Business Group Spillovers

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We compare the investment of standalone firms across regions after a positive shock to the investment opportunities generated by a large-scale highway development project. We show that the standalones' investment sensitivity is lower in regions with a higher density of business groups in the local area. We investigate mechanisms driving our results and find support for a financing mechanism whereby banks allocate capital preferentially to group-affiliated firms in responding to the increase in credit demand. Overall, our study documents that business groups have spillover effects on standalone firms. (*JEL* G32, G34)

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Business groups are present in many countries, and, in some of them, they dominate the corporate landscape.[1] Concerns about the effect of business groups on the economy date back to at least the early twentieth century. Kandel, Kosenko, Morck, and Yafeh (2019)

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[1] See Faccio and Lang (2002) and Claessens, Djankov, and Lang (2000) for evidence on the prevalence of business groups in Western European and East Asian countries, respectively.

describe the presence and subsequent disappearance of business groups in the United States between the 1920s and 1950s and document the government's concern that business groups wielded outsized market power and impeded competition. The United States is not the only case. Dau, Morck, and Yeung (2020) survey historical accounts for a broad cross section of countries and argue that business groups' presence hampers economic growth.

More recently, in the 1990s, the South Korean conglomerates, or *chaebols*, were perceived to inhibit the growth of small- and medium-sized firms because, among other things, most of the finance available was directed to these business groups.[2] An even more recent example comes from Israel, where legislation was passed to limit the size and influence of business groups (Bebchuk 2012; *Haaretz* 2012; *Times of Israel* 2013).[3]

The arguments advanced in the literature and policy debates suggest that business groups may impact the economy through their effect on nonaffiliated firms. However, systematic empirical evidence on this issue is lacking. In this paper, we study this issue and examine whether business groups affect standalone firms' behavior, specifically, their investments.

Business groups can affect investments by standalone firms through a variety of channels. For example, if business groups have preferential access to bank capital, they can crowd out financing to standalone firms. Alternatively, if business groups are better at quickly seizing investment opportunities, they can increase industry capacity and reduce the attractiveness of further investments by standalone firms.

Because our focus is on studying the effect of business groups on standalone firms, the empirical methodology compares standalone firms in regions with high business group prevalence to standalone firms in regions with low business group prevalence. A key challenge in this comparison is the difficulty in controlling for investment opportunities. If these opportunities varied with business group prevalence, we would not be able to isolate the impact of business group prevalence from differences in investment opportunities (omitted variable bias). For this reason, instead of comparing the investment of standalone firms in regions with different levels of business group prevalence, our approach is to identify an investment opportunity shock that plausibly affects

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2 See, *Financial Times* (1998) for a discussion of these issues.

3 Hamdani, Kosenko, and Yafeh (2021) describe similar attempts to dismantle business groups in other countries.

these regions equally and examine changes in investment by standalone firms.[4]

We focus on India, where there is significant variation in business group prevalence across regions and use a large-scale highway development project (called Golden Quadrilateral, henceforth GQ) as a shock to the investment opportunities for firms that lie along the road network. The project involved upgrades to the 5,800-kilometer highway system that connects the four major cities of Delhi, Mumbai, Chennai, and Kolkata, making it the fifth-longest highway in the world.[5] This program required significant investments by the government and represented an important infrastructure improvement for India.

The upgrade of the GQ road network led to improved inventory efficiency and input sourcing by manufacturing firms located along the GQ road network (Datta 2012). In addition, the road upgrade also increased access to other regional markets for firms located along the network (Asturias, García-Santana, and Ramos 2016). Indeed, we show that firms' total factor productivity increased after the road upgrade. We also show that there was a significant increase in the total investment even beyond infrastructure-related industries following the commencement of road upgrades. The magnitude of this increase is substantial, with the average firm increasing its investments by 6% of total assets. Taken together, the evidence suggests that the road upgrade constituted a positive shock to investment opportunities for firms that lie along the road network.

Equipped with this shock, we turn to our main tests. We compare the investment by standalone firms around the shock as a function of the degree of business group prevalence in their local economies. We proxy for group prevalence by using the ratio of assets owned by all business-group-affiliated firms to assets owned by all firms in each region and split regions by business group shares. We find that the increase in investment is lower for standalone firms in high-business-group share regions compared to investments by standalone firms in low-business-group share regions.

This empirical strategy of comparing standalone firms across regions sidesteps issues related to the comparability of firms with different

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4 An alternative methodology would be to use exogenous variation in the level of business group prevalence. Indeed, such variation is possible to find. Larrain, Sertsios, and Urzúa I (2019) use industry shocks that lead to the breakup of business groups. Also, sometimes groups are partially dismantled due to a family feud. However, this type of variation cannot be used to address questions about the economywide role of business groups since it usually only affects a small set of firms and hence will have a negligible impact on the aggregate level of business group prevalence.

5 In particular, it sought to upgrade highways to international standards of four- or six-laned, dual-carriageway highways with grade separators and access roads. The road network connected as part of the GQ program represented 4% of India's highways in 2002, and the upgrade work raised this share to 12% by the end of 2006.

organizational structures. A vast literature in finance is interested in comparing standalone firms with business group firms (Faccio, Morck, and Yavuz 2020; Faccio and O'Brien 2021; Santioni, Schiantarelli, and Strahan 2020). The concern with this approach is that characteristics that influence the choice of organizational form might also be correlated with the outcomes of interest. These papers mitigate this concern using propensity score matching and exogenously failed control block transactions. Such an issue does not arise in our setting, as we compare standalone firms in one region to another.

Admittedly, there are potential threats to our identification. First, standalone firms across these regions might be different. Second, beyond firm-level differences, there could be regional differences across high- and low-business-group share areas that might instead explain our findings. Finally, the intensity of the investment opportunity shock itself might vary by region, which could drive the differential investment response by standalone firms across regions.

We address these concerns by comparing firm and regional characteristics, finding that they are similar across regions with varying levels of business group prevalence. To further alleviate concerns that regional differences other than business group prevalence might be operative, we show that our results are quantitatively similar in horse race regressions that control for important regional characteristics. To explore potential differences in the intensity of the shock, we gather survey evidence on the physical condition of the road, finding that ex-ante road quality was similar across regions with varying levels of business group prevalence. Further, we show that the average firm invests similarly in high- and low-business-group share regions. Finally, we show that stock price reactions to new plant announcements by standalone firms around the GQ upgrades are positive but similar across regions with varying levels of business group prevalence. Overall, these tests provide support for the identifying assumptions of our empirical strategy.

We next proceed to shed light on potential mechanisms driving the investment behavior of standalone firms. Our results on the average investment being similar, together with the baseline result on standalone investment, suggest a composition effect, with the investment of group-affiliated firms making up for the lower investment of standalone firms in high-business-group regions. We consider four mechanisms that can explain this pattern. First, business groups and standalone firms compete for factors of production, capital, and labor, with group-affiliated firms having an advantage over standalone firms in securing them. Indeed, we find evidence that banks preferentially allocate capital to business group firms. Using a novel hand-collected loan-level data set, we show that banks with significant preexisting lending relationships with business group firms reduce their supply of capital to standalone firms after controlling for any firm-level determinants of credit demand. This preference could be because it might be safer for banks to lend to group affiliates (Almeida, Kim, and Kim 2015; Gopalan, Nanda, and Seru 2007) or banks may find group affiliates more attractive than standalone firms as lending to one member in the group can generate demand for the banks' services from other members in the group. At the same time, we note that our data do not allow us to study changes in labor market conditions. Hence, it remains possible that the lower investment of standalone in high-business-group share regions is driven by their difficulty in finding labor required for the increased capital.

