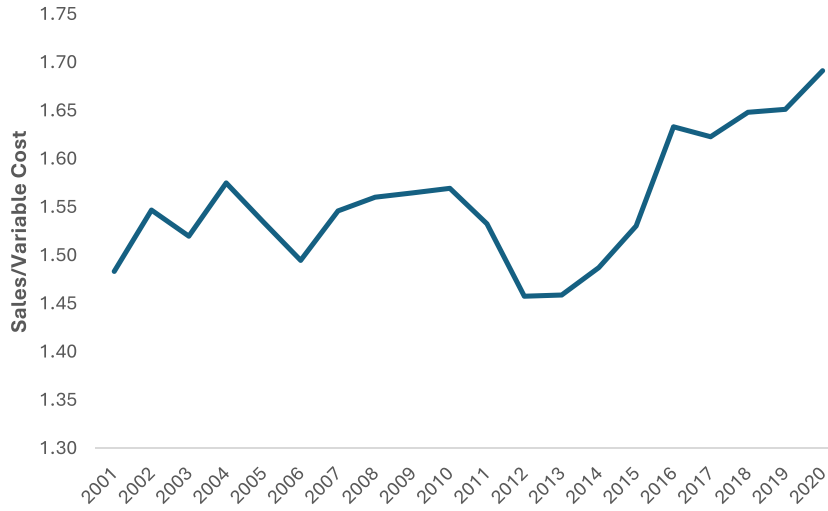
Are those FBGs whose operations have expanded most rapidly in recent decades, and who are perceived as having especially close connections to government, different? Reliance is the obvious example of a business group that has nurtured close connections to political power. After five years, the analysis finds that Reliance had managed to accumulate market shares of over 5 percent in only 9 percent of the sectors that it entered. However, in two-thirds of these cases, the market shares were > 25 percent. The contribution of those three sectors' revenues to aggregate group performance was also very significant. Adani displays a similar pattern.

As for the two long-standing and highly diversified FBGs—Birla and Tata Sons—although they both entered and stayed in a sizeable number of sectors, Birla had accumulated revenue shares > 5 percent in only 6 NIC-3 sectors, with none recording a significant increase between 5 and 10 years. In Tata's case, there has also been entry into many sectors, but significant revenue shares have been achieved in only 16 percent of cases, and none had a sizeable increase in shares between 5 and 10 years after entry. As is the case more widely, although these two groups have pursued diversification into new sectors, they have built large market shares in a small number of instances and have not deepened their presence over time.

In short, diversification has continued to be a pronounced feature of many FBGs, including the largest ones. Yet, this has not necessarily been associated with the accumulation of substantial market shares. Part of that may be because of the relatively short time period, part may be attributable to an underlying process of experimentation. Nevertheless, it is striking that both Ambani and Adani have managed to build substantial market shares in some newly entered sectors that in turn have been major contributors to group revenues.

[27] Entry for a FBG is based on the year of incorporation of the subsidiary operating in the NIC-3 sector.
[28] Although only 20 years of data are available, the fact that most entries occur in the first 10 is helpful for the exercise. Unreported revenue numbers at 5 or 10 years are recorded as 0.

Figure 5 Sales/Variable Cost for FBGs, 2001–20



Source: Authors' calculations based on CMIE PROWESS.

5. FBG Financial Performance and Markups

Given the evolution of concentration and market shares, what has happened to pricing and the financial performance of the top 25 FBGs in the reference period? With respect to the latter, publicly available evidence suggests significant heterogeneity across the business groups. However, some have reported large increases in net profits. For example, Tata Sons' net profit grew at $>$ 27 percent annually between 2014–2024, and most of this rise in profits was channeled into new ventures and diversification, rather than the payment of dividends to shareholders (Kant 2024). Although the Prowess dataset has information on post-tax profits, given the governance of Indian business groups and the resulting opacity in accounting, this article does not use this variable but instead considers pricing.