The second mechanism we consider is that group-affiliated firms in regions with greater business group prevalence crowd out demand for standalone firms' output in product markets. Investment by group-affiliated firms may increase industry capacity and reduce the attractiveness of further investment by standalone firms. To provide evidence for this mechanism, we focus on industries that do not rely on local demand, namely manufacturing and high-exporting industries, where crowding out of demand is unlikely to be operative. We find that our main results hold in these subsamples and are quantitatively stronger. Together, these results suggest that crowding out of demand by group-affiliated firms is quantitatively unimportant, at least in these settings.

Third, another mechanism that could be operative is that group-affiliated firms can seize investment opportunities faster than standalone firms and that these opportunities have a "winner-takes-all" aspect to them. In such cases, investments by group-affiliated firms can crowd out investments of standalone firms in high-business-group share regions. To provide evidence on this mechanism, we utilize a regulation whereby manufacturing of certain products was reserved for production by smaller firms, likely standalone firms, and hence crowding out by business group affiliates was unlikely in these products. In our estimations, we find that the baseline effect is present even in those industries where business group firms are less likely to be allowed to invest. While we cannot completely rule out that in every industry group affiliates crowd out investment opportunities of standalone firms, the fact that, in settings with reduced scope for such crowding out, the results are equal or stronger than the baseline suggests that crowding out of demand by group-affiliated firms is quantitatively unimportant.

Finally, we consider a fourth mechanism whereby business groups have better political connections than standalone firms and hence can obtain preferential access to government contracts. Focusing on the subsample of infrastructure-related industries, we find suggestive evidence that the presence of politically connected business groups depresses standalone investments. However, we cannot establish whether political connections operate in other industries.

We perform several robustness tests to show that our baseline result of lower investment by standalone firms in high-business-group share regions holds up under different specifications. First, we show robustness to alternative definitions of our business group share measure. Second, we address the concern that firm exits might drive lower investment. While we do not observe exits in our sample, we use proxies for exit and show that dropping firms that stop reporting financial data and those with extremely large negative sales growth does not alter our baseline results. Finally, we also show that changes in the regional composition of firms, either through firm entry or through mergers and acquisitions, do not explain our findings.

Our paper is relevant to the large literature on business groups and conglomerates on several fronts. First, prior literature has often focused on examining conglomerates in isolation (Almeida, Kim, and Kim 2015; Gopalan, Nanda, and Seru 2007; Hoshi, Kashyap, and Scharfstein 1991). These studies provide convincing evidence of the functioning and efficiency of internal capital markets. However, they are silent about the effect of business groups on standalone firms. Our study sheds light on a spillover in the economy wherein business groups inhibit the growth of standalone firms by reducing their investment.

Second, we provide empirical support for the prediction from Almeida and Wolfenzon (2006) that the presence of business groups reduces the supply of capital to standalone firms. However, the policy implications of our study are unclear. It could very well be the case that standalone firms are inefficient, and thereby any reallocation away from them may improve the capital allocation in the overall economy. Given this, more research is needed to ascertain whether business group prevalence can improve or hurt capital allocation in the economy.

In general, better knowledge of the mechanisms will help determine whether the aggregate effect of these spillovers is positive or negative. For example, if business groups reduce investments by standalone firms because productive group affiliates can seize investment opportunities faster, then the policy implication would be to promote business group presence. While our paper takes a modest step towards documenting specific mechanisms at play, further research can improve our understanding of the aggregate effects of the spillovers we document.

Finally, our paper is also related to the literature examining the impact of highway infrastructure on local economic activity. Chandra and Thompson (2000) study the impact of U.S. interstate highways and show that they have a differential impact on nonmetropolitan areas across industries and affect the spatial allocation of economic activity. In the context of GQ, Datta (2012) finds that firms in cities that lie along the routes of the upgrade benefited significantly from the improved highways. Further, these firms increased inventory efficiency due to lower transportation obstacles to production and access to efficient suppliers. Ghani, Goswami, and Kerr (2014) show that the upgraded GQ network substantially impacted the growth of manufacturing activity. While our findings are highly complementary, our goal is not to study the effect of GQ per se but to use it as a shock to investment opportunity and examine the investment behavior of standalone firms as a function of the prevalence of business group firms.

1. Background about the Golden Quadrilateral

India has the second-largest road network in the world.[6] National highways are critical to this road network and play a significant role in regional trade while carrying nearly half of the total road traffic volume. At the end of the 1990s, India's highway network was in a state of disarray marked by poor connectivity, sub-par road conditions, and congestion, with limited lane capacity. Poor road surface conditions, frequent stops at state borders for tax collection, and increased demand from growing traffic all contributed to congestion, with 25% of roads categorized as congested (World Bank 2002).

To tackle these issues, the Government of India (GoI) launched the National Highways Development Project (NHDP) in 1998, intending to improve the performance of the highway network. We study the upgrade of the 5,800-kilometer highway system called the Golden Quadrilateral, which connects the four major cities of Delhi, Mumbai, Chennai, and Kolkata, making it the fifth-longest highway in the world.[7] Initially approved in 1998, many segments of the project started only as late as 2001. These delays in the start of construction led to differences in completion.[8] The construction was complete for a significant portion of

[6] It consists of expressways, national highways, state highways, and major district and rural roads. Taken together, these roads carry close to 65% of freight in terms of weight.

[7] The GQ work involved upgrading highways to international standards by incorporating features of high-quality highway systems such as expanded lane capacities, dual-carriageway highways with grade separators, overbridges, bypasses, and access roads. This upgrade raised the share of highways to 12% of the road network by the end of 2006. In comparison, highways constitute about 5% of the road network in developed economies such as the United States and Japan and 13% in the United Kingdom (World Road Statistics 2009).

[8] The junior Highways Minister, Tushar Chaudhary, told the Parliament that "Projects have been delayed mainly due to problems associated with land acquisition, shifting of utilities, obtaining environment and forest clearance, approval for a road over bridges, poor performance of some contractors due to cash flow constraints and law and order problems in some states." (*Economic Times* 2013)

the segments by the end of 2006, but minor work on additional phases of the project continued even as late as 2009.[9]

To complete the GQ upgrades, 128 separate contracts were awarded. Most of the construction involved public-private partnerships and the cost was to be recovered by levying a tax of INR 1 on petrol and diesel. A significant portion of the funding came from the federal government, the remainder from multilateral financing agencies such as the Asian Development Bank and the World Bank (WB).[10] Therefore, road construction by itself did not impose constraints on the banking system.

Figure 1 illustrates the time variation in the start year of the construction along the four major segments of the GQ road network, with the height of the bar corresponding to the number of subsegments. As the figure shows, the bulk of construction is concentrated between 2000 and 2006, with no major differences in the timing of construction among the four segments. Figure 2 shows the geographical variation of various segments over the start year of construction. Panels (a) to (d) of the figure display the evolution of the road network over time. We see a significant increase in construction over this period. The median completion time across the 128 contracts was 2.3 years, and the median completed road length was 50 kilometers. As we explain below, this variation in the commencement of road construction for cities located on the GQ road network is central to our empirical strategy.

The most direct benefit from upgraded connectivity is a significant reduction in transportation costs and improved market access for firms to other regional markets (Asturias, García-Santana, and Ramos 2016).[11] Datta (2012) finds that immediately after the upgrades commenced, there are improved inventory efficiency and input sourcing by manufacturing firms located along the GQ road network.[12] Ghani, Goswami, and Kerr (2014) show significant output growth and entry in industries initially positioned along the GQ network. We also confirm improvements in inventory efficiency and total factor productivity for firms along the road network after the upgrade.

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[9] A significant portion of construction began in 2001, with a target completion date of 2004.

[10] The federal government contributed about 60% of the financing, while the multilateral agencies contributed 20%; the rest was raised through a variety of new public-private initiatives such as Build Operate Transfer and equity sharing concessionaire agreements. For financing, the federal government created the Central Road Fund through the Central Road Fund Ordinance, 2000 in November of that year. The revenue accrued through levies would form part of the fund, which was used to finance the upgrade of highways.

[11] For other work related to market access, see Alder (2014).

[12] For evidence on significant long-term economic benefits, see Khanna (2014).

In addition to these studies, the benefit in terms of lower transport cost and ability to access new markets is also highlighted in a World Bank report (World Bank 2000):

> The primary benefit of the project is a reduction in transport costs resulting from increased capacity, reduced bottlenecks, separation of local and through traffic in towns and improved pavements. This is directly linked to costs of goods and services, fares, ability to market local products and regional economic development.

The popular press also commented on these benefits for firms located along the GQ network (*Business Today* 2013):

> "We have been able to serve customers faster than before," he says. "This has resulted in a higher number of repeat orders and our entry into newer markets such as Chennai and Bangalore."

Thus, upgrade of the GQ road network is plausibly a positive investment opportunity shock that improved market access and reduced transportation costs for firms that lie along it.

2. Data and Summary Statistics

2.1 Data

GQ construction. We compile information on each of the 128 contracts from the annual reports of the National Highway Authority of India (NHAI) from 1998–1999 to 2013–2014 as well as from the Ministry of Roads, Transport, and Highways. These annual reports identified the project name for the highway stretch, the length of the highway stretch, the national highway number, the start date for the project, cost of the stretch, and financiers of the stretch.

In most cases, the name of the project indicated the start and end cities on a highway stretch along with the highway number. In some cases, the project name was not clear or the city name could not be located. In such cases, we use information on the NHAI website for the highway project chainage and map it to the preceding or succeeding highway stretch.

Firm financials. Our main data source is Prowess, a database maintained by the Centre for Monitoring Economy (CMIE). This data set has been used by a number of prior studies on Indian firms, including Bertrand, Mehta, and Mullainathan (2002), Gopalan, Nanda, and Seru (2007), Mookherjee, Visaria, and von Lilienfeld-Toal (2012), Naaraayanan and Nielsen (2021), and Gopalan, Mukherjee, and Singh (2016). Prowess contains annual financial data sourced from balance sheets and income statements for about 34,000 publicly listed and private Indian firms.

The data cover about 2,000 to 6,000 firms every year with assets plus sales of over INR 40 million. It contains additional descriptive information on the headquarter location, industry classification, the year of incorporation, and group affiliation. We adopt Prowess's group classification to identify whether a firm is affiliated with a business group or not.[13] This group affiliation has been used most notably in Khanna and Palepu (2000) and Bertrand, Mehta, and Mullainathan (2002). We extract data from the latest vintage of Prowess, which is free from survivorship bias, as highlighted by Siegel and Choudhury (2012).

We also take advantage of the granularity of the sales variable. Specifically, Prowess reports revenues and quantity for manufacturing firms at the product level, allowing us to perform sharper tests of our mechanisms and specifically to rule out concerns regarding rival investment opportunities. While the database is rich and provides physical quantities, we do not use it in the paper as they vary substantially in terms of the unit of measurement (e.g., weight, numbers, and volume) within and across firms, thus making comparisons harder. These data are available due to the disclosure requirements imposed by the Companies Act 1956 and, thereafter, the Companies Act 2013.

New plant announcements. Data on new plant announcements are from the CapEx database maintained by CMIE. This data set contains information on new plants announced in India since 1990. Specifically, it provides information on date of announcement, plant location, ownership, project cost, and industry classification. The information is obtained from multiple sources including annual reports, news articles, and government press releases. The database is updated on a daily basis and contains information on the entire project life cycle whenever it is available. Typically, projects costing more than INR 100 million (approximately USD 2 million) are included in the database (Alok and Ayyagari 2020).

Regional banking data. To study the response of aggregate regional lending to GQ upgrades, we use district-level data from the Reserve Bank of India (RBI). Part of the data is downloaded from the RBI's data warehouse webpage, and the other part is hand-collected from the publication "Banking Statistics 1990–2016," available for download as a PDF file on the RBI webpage. Data on bank credit is drawn from the "Database on the Indian Economy," published by the RBI. A data series called "Quarterly Statistics on Deposits & Credit of Scheduled Commercial Banks" provides information on outstanding credit and the

[13] According to Gopalan, Nanda, and Seru (2007), Prowess's broad-based classification is more representative of group affiliation than a narrow equity-based classification. We note that very few firms change their group affiliation in the data.

number of branches of all banks at various regional levels (district level and urban versus rural levels). The data are reported on a quarterly basis.

Loan-level data set. To study banks' credit supply decisions, we introduce a novel loan-level data set that allows us to control for firm-level determinants of credit demand, as in Khwaja and Mian (2008). To do so, we rely on the credit registry at the Ministry of Corporate Affairs (MCA), GoI. The MCA mandates registration of all secured lending as a condition for lenders to invoke their creditor rights. We scrape the data, which contains the firm's name, the name of the lender, the origination amount, the date of initiation of the loan, and when the lending relationship ends. To link this data set to our baseline sample, we perform a time-intensive name-matching exercise described in Internet Appendix A. Internet Appendix Table 1 provides the descriptive statistics for this merged sample.

World Bank Enterprise Survey. We gather regional information on road conditions for firms that lie on the GQ road network. We rely on the survey conducted by the WB just before the GQ upgrade, also used in Datta (2012). It focuses on a random sample of firms in the formal sector, stratified by industry, firm size, and location, that is representative of the nonagricultural economy (World Bank 2009).

Other data sets. We supplement these data sets with information on city and district population from the Population Census of 2001. We collect information on business registration and financial disclosure reporting from the MCA.

2.2 Final sample and summary statistics

From the overall Prowess sample of 1989 to 2016, we exclude all financial firms (NIC code: 641-663), firms owned by central and state governments, firms with negative values of total assets and sales, firms with leverage outside the [0,1] range, and observations with a ratio of investment to lagged total assets greater than 1.[14] In addition, we exclude all firms operating in "other manufacturing industries" (NIC code: 321-329), "coke and refined petroleum products" (NIC code: 191-199), and "construction firms" (NIC code: 420-439). We do so to isolate the effect of GQ upgrades on firms that benefit from market access as opposed to the actual road construction.[15] We exclude firms with sales growth exceeding 100% to avoid potential business discontinuities caused by mergers and acquisitions. Given that accounting data of very small firms are likely to be noisy, we exclude firms with capital, book

[14] Firms with leverage greater than 1 were considered to be bankrupt in India until 2016.

[15] While we omit these industries in our main tests, we focus on infrastructure-related industries to tease out the mechanism in Section 5.4.

assets, and sales with less than INR 2.5 million (around USD 0.03 million) in the previous year.[16]

Table 1 reports descriptive statistics for firms in our sample. Panel A presents descriptive statistics for all firms, while panel B presents descriptive statistics for standalone firms. On average, standalone firms are smaller in size and younger than the average firm. However, standalone firms are similar in terms of other firm characteristics, such as cash flow, profitability, investment, and debt.

3. Empirical Strategy

We study the investment behavior of standalone firms as a function of the prevalence of business groups in their local area. A key challenge in isolating the effect of regional variation in business group prevalence on standalone investment is adequately controlling for all other determinants of investment. Specifically, these determinants can vary systematically across regions with different levels of business group prevalence. For this reason, instead of comparing the investment of standalone firms in regions with different levels of business group prevalence, our approach is to identify an investment opportunity shock that plausibly affects these regions equally and examine changes in investment by standalone firms around such a shock.

An alternative approach to studying this question would have been to exploit exogenous variation in business group prevalence. Indeed, such variation is possible to find. Larrain, Sertsios, and Urzúa I (2019) use industry shocks that lead to the breakup of business groups. Also, sometimes groups are partially dismantled due to family feuds. However, this type of variation cannot be used to address questions about the economywide role of business groups since it usually only affects a small set of firms and hence will have a negligible impact on the aggregate business group prevalence.