The study's approach is to first focus on a measure of markup and then examine whether it is associated with market concentration. To do this, the study employs an accounting or demand-based measure of markup for its analysis (see De Loecker, Eeckhout, and Unger 2020). The markup is defined as:

$$Markup \equiv \frac{Price}{Marginal\ Cost} = \frac{Price \times Ouput}{Marginal\ Cost \times Ouput} = \frac{Sales\ Revenue}{Variable\ Cost}$$

This measure rests on three main assumptions. First, the production technology is constant returns to scale. This ensures that marginal cost is equal to average cost. Second, that inputs are perfect substitutes in production. Third, the marginal cost measure only has components that vary with the level of output. While the second assumption is common to the production-approach measure of markups (De Loecker and Warzynski 2012), the constant-returns-to-scale assumption is more problematic, at least for firms in general. However, as the methodology is being applied to the largest and most successful business groups that face relatively few barriers to exhausting scale economies, the constant-returns-to-scale assumption is plausible. In line with the third assumption, variable cost in this article's approach comprises items that vary with output. For its construction of variable cost, the analysis sums seven components: raw materials, stores, and spares; packaging and packing expenses; power, fuel, and water charges; compensation to employees; outsourced manufacturing jobs; selling and distribution expenses; and indirect taxes. The analysis focuses on the change rather than the level itself.

On this basis, the analysis aggregates the sales and variable costs for all the top 25 FBGs for each year and computes the ratio of sales revenue to variable costs, which provides an approximation of the markup. Figure 5 reports the results for the top 25 FBGs, 2001–2020. This shows that after following a

Table 6. Fixed Effects Model for Top 25 FGBs: Markup over Marginal Costs vs. Concentration

	2013–2020			2000–2020		
Dependent Variable: Markup over Marginal Costs	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
CR5	.286**	0.285**	0.285**	0.078	0.077	0.074
	(0.143)	(0.143)	(0.142)	(0.051)	(0.049)	(0.047)
Number of Groups		−0.028	−0.028		−.002	−.002
		(0.039)	(0.038)		(0.004)	(0.004)
Number of FBGs			−0.055			−0.132
			(1.058)			(0.241)
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	1037	1037	1037	2,592	2,592	2,592

Source: Authors' calculations based on CMIE PROWESS.
Note: * p<0.10, ** p<0.05, *** p<0.01
Robust standard errors are reported in brackets.
Model selection is based on the Hausman Test.

marginally decreasing trend between 2001 and 2013, the ratio of sales to variable costs then shifts upwards for the rest of the period. Between the trough in 2013 and the peak in 2020 this amounted to a 16 percent increase with a 14 percent increase overall between 2001 and 2020. These findings find resonance in Acharya (2023) who estimates that aggregate sales-weighted and assets-weighted markups fell up to 2013 before rising between 2013 and 2020/21 by 14–20 percent. For robustness, the study has also estimated the markup using the production approach by De Loecker and Warzynski (2012), and this yields similar trends in the markup, particularly post-2013.[29]

The study then looks at the relationship between the markups of the top 25 FBGs and market concentration. The hypothesis is that the markups earned by the FBG are strongly linked to market concentration. The analysis estimates a panel regression model with panel and time fixed effects. The panel data used to test this hypothesis comprise the markup earned by all the top 25 FBGs combined, a measure of concentration, and other covariates for each NIC-3-level industry from 2001 to 2020. The markup is measured by $\frac{sales}{variable\ cost}$ ratio of the top 25 FBGs. The CR5 at the NIC3 industry level is used as the measure of concentration, and the analysis controls for the number of top 25 FBGs and other firms and Business Groups operating in a NIC-3 industry. The analysis also estimates a subsample regression for 2013–2020 to examine the upward trend in the FBG markup during that period, as observed in fig. 5. The fixed effects model that has been estimated is as follows:

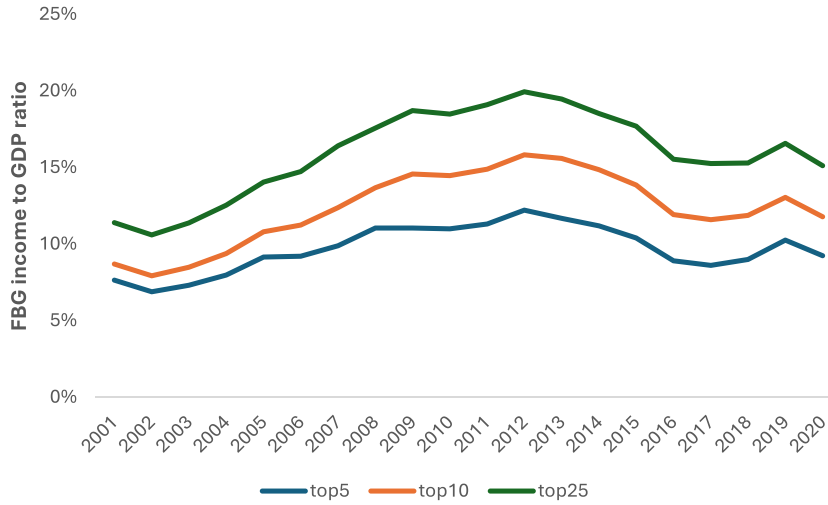
$$MarkupFBG25_{it} = \alpha_i + \delta_t + \alpha_1 CR5_{it} + \alpha_2 BGcount_{it} + \alpha_3 FBGcount_{it} + \epsilon_{it}$$

$MarkupFBG25_{it}$ is the $\frac{sales}{variable\ cost}$ ratio for the top 25 FBGs for an NIC-3 industry i and year t. Here, sales and variable costs are aggregated for all the top 25 FBGs in an NIC-3 industry i and year t. The parameters α_i and δ_t are the panel and time fixed effects, respectively. $CR5_{it}$ is the CR5 ratio of a NIC-3 industry i and year t. $BGcount_{it}$ is the number of firms and business groups other than the top 25 FBGs in a NIC-3 industry i and year t. $FBGcount_{it}$ is the number of the top 25 family business groups in an NIC-3 industry i and year t. ϵ_{it} is the stochastic error in the model. The results are summarized in table 6.

The coefficient on the CR5 measure is positive over the entire analysis period and significant for 2013–2020, indicating a robust positive association between markups and industry concentration at the

[29] This markup is based on a production function estimate that uses log sales as output, log power, fuel and water charges as the variable (free) input, log assets as the state variable and log raw material as the intermediate input. The markups are estimated using the markupest program in STATA.

Figure 6 FBG Income to GDP Ratio (Top 5, 10, and 25 FBGs)



Source: Authors' calculations based on CMIE PROWESS.

NIC 3 level, particularly in the post-2013 period. This association persists even after controlling for the number of top 25 FBGs and the number of other firms and groups operating in a NIC-3 sector. As one would predict, the signs on the latter variables are negative, although in no instance are they statistically significant.

The question arises whether this relationship between the markups of the top 25 FBGs and market concentration applies only to the top FBGs or to other firms and business groups as well. To address this, the analysis estimates the model for all firms and business groups, other than the top 25 FBGs. One finds that the coefficient on CR5 is positive and significant for 2013–2020, but is not significant for the entire period 2001–2020. Furthermore, although there is a significant positive correlation between the non-FBGs' markup and concentration during 2013–2020, the size of the coefficient is roughly one-eighth that of the top 25 FBGs. One can infer from these regression results that the association of concentration and markups is far stronger for the FBGs than for the other firms and business groups.[30]

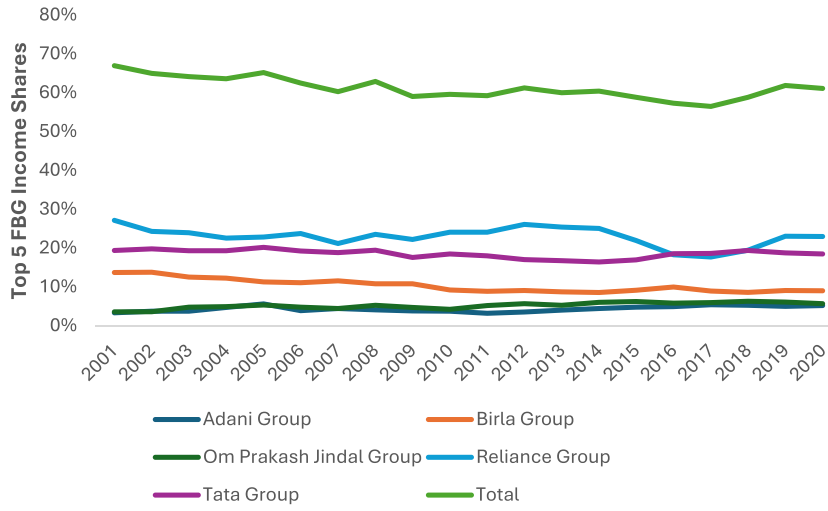
In sum, NIC-3 data make it possible to identify a positive association between market power and markups. These results make it possible to better understand the rising number of high-concentration sectors at the NIC-3 level post-2015, seen in figs. 3 and 4, along with rising markups for the top 25 FBGs, particularly since 2013.