3.1 Investment opportunity shock: GQ upgrades

We begin by presenting evidence that the GQ road network upgrade is a plausibly exogenous shock to the investment opportunity of the firms located along the network. We estimate the following parametric model using all firms along the GQ road network:

$$\mathrm{y}_{ijcst} = \alpha_i + \beta \mathrm{PostGQ}_{ct} + \omega_{jt} + \theta_{st} + \eta_{ijcst}, \qquad (1)$$

where subscripts i and t refer to firm and year, respectively, and $PostGQ_{ct}$ is an indicator variable taking a value of 1 for all years

[16] Note that we include all available years with financial data for each firm. In our sample, on average, there are seven observations per firm.

including and after the commencement of the GQ upgrade in the city (Datta 2012). The subscripts j, c, and s refer to industry, city, and state, respectively. Standard errors are corrected for heteroscedasticity and autocorrelation and clustered at the city level (Bertrand, Duflo, and Mullainathan 2004). The parameter of interest is β, which measures the change in the outcome variables of firms in the cities that receive GQ compared to the yet-to-receive cities, conditional on the set of fixed effects.

We identify the firms that benefit from the commencement of the GQ upgrade based on the city of their headquarters and match these cities to highway project stretches. We code firms at both ends of a stretch to be treated at the start of the construction. A typical highway stretch in our sample connects two cities that are around 50 kilometers apart.[17] After applying the sample selection criteria, which drops smaller firms, we are left with 110 stretches (out of the possible 128 stretches) connecting 44 cities with some economic activity. A few cities connect two or more stretches of the highway and in such instances we assign them the earliest start date among all stretches for such cities. Additionally, we treat the adjacent suburbs (Gurgaon, Faridabad, Ghaziabad, and NOIDA for Delhi; Thane for Mumbai) as part of the nodal city (Datta 2012). Overall, the sample of firms in treated regions comprised 72% of total sales in India before the GQ upgrade.

To alleviate concerns that firms along the road network differ from those located away from it, we restrict the sample to firms that eventually receive an upgraded road. Effectively, we employ a specification similar in spirit to a difference-in-differences strategy but exploit only the variation in the timing of construction of highway segments. Thus, at any point in time, the treated firms are those in cities that receive GQ, and control firms are those in cities that are yet to receive GQ.[18]

The empirical specification allows us to rule out concerns about location- and industry-specific effects that may differentially affect firms' investment policies. First, we include firm fixed effects to control for unobserved time-invariant firm characteristics. Second, we include industry-by-year fixed effects that control for time-varying industry shocks (e.g., technical innovation). Finally, since the treatment varies within states, we also include state-by-year fixed effects to control for

[17] Such short distances imply that there are no major cities in the middle of the upgraded segments and hence meaningful economic activity.

[18] We show robustness to recent concerns raised in the literature on staggered difference-in-differences designs by using the imputation estimator suggested in Borusyak, Jaravel, and Spiess (2022). In order to implement these estimations, we expanded our sample to include firms that did not lie along the GQ road network and hence were never treated.

local economic confounds and general policies that affect firms (e.g., regional macroeconomic shocks).

Table 2 reports the results examining changes in total factor productivity (TFP), inventory efficiency, and investment around the commencement of GQ road upgrades. In column 1, we begin by examining the effect of GQ upgrades on productivity, which we measure using the methodology outlined by Levinsohn and Petrin (2003). We find a significant increase in TFP among firms after the GQ upgrade, consistent with the idea that GQ road upgrades significantly raised the marginal product of capital and labor. Further, in column 2, we examine changes to inventory efficiency, which we measure using days sales of inventory, and find that firms that lie along the GQ road network experience a significant reduction around upgrades. This reduction is consistent with anecdotal accounts presented in Section 1 and Datta (2012), documenting improvements in input sourcing and inventory efficiency.

Finally, in column 3, we show that there is an overall increase in investment among firms after the upgrade of the road network. The magnitude of this increase is substantial. Relative to the sample average, this represents an increase of 6%.

The interpretation of β in Equation (1) as the impact of GQ upgrades requires the assumption that the timing of the road construction is orthogonal to the investment opportunities of the firms that lie along the road network. In Appendix B, we confirm the validity of the identifying assumption by (i) ruling out pretrends in investments, and (ii) showing that observable differences in firm characteristics cannot explain the timing of the GQ road upgrade. As a recent survey by Roth and Sant'Anna (2023) points out, such quasi-randomness supports the validity of parallel trends assumption. Further, we rule out concerns about staggered treatment adoption and heterogeneous causal effects using the imputation estimator suggested in Borusyak, Jaravel, and Spiess (2022).

Overall, we establish that GQ upgrades led to significant improvements in firm productivity and increased capital expenditures. Thus, the evidence suggests that we have a plausible shock to the investment opportunity for firms on the GQ road network.

3.2 Standalone investment as a function of business group share

Equipped with the investment opportunity shock, we turn to our main tests, where we examine the extent to which the sensitivity of standalone firm investment to the GQ shock varies with regional business group prevalence. For each city, we compute the share of group-affiliated firms' assets in the year before the GQ road network upgrade. We then define

High BGS as an indicator variable set to 1 if the share of assets is in the top quartile of the distribution.[19] Thus, this measure captures the prevalence of group-affiliated firms at each location.

We estimate the following equation:

$$\begin{aligned} y_{ijcst} = \alpha_i + \beta_1 PostGQ_{ct} + \beta_2 PostGQ_{ct} \times HighBGS + \omega_{jt}, \\ + \mu_{jt} \times HighBGS + \theta_{st} + \gamma_{st} \times HighBGS + \epsilon_{ijcst}. \quad (2) \end{aligned}$$

For these tests, we restrict our attention to standalone firms because the paper aims to examine the association between regional prevalence of business groups and standalone investment.[20] For this reason, the coefficient of interest in Equation (2) is β_2, which measures the change in standalone investment around GQ road upgrades in high-business-group share regions relative to low-business-group share regions, conditional on the set of fixed effects. Put differently, β_2 captures the extent to which the sensitivity of standalone firm investment to the GQ shock varies across high-business-group share regions relative to low-business-group share regions.

As our empirical specification focuses on standalone firms, the endogenous choice of organizational form does not bias the estimates, which is a significant hurdle for papers that compare standalone firms to group-affiliated firms. One might worry that the investment opportunities vary by organizational form; for example, perhaps group-affiliated firms have better networks and access to key market players, allowing them to better capitalize on these opportunities. Given that we compare standalone firms across regions, our setting is devoid of such issues.

Furthermore, our empirical specification flexibly controls for the differential regional impact of industry-year- and state-year-specific effects across high- and low-business-group share areas by interacting *High BGS* with the set of interactive fixed effects.[21] For example, the interaction of industry-year fixed effects with *High BGS* allows for the effect of technological shocks to vary for firms in high- and low-business-group share regions.

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[19] Internet Appendix Figure 2 plots the distribution, specifically the mean and the standard deviation, of group-affiliated firms' asset share in each quartile, supporting the choice of the top quartile as the cutoff for the baseline measure. We also show that the results are robust to alternative cutoffs and using alternative definitions.

[20] In our sample, we have 4,177(1,856) unique firms (standalone firms) in *High BGS* regions and 805(394) unique firms (standalone firms) in *Low BGS* regions.

[21] We do not include time-varying control variables, such as cash flow or profitability, in our empirical specification as they themselves may be affected by the treatment, rendering them "bad controls"(Angrist and Pischke 2008).

4. Main Results and Identification Challenges

4.1 Main results

Table 3 reports the main results of this study. The increase in investments is lower for standalone firms in high-business-group share regions relative to low-business-group share regions, with this difference being statistically significant. In terms of magnitude, we find that standalone investment around the GQ upgrade for firms in the first three quartiles of business group share increase by 0.039 (coefficient on *PostGQ* in column 2), albeit statistically insignificantly, while the standalone investment change for firms in the top quartile (coefficient on *PostGQ* + *PostGQ* × *High BGS* in column 2) is essentially zero. This effect on investment is economically sizeable and represents a 10% decrease in investment relative to the average (panel B of Table 1).

In Figure 3, we plot the evolution of investment sensitivity in event-time for standalone firms in high-business-group share regions relative to low-business-group share regions. We note that all coefficients in the pre-period are close to zero, thereby supporting the assumption that there are no differential pretrends in standalone investments across high- and low-business-group share regions around the GQ upgrade. At the same time, the coefficient estimates including and after year 2 are large, negative, statistically significant, and persistent until 10 years after the highway upgrade. In Appendix C, we document that these estimates are robust to using the imputation estimator suggested in Borusyak, Jaravel, and Spiess (2022), allowing us to rule out concerns about the two-way fixed effects estimator providing biased estimates in cases when the treatment is staggered and in the presence of treatment effect heterogeneity (Goodman-Bacon 2021; Roth, Sant'Anna, Bilinski, and Poe 2023).

Collectively, the results suggest a lower sensitivity of standalone investment to the investment opportunity shock as a function of the regional prevalence of business groups.

4.2 Identification challenges

Admittedly, there are potential threats to our identification. First, differences in standalone firm characteristics across these regions might explain the differential investment response. Second, as business group shares are not randomly assigned, one may worry that regional differences might instead explain our findings. Finally, the intensity of the shock itself might vary by region, thus leading to differences in investments. We address these concerns below in detail.

4.2.1 Firm and regional differences. We begin by comparing firm-level characteristics of standalone firms across high- and low-business-group share regions. Panel A of Table 4 presents the results. We find no differences in the mean and median for profitability, investment, debt, cash flow, and assets. Importantly, since one of the main documented benefits of the road upgrade is to improve inventory efficiency, we also test whether firms are similar in this regard before the shock.[22] We find that this is the case. At the same time, we find a significant difference in the average (but not in median) TFP among standalone firms across regions, with standalone firms in *High BGS* regions having higher productivity compared to standalone firms in *Low BGS* regions. If anything, this difference would bias against finding a lower investment sensitivity in high-business-group share regions. Nonetheless, we address the general concern about differences in productivity more directly through horse race regressions, as explained below.

Another concern might be that regional differences instead explain our findings. To mitigate such a concern, we compare ex-ante regional characteristics across high- and low-business-group shares in panel B of Table 4. We begin by comparing financial development across regions and find no statistical differences in the number of bank branches per capita or the fraction of listed firms. We also compare the physical infrastructure and find no difference in the rating that firm managers assign to roads or in the frequency with which they consider transportation an obstacle to growth. Finally, we compare labor market conditions. Before the GQ upgrade, a similar fraction of managers report facing constraints in hiring labor on a contractual basis, and there are no differences in the frequency of managers reporting labor as an obstacle to firm growth. Further, we do not find differences in the time to fill vacancies for managers at these firms.

An alternative approach to mitigating concerns that regional differences other than business group prevalence might explain our findings, is to run horse race regressions that control for important regional characteristics that may instead explain them. In addition to *PostGQ* $\times$ *High BGS*, the empirical specification includes interactions between *PostGQ* and *High Listed Share*, *High Firm Age*, and *High TFP*. We use the same procedure as in *High BGS* to construct these variables and define these characteristics using all firms and only standalone firms in panels A and B of Table 5, respectively. Defining these characteristics using all firms (business group affiliates and standalones) accounts for the possibility that business group share proxies for other regional

[22] Inventory efficiency is measured by days sales of inventory. Fewer days sales of inventory suggest that firms quickly convert inputs to sales. Such conversion can come about either due to a reduction in costs, switching to efficient suppliers, or access to new markets.

characteristics, and the definition based on standalone firms accounts for the possibility that standalone firms in high- and low-business-group share regions are different. As in our main results (Table 3), we focus on standalone firms and their investment in these regressions.

Controlling for these additional interactions does not affect the statistical and economic significance of *PostGQ* × *High BGS*. Specifically, interactions of *PostGQ* with *High Firm Age* and *High TFP* are statistically insignificant across both definitions and do not qualitatively affect the coefficient on *PostGQ* × *High BGS*.[23] Importantly, even though there was a significant difference in total factor productivity of standalone firms 1 year before GQ (Table 4), we note that controlling for interactions with TFP does not alter our baseline findings.

The coefficient on *PostGQ* × *High Listed Share* is negative and statistically significant in some specifications. Even in these cases, the coefficient on *PostGQ* × *High BGS* is essentially unchanged and remains statistically significant. The result that the inclusion of *PostGQ* × *High Listed Share* does not affect the significance and magnitude of our coefficient of interest is not surprising given that there is a very small correlation between business group share and the fraction of listed firms ($\rho = -0.09$), suggesting that they are orthogonal to each other.

Overall, these tests mitigate concerns that differences in either firm or regional characteristics drive the lower sensitivity of standalone investment to the investment opportunity shock.

4.2.2 Varying shock intensity by business group share. A second potential threat to identification relates to the differential intensity of the shock across regions. For example, if the ex-ante road quality is poorer in some of these regions, then the GQ upgrade would constitute a larger shock to investment opportunities for the firms in those regions.

To rule out such a possibility, we gather evidence from the World Bank Enterprise Survey on the quality of roads, which we show is similar ex-ante across high- and low-business-group share in panel B of Table 4. Further, we read project documents from the NHAI and World Bank and found that the ex-post road quality, such as the number of lanes, road strength, and materials used, are similar for all stretches of the GQ upgrade.

Another implication of the shock intensity being equal across regions is that the average firm invests the same amount around GQ upgrades. To examine this, we estimate Equation (2), our primary test, on the entire

23 In Internet Appendix Table 4, we show that the results are qualitatively similar if we use firm size instead of firm age in these regressions.

sample of firms, reported in column 1 of Table 6 and find that this is indeed the case. In column 2, for comparison, we show our baseline result that standalone firms invest less in high-business-group share regions. Moreover, in column 3, we focus on the sample of group-affiliated firms, finding that the average group-affiliated firm invests more in regions with a high business group share. This effect is economically small and statistically significant only at the 10% level.

Additionally, we use stock price reactions to new plant announcements by standalone firms to assess investors' views on the value of new investment around the GQ upgrade. We obtain data on new plant announcement dates, their location, and the capital invested from the CapEx database maintained by CMIE. The database typically captures large plants, approximately USD 2 million. In panel A of Internet Appendix Table 5, we show that the stock price reactions to new plant announcements initiated after the GQ upgrade are positive and larger than before the GQ upgrade. This increase in value is consistent with improved investment opportunities for firms after the GQ upgrade. Importantly, this positive reaction is similar for standalone firms across high- and low-business-group share regions. One interpretation of this evidence is that, while investors perceive the investment opportunities around GQ upgrades to be positive, they do not perceive them to vary by business group prevalence, suggestive of similar investment opportunities. Admittedly, the stock price reaction is also a function of the investment size. For this reason, we control for investment size in panel B and obtain essentially the same results.[24]

Further, as discussed in Section 1, an important component of the investment opportunity shock is improved inventory efficiency and input sourcing (Datta 2012; Hesse and Rodrigue 2004; Li and Li 2013; Redding and Turner 2015; Shirley and Winston 2004). In Internet Appendix Table 6, we show that this is indeed the case, finding that there are significant improvements to inventory efficiency. Importantly, we show that the improvement is similar for standalone firms across regions with varying levels of business group share. Admittedly, there could be other determinants of inventory efficiency beyond road quality. For this reason, we take these results as suggestive evidence for a similar investment opportunity shock.