6. Weight of FBGs in the Indian Economy

To get a sense of the evolving place of FBGs in the Indian economy, fig. 6 now relates FBG gross revenues to national income (GDP) for the top 5, 10, and 25 FBGs respectively between 2001 and 2020. In each instance, the shape is that of an inverted-U with shares rising significantly between 2003 and 2012 before falling away thereafter. What is most striking is the scale of FBG activity. At the peak in 2012, the top 25 FBGs' revenues amounted to 20 percent of India's GDP, with the top 5 and 10 accounting for 12 percent and 16 percent respectively. Despite some subsequent decline, between the start of the period and the end, the top 25 FBGs' revenues still went from 11 to 15 percent of GDP with the top 5 and 10 also increasing their shares by between 2 and 3 percentage points. As already noted, these shares are significantly larger than customarily found in the advanced economies, although they are not dissimilar (and in some cases are smaller) than in other Asian economies where business groups are also present.

[30] Results are available on request from the authors.

Figure 7 Top 5 FBG/Top 25 FBG Income Shares



Source: Authors' calculations based on CMIE PROWESS.

To what extent has this upward drift in the gross revenue/GDP share been driven by the top 5 FBGs? Figure 7 is consistent with the study's earlier analysis in showing that the share of the top five FBGs—Adani, Birla, O. P. Jindal, Reliance, and Tata Sons—has moved slightly downwards over the reference period. The individual shares for the top five have also remained rather stable. Nevertheless, the top five still accounted for over 60 percent of the top 25 FBGs' revenues in 2020.

7. Conclusion Statement

Despite continuing market liberalization since 2000 and some evidence of declining concentration as a result, business groups –especially family-owned ones—have retained a leading place in the Indian economy. Explicitly encouraged and favored by public policy, particularly before 1990, these groups have very successfully entrenched themselves. The top 25 FBGs' revenues accounted for $>$ 15 percent of GDP in 2020. Further, there has been limited turnover in their ranks, even in the face of market liberalization. Prominent FBGs—such as Adani and Reliance—are, moreover, widely perceived as actively leveraging their close connections to politicians and exploiting opportunities provided by policy regimes and their loopholes.[31]

This paper has used a unique and rich dataset to analyze the extent of market concentration in India at the aggregate, 2- and 3-digit industry levels, along with the place of business groups in the two decades since 2000. The paper finds that market concentration has indeed been declining during that period, mainly due to policy-induced shrinkage of the public sector. Concentration has also been falling for the private sector and for the FBGs. Thus, at the NIC-3 level, the proportion of industries with low concentration has risen considerably over the period. Nevertheless, a bloc of high-concentration sectors has remained in place, representing more than 40 percent of industries in 2020. Indeed, the largest five firms controlled more than half of the revenues in around 74 percent of NIC-3 industries.

At the same time, business group diversification—a persistent feature of most Indian FBGs—has been increasing rapidly, especially from 2000 to 2010. Much of this diversification has been across, rather than within, sectors. However, the process of diversification—which is still unfolding—has generally not been associated with the simultaneous accumulation of large market shares by FBGs. This may simply reflect

[31] Some recent examples are given in Rajagopalan and Narla (2024).

the limited amount of time that has passed, but it could also point to FBG strategies that give priority to diversification and experimentation in the face of structural changes and the emergence of new sectors.

With respect to market power, the analysis of FBGs' mark-ups indicates that these declined marginally between 2000 and 2013 but then rose sharply, a change strongly correlated with increases in concentration at NIC-3 level. This may also indicate political economy effects. The Indian government in this period has shown a preference for some business groups as "national champions," while FBGs have also been sustained by tariff protection and preferential access to finance and other resources.[32] They may also have gained advantage from their organizational formats. To date, public policy appears to have achieved, at best, limited success in addressing the consequences of this increased concentration for competition, whether in terms of market power in specific sectors or with respect to the level of overall concentration in the economy.