Together, our evidence suggests that the intensity of the shock was similar across regions with varying levels of business group share, thus mitigating concerns about such differences driving the lower sensitivity of standalone investment to GQ upgrades.

[24] The number of observations differs between the panels due to missing information on project costs. Note that we refrain from including project size directly in the regressions as a control variable as it is a function of the investment opportunity shock, rendering it a "bad control."

5. Exploring Potential Mechanisms

So far, we have shown that standalone firms have lower investments in regions with a high-business-group share. In addition, we showed in Table 6 that the average investment by firms in high-business-group share regions is similar to the average investment by firms in low-business-group share regions. These results suggest a composition effect, with group-affiliated firms making up for the lower investment of standalone firms in high-business-group regions.

One possible explanation for this pattern is that business groups and standalone firms compete for factors of production, with group-affiliated firms having an advantage over standalone firms. Another explanation for the lower investment by standalone firms in high-business-group share regions is that business group firms in these regions crowd out demand for standalone firms' output in product markets. Moreover, it could be the case that group-affiliated firms are more adept at seizing investment opportunities sooner and that these opportunities have a "winner-takes-all" aspect to them. In such cases, group-affiliated firms can crowd out investments of standalone firms in high-business-group share regions. Finally, the lower investment can instead be driven by business groups with better political connections than standalone firms, allowing them to obtain preferential access to government contracts. In the subsequent sections, we test these mechanisms and present the plausible assumptions and caveats for each of these mechanisms to be operative. Therefore, the evidence presented in these tests is suggestive and not conclusive.

5.1 Factors of production

In this section, we focus on the allocation of bank capital as a possible driver of the lower investment sensitivity. First, we document an equal increase in bank lending around the GQ upgrade across high- and low-business-group share regions. Second, we show that banks with significant lending exposure to group affiliates reduce lending to standalone firms, a result that holds after controlling for firm-level determinants of credit demand. Together, these results suggest that banks have a preference for lending to group affiliates at the expense of standalone firms.

We begin by examining whether banks directed lending differentially across high- and low-business-group share regions around the GQ upgrade. To do so, we compile data from the RBI and compare aggregate bank lending across regions with varying business group prevalence.[25] We present results in Table 7. From columns 1 and 2, it is evident

[25] Note that we focus on districts instead of cities for these tests, as the RBI only provides aggregated data at the district level.

that around the GQ upgrades, districts along the GQ road network experienced an increase in overall bank lending. That is, banks respond to an increased demand for funds by allocating capital to regions that experience increased investment opportunities.[26] Importantly, columns 3 and 4 show no differential bank lending patterns across high- and low-business-group share regions. These results show that while there is an increase in credit supply, such an increase is similar for regions with varying levels of business group prevalence.

Next, we test whether banks direct their scarce funds towards business group affiliates in response to the increase in demand for financing, thereby crowding out lending to standalone firms. A simple comparison of bank lending to group affiliates and standalone firms is insufficient to establish banks' preferences because it might be that these organizational forms differ in their demand for credit. For this reason, we control for firm-level determinants of credit demand using an empirical specification similar in spirit to Khwaja and Mian (2008). The idea of the test is to assess whether the same standalone firm borrowing from two different banks—one with significant lending to exposure to group affiliates and the other without— borrows less from the more exposed bank after the shock. Specifically, we estimate the following loan-level equation using time-collapsed loans to standalone firms:

$$\Delta L_{ib} = \alpha_i + \beta_1 \mathit{Group\ exposure}_b + \eta_{ib}, \tag{3}$$

where i stands for firm and b stands for bank. ΔL_{ib} is the change in the average loan amount to standalone firms 5 years after relative to 5 years before the GQ upgrade. The variable, *Group exposure*, is defined for each bank as the total lending to group affiliates before the start of the GQ upgrade. Importantly, the empirical specification includes firm fixed effects that control for firm-level determinants of credit demand. Further, group exposure and changes in lending might be correlated for each bank, and hence we conservatively cluster standard errors at the bank level (Khwaja and Mian 2008).

As Prowess does not contain data on loan amounts lent to firms by banks and financial institutions, we resort to hand-collecting a novel loan-level data set from the credit registry at the MCA to implement this specification. The MCA mandates registration of all secured lending as a condition for lenders to invoke their creditor rights. The name match between Prowess and the loan-level data set yields 2,430 loans to 302 unique firms from 140 lenders. Further, the empirical specification imposes a stringent requirement that the standalone firms borrow from

[26] Our results are consistent with recent work showing that financing responds to large infrastructure investments and helps spur real economic outcomes (Agarwal, Mukherjee, and Naaraayanan 2022; Das, Ghani, Grover, Kerr, and Nanda 2019).

multiple banks both before and after the GQ upgrade. Such a restriction leads to the final sample consisting of 163 loans to 17 unique firms from 15 unique lenders.

As we rely on firms borrowing from multiple lenders, we find that, relative to the sample of firms in our baseline regressions, the firms in the loan-level data set are larger and older, have higher cash flow and profitability, are more likely to be listed, have higher investment rates, and borrow more (Internet Appendix Table 1). We also note that there is substantial variation in the *Group exposure* amount, as suggested by the coefficient of variation of 1.15.

Table 8 presents estimates from the loan-level regressions as laid out in Equation (3). Column 1 finds that banks with significant lending exposure to business group firms before the GQ upgrade reduced their lending supply to standalone firms after the investment opportunity shock. In column 2, we weight the regressions by the average firm size, measured before the GQ upgrade, to ensure that firm-level determinants correlated with firm size do not drive our estimates. In terms of economic magnitude, a one standard deviation above the mean increase in *Group exposure* amount leads to a 18.5 (19.1) percentage point reduction in the loan growth rate around the GQ upgrade. Together, these results support the view that banks with significant preexisting lending relationships with group-affiliated firms reduce their capital supply to standalone firms.[27]

Note that the empirical specification only uses information on the location of the standalone firms to determine the timing of loan issuance relative to that of GQ upgrades and not for classifying the location based on business group prevalence. As such, this test suggests that the average standalone firm, regardless of its location in a high- or low-business-group share region, experienced a reduction in the supply of credit from exposed banks. Therefore, this specification alleviates concerns about unobserved characteristics of *High BGS* regions driving standalone firms' lower investment sensitivity. At the same time, by controlling for firm-level determinants of credit demand, these results are also not subject to the concern that the intensity of the investment opportunity shock differs across regions.

Our tests show that banks reduce the supply of credit to standalone firms. There are several reasons why banks preferentially allocate capital to group affiliates. One reason is that it might be safer to lend to group affiliates. As Gopalan, Nanda, and Seru (2007) show, business group affiliates financially support member firms in financial distress

[27] Note that the loan-level regressions can only speak to the mechanism for the matched sample. However, as this sample consists of large firm-bank pairs, we think that the reduction in the supply of capital is also likely to affect smaller standalone firms, which are lower in the pecking order for lending.

with intragroup loans. Similarly, Almeida, Kim, and Kim (2015) show that group affiliates support member firms with positive investment opportunities through cross-equity investments. Moreover, banks may find group affiliates more attractive than standalone firms as lending to one member in the group can generate demand for the banks' services from other members in the group.

Finally, we note that our data do not allow us to study changes in labor market conditions. Hence, it remains possible that the difficulty in finding the labor required for the increased capital drives the lower investment sensitivity of standalone firms.

5.2 Product markets

Another potential explanation for the lower investment sensitivity is that group affiliates crowd out demand for standalone firms' output in product markets. As such, investments by group affiliates increase industry capacity and may reduce the attractiveness of further investment by standalone firms. Such an effect is more likely operative in industries that rely on local demand.