This paper thus signals the need for India to develop new policies in the face of FBG entrenchment. The 2013 Companies Act began to limit the numbers of layers, as well as crossholdings, of FBGs, but the scope of these limits was circumscribed and enforcement has been weak. In addition, raising the level and intensity of competition—rather than continuing to favor incumbent FBGs—must be a central component in promoting market liberalization. This requires promoting entry along with the withdrawal of tariff and non-tariff protection, especially in high-concentration industries. Even so, although there is clear scope for competition policy to be used to address market power in individual sectors, this can be only a part of the policy menu. By itself, such policy will not be able to address institutional failures—for example, in capital markets—that may continue to be a reason for the persistence of the business-group format. Moreover, it will do relatively little to address the level of *overall* concentration in the Indian economy. A more radical approach that sets specific limits to the maximum market share that a business group can hold could be considered. Once a specified level is reached, existing firms would have to divest to ensure that the thresholds are not exceeded. Needless to say, this would require some reversal of the strong preference for FBGs and concentrated interests that has marked Indian public policy for many decades.

More generally, to address the powerful incumbency advantages and the dampening consequences for competition and innovation, policy in developing countries needs to address the incentives for businesses to operate as business groups. In fact, a number of countries have sought to implement such policies, but to date, as in India, experience suggests that although prohibitions and taxation can help on occasion, they are not always effective. But there are some lessons from a few successful experiences (Hamdani, Kosenko, and Yafeh 2021; Commander and Estrin 2022). For example, Israel has used prohibitions, limiting the potential for pyramidal structures by reducing the number of layers in business groups to two while banning simultaneous control of financial and non-financial firms within a business group. High inheritance or successor taxes—a policy that was started in Japan and, more recently, introduced in South Korea—also seem to be promising. These act to significantly lower the incentives for maintaining family business group structures. Given the widespread prevalence of business groups in many developing countries, the need for specific policies to address their entrenchment as well as the strengthening of competition policies more generally, has wider salience than in India alone.

Data Availability Statement

The data underlying this article were provided by CMIE Prowess (2023) under license. Data will be shared on request to the corresponding author with the permission of CMIE. The summary data generated for figures and the Stata do-file used for analysis are provided in Commander et al. (2025).

Appendix A1: Details of Top 25 Family Business Groups and Business Groups in 2019–20

[32] See Acharya (2023).

Appendix A2: Concentration Ratios and Herfindahl-Hirschman Indices

The following is the methodology for generating concentration ratios and Herfindahl-Hirschman indices:

Table A1.1 Top 25 Family Business Groups and Business Groups in 2019–20

S. no	Family business groups	Business groups
1	Reliance Group	Reliance Group [Mukesh Ambani]
2	Tata Sons	Tata Sons
3	Birla Group	Birla Aditya Group
4	Om Prakash Jindal Group	Om Prakash Jindal Group
5	Adani Group	Larsen & Toubro Group
6	Mahindra & Mahindra Group	Adani Group
7	Essar (Ruia) Group	Mahindra & Mahindra Group
8	Bharti Telecom Group	Essar (Ruia) Group
9	Vedanta Group	Bharti Telecom Group
10	Bajaj Group	Infosys Ltd.
11	Hinduja (Ashok Leyland) Group	Vedanta Group
12	WIPRO Group	Bajaj Group
13	HCL Group	Hinduja (Ashok Leyland) Group
14	T.V.S. Iyengar Group	WIPRO Group
15	Rajesh Exports Ltd.	HCL Group
16	Hero (Munjals) Group	T.V.S. Iyengar Group
17	UB Group	Rajesh Exports Ltd.
18	RPG Enterprises Group	I.T.C. (F) Group
19	Murugappa Chettiar Group	Hero (Munjals) Group
20	Future Group	Reliance Group [Anil Ambani]
21	Shapoorji Pallonji Group	UB Group
22	Ruchi Group	RPG Enterprises Group
23	J.K. Singhania Group	Murugappa Chettiar Group
24	Godrej Group	Future Group
25	Piramal Group	Shapoorji Pallonji Group

Source: Authors' calculations based on CMIE PROWESS.