To explore whether this mechanism explains our main result, we focus on (i) manufacturing and (ii) high-exporting industries. In these sectors, firms rely on national and international demand, which is substantial relative to the size of local production. Given this, group affiliates' investments are less likely to crowd out demand for standalone firms' output.

We repeat our main tests (Table 3) for these subsamples and present the estimates in Table 9. Column 1 (column 2) presents results for firms in the manufacturing sector (high-exporting industries). We define industries as *High Exporting* as those with a ratio of export earnings to sales above the median before the GQ upgrade. Across the two subsamples, we find an economically and statistically significant lower investment among standalone firms in high-business-group share regions relative to low-business-group share regions. Indeed, our main results hold in these subsamples and are quantitatively stronger, suggesting that, on average, crowding out of demand is not operative, at least in these settings.

5.3 Rival investment opportunities

Another plausible mechanism could be that group-affiliated firms are more adept at seizing investment opportunities sooner and that these opportunities have a "winner-takes-all" aspect to them. In such cases, group-affiliated firms can crowd out investments of standalone firms in high-business-group share regions.

To test this mechanism, we utilize product-level information from Prowess and a regulation in India that effectively restricted certain products (henceforth, reserved products) from being manufactured by large firms.[28] Most group-affiliated firms, given their size, are prohibited by this regulation from producing and investing in this subset of products. Therefore, the crowding out of standalone firms' investment opportunities is less likely to be operative in this subset.[29]

In Table 10, we focus on the subset of reserved products identified using the five-digit industrial classification. In columns 1 and 2, we focus on the sample of standalone firms whose main product is reserved by the regulation. Additionally, in column 3, we restrict the sample to reserved products in which standalone firms had a market share of above 90%. Again, our main result holds in these subsamples and is quantitatively stronger.

While we cannot completely rule out that in every industry group-affiliated firms crowd out investment opportunities of standalone firms, the fact that, in settings with reduced scope for such crowding out, the results are equal or stronger than the baseline suggests that crowding out of demand by group-affiliated firms is quantitatively unimportant.

5.4 Political connections

Finally, our main result could be driven by business groups having political connections and using them to obtain contracts from the government (Khanna and Yafeh 2007). Therefore, if group affiliates in high-business-group share regions wield outsized political power, standalone firms in these regions could be at a more considerable disadvantage, leading them to obtain fewer government contracts, which, in turn, could explain the lower investment sensitivity of standalone firms in these areas.

To test this prediction, we focus on infrastructure-related industries since, in the period that we study, as the road is being built, many infrastructure projects are being allocated by local governments. This focus is motivated by prior work in economics suggesting the existence of rampant favoritism and corruption in infrastructure-related industries in emerging economies and especially at the time of the awarding of contracts involving public procurements (Kenny 2006; Lehne, Shapiro, and Eynde 2018; Olken 2009).

Internet Appendix Table 7 presents the results for the subsample of firms operating in infrastructure-related industries. Column 1 of panel A estimates our baseline regression for group-affiliated firms, showing no

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[28] The policy was specifically geared towards promoting small establishments and has been extensively studied in Martin, Nataraj, and Harrison (2017).

[29] We find that these reserved products are mostly produced by standalone firms, with their average market share being close to 90%. Comparing this to the market share of standalone firms in products that were never reserved, we find that standalone firms had an average market share of 38.5%.

differential impact across regions with varying levels of business group prevalence. In column 2, we estimate the same specification but for the subsample of standalone firms and again find that an increase in investment is not different across regions.

To sharpen these tests, we redefine business group share using only the largest 25 business groups as a proxy for their political influence (Fisman and Khanna 2004). Estimates from panel B suggest that standalone investment is lower in areas with a significant presence of the 25 largest business groups, while investments by business group affiliates are larger in regions with a significant presence of the 25 largest business groups. These results highlight that the political connections mechanism is likely operative in infrastructure-related industries. However, we acknowledge that it is difficult to extrapolate this evidence to suggest that political connections also operate in other industries.

6. Robustness Checks

In this section, we explore the robustness of our findings and show that our baseline result of lower investment by standalone firms in high-business-group share regions holds up under various specifications. First, our empirical specification does not include time-varying control variables, as they themselves may be affected by the treatment, rendering them "bad controls" (Angrist and Pischke 2008). To assuage concerns, in Internet Appendix Table 8, we show that our results on lower investment by standalone firms are qualitatively similar when we include interactions of pretreatment time-invariant firm characteristics with *PostGQ* in our empirical specification.

Next, we consider alternative definitions of our baseline measure, *High BGS*, defined using the top quartile of group-affiliated asset share in a city. Internet Appendix Table 9 presents these results. For ease of comparison, we report the coefficients from the baseline tests (column 2 of Table 3). In column 2, we repeat our baseline tests without interacting the fixed effects with *High BGS*. Next, we alter the definition in two ways, (i) by using a continuous business group share of assets in a city in column 3, and (ii) alternatively, by defining the top quartile using the Hirschman Herfindahl Index based on group-affiliated firms' sales at each location in column 4. To further examine whether the baseline results vary across the distribution of group-affiliated asset share, in columns 5 and 6, we interact *PostGQ* with quartiles and terciles of group-affiliated asset share in a city, respectively. Our results are qualitatively similar in all specifications and definitions, finding that greater business group prevalence is associated with a lower standalone investment.

Further, we address the concern that differential exits by standalone firms drive lower investment in high-business-group share areas, as *High*

BGS may proxy for low productivity of standalone firms. While we do not directly observe firm exits, we conduct several tests to assuage the concern. First, in Internet Appendix Table 10, we examine whether a firm stopped reporting financial statements, finding that only 20 firms exited by this measure. Although this seems low, our sample consists of relatively large firms in the Indian context. Still, we show that our results are robust to dropping these exiting firms from our estimations. Second, we alternatively define exit as firms having extremely large negative sales growth. Internet Appendix Table 11 reports results from this exercise, finding that dropping such firms strengthens the coefficient estimate on $PostGQ \times High\ BGS$. Third, in Internet Appendix Table 12, we show that standalone firms are unlikely to be a target in mergers and acquisitions around GQ upgrades and the probability of being a target is similar across high- and low-business-group share regions.

Finally, we examine whether the lower investment by standalone firms results from changes in firm entry across regions. To do so, we examine firm entry at the regional level around GQ upgrades as a function of business group share. Internet Appendix Table 13 finds an increase in firm entry after GQ upgrades. However, this increase is similar across high- and low-business-group share areas. Note that the increase in the firm entry is consistent with the view that the GQ upgrade is a shock to investment opportunities.

Overall, we find robust evidence that standalone firms invest less in high- relative to low-business-group share regions.

7. Conclusion

We study whether standalone firms invest less in regions with greater business group presence. We use a recent large-scale highway development project in India as a shock to investment opportunities for firms that lie along the road network. We find that a higher density of business groups is associated with lower investment by standalone firms. Our results support a financing channel whereby demand for funds from group affiliates crowds out financing to standalone firms.

Our paper contributes to current debates on the economywide effects of business groups and, more broadly, ownership concentration. While we establish the existence of a spillover effect of business group affiliates on standalone firms, more research is required to pin down all the different mechanisms. Better knowledge of the mechanisms will help determine whether the aggregate effect of these spillovers is positive or negative. For example, if business groups crowd out financing for standalone firms and reduce the economy's allocation efficiency, the policy implication would be to dismantle business groups. Given the dominance of business groups worldwide, more research is needed to understand the mechanisms through which they affect the overall economy.