- Concentration Ratio and Herfindahl-Hirschman indices for a year: the data are collapsed so that all activities of a business are aggregated for each year. To calculate the CR5, businesses are ranked yearly based on their total income. The share of income of the top five businesses is then calculated each year. The Herfindahl-Hirschman is calculated using the following formula:

$$HHI_t = \sum_{i=i}^{n} s_{it}^2$$

Here, s_{it} is the share of the i^{th} business in the aggregate income of year t, assuming that there are n businesses.

- Concentration Ratio and Herfindahl–Hirschman Indices at NIC-2 level: The data are collapsed so that all activities of a business are aggregated at the NIC-2 level. The businesses are then ranked for each year within each NIC-2 level. The share of the total income of the top five businesses is calculated for each NIC-2 level to generate the concentration ratio. Using the same data, the Herfindahl-Hirschman index is calculated separately for each NIC-2 level.
- Concentration Ratio and Herfindahl–Hirschman Indices at NIC-3 Level: The business-concentration ratios are calculated so that they are ranked for each year within each NIC-3 level. The share of the total income of the top five businesses is calculated for each NIC-3 level to generate the concentration ratio. The Herfindahl-Hirschman index is calculated separately for each NIC-3 level.

The study also calculates the total income shares of the top 5, top 10 and top 25 Family Businesses based on the same methodology. The only difference is that instead of generating income ranks for all businesses, the analysis does this only for the list of the top 25 Family Businesses.

Appendix A3: HHI Decomposition

HHI_{total} is the Herfindahl–Hirschman index for the entire economy:

$$HHI_{total} = \sum_i \sum_j \left(\frac{I_{ij}}{\sum_i \sum_j I_{ij}} \right)^2$$

I_{ij} is the income of firm j in sector i.

$$HHI_{i=} \sum_j \left(\frac{I_{ij}}{\sum_j I_{ij}} \right)^2$$

HHI_i is the Herfindahl–Hirschman index for sector i.

$$HHI_{total} = \sum_i \sum_j \left(\frac{I_{ij}}{\sum_i \sum_j I_{ij}} \right)^2$$

$$HHI_{total} = \sum_i \sum_j \left(\frac{\sum_j I_{ij}}{\sum_i \sum_j I_{ij}} \right)^2 \left(\frac{I_{ij}}{\sum_j I_{ij}} \right)^2$$

$w_i = \frac{\sum_j I_{ij}}{\sum_i \sum_j I_{ij}}$ is the share of sector i's income in the income of the entire economy.

$$HHI_{total} = \sum_i \sum_j (w_i)^2 \left(\frac{I_{ij}}{\sum_j I_{ij}} \right)^2$$

$$HHI_{total} = \sum_i w_i^2 \sum_j \left(\frac{I_{ij}}{\sum_j I_{ij}} \right)^2$$

$$HHI_{total} = \sum_i w_i^2 HHI_i$$

$$HHI_{total} \equiv HHI_T$$

Analysing the change in HHI_{total} between period $t+1$ and t:

$$\Delta HHI_{Tt} = HHI_{Tt+1} - HHI_{Tt}$$

$$\begin{aligned}
\Delta HHI_{Tt} &= \sum_i w_{it+1}^2 HHI_{it+1} - \sum_i w_{it}^2 HHI_{it} \\
&= \sum_i (w_{it+1}^2 HHI_{it+1} - w_{it}^2 HHI_{it}) \\
&= \sum_i \left(w_{it+1}^2 HHI_{it+1} + w_{it}^2 HHI_{it+1} - w_{it}^2 HHI_{it+1} - w_{it}^2 HHI_{it} \right) \\
&= \sum_i \left[\left(w_{it+1}^2 - w_{it}^2 \right) HHI_{it+1} + w_{it}^2 \left(HHI_{it+1} - HHI_{it} \right) \right] \\
&= \sum_i \left[\left(w_{it+1} + w_{it} \right) \Delta w_{it} HHI_{it+1} + w_{it}^2 \Delta HHI_{it} \right]
\end{aligned}$$

- ΔHHI_{it} is the change in sectoral HHI for sector i.
- Δw_{it} is the change in the weight of sector i in the economy.

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