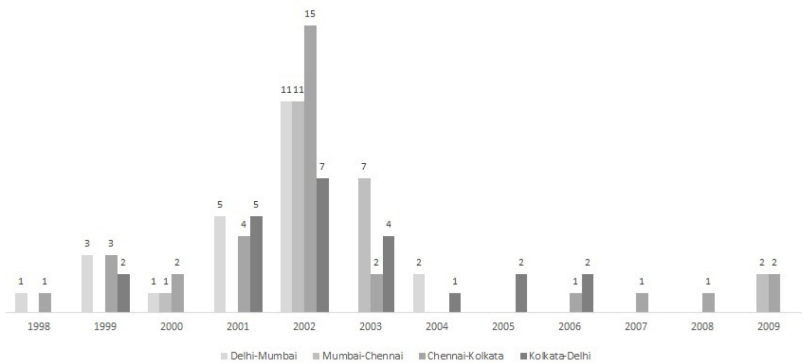

Figure 1
Temporal variation in GQ construction
This figure illustrates the temporal variation in the commencement of construction of the four segments forming part of the Golden Quadrilateral, which connects the four nodal cities of Delhi, Mumbai, Chennai, and Kolkata. The height of each bar corresponds to the number of subsegments that began construction each year. Data source: National Highway Authority of India.

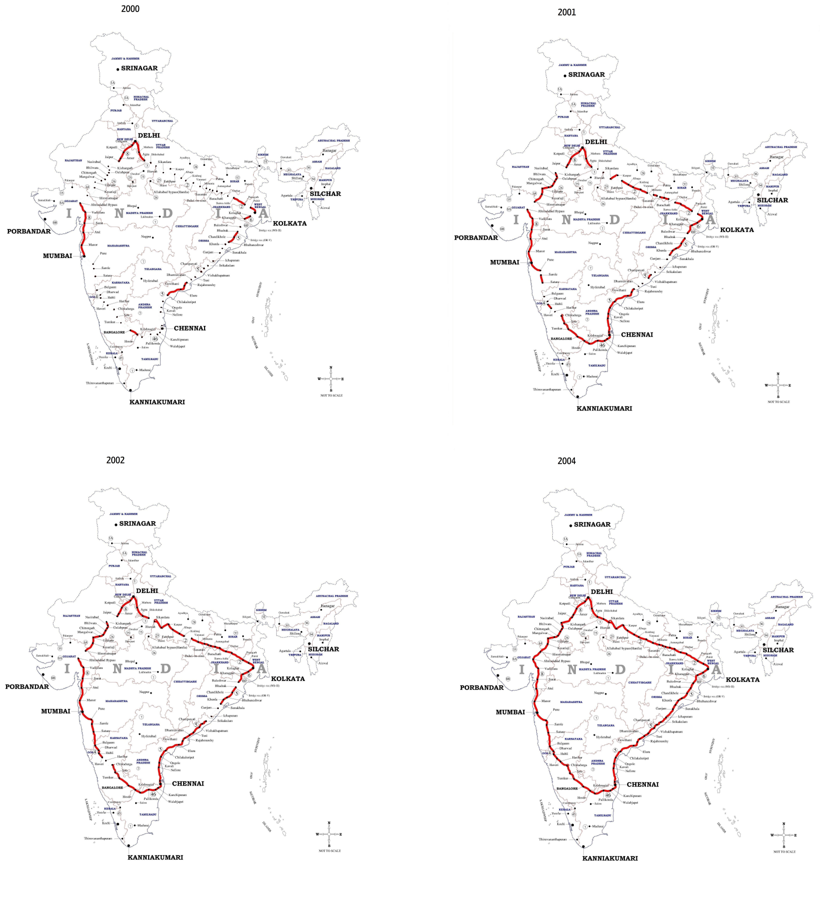

Figure 2
GQ construction evolution over time
This figure illustrates the spatial variation of segments at different points in time along the GQ network. The network is part of the 5,846 kilometer stretch of the GQ connecting the four nodal cities of Delhi, Mumbai, Chennai, and Kolkata. Map source: National Highway Authority of India.

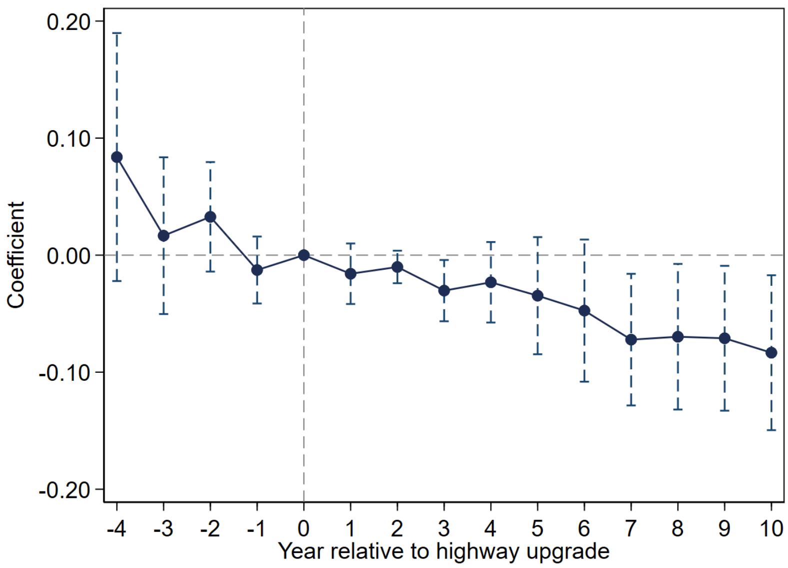

Figure 3
Standalone investment by business group prevalence around GQ upgrades
This figure displays the dynamic coefficients (λ_k) and their corresponding 90% confidence intervals of the differential investment by standalone firms in high- relative to low-business-group share regions around the upgrade of the GQ road network. We estimate a fully dynamic specification that allows us to capture the dynamics of standalone firm investment relative to the year of commencement of the GQ upgrade. Specifically, we estimate the following equation:

$$Investment_{ijcst} = \alpha_i + \sum_{k=-1}^{-4} \mu_k + \sum_{k=1}^{10} \mu_k + \sum_{k=-1}^{-4} \lambda_k \times HighBGS + \sum_{k=1}^{10} \lambda_k \times HighBGS$$
$$+ HighBGS \times \theta_{jt} + \epsilon_{ijcst}.$$

All coefficients are plotted relative to investment at k=0, which is normalized to zero. *High BGS* is an indicator variable set to 1 if the share of group assets is in the top quartile of the distribution. The sample is restricted to firms along the GQ network and covers the window of [−4,+10] around the commencement of the upgrade.

Table 1
Summary statistics

	A. All firms					
	N	Mean	SD	P25	P50	P75
Assets (INR millions)	24,709	8,176	73,751	290	919	3,075
Firm age (years)	24,709	30	21	16	23	35
Cash flow	24,709	0.06	0.11	0.00	0.06	0.12
Profitability	24,709	0.12	0.10	0.07	0.11	0.16
Listed	24,709	0.63	0.48	0.00	1.00	1.00
Investment	24,709	0.38	0.22	0.21	0.35	0.51
Debt	23,755	0.27	0.27	0.09	0.22	0.36
Total factor productivity	21,494	3.10	2.57	1.80	2.39	3.31

	B. Standalone firms					
	N	Mean	SD	P25	P50	P75
Assets (INR millions)	15,842	2,593	11,873	236	657	1,893
Firm age (years)	15,842	27	20	16	22	31
Cash flow	15,842	0.05	0.11	0.00	0.05	0.11
Profitability	15,842	0.12	0.10	0.07	0.11	0.16
Listed	15,842	0.57	0.50	0.00	1.00	1.00
Investment	15,842	0.39	0.22	0.22	0.36	0.53
Debt	15,842	0.25	0.19	0.10	0.23	0.36
Total factor productivity	10,308	3.19	2.50	1.91	2.50	3.45

This table reports the descriptive statistics of firm characteristics for our sample. Panel A reports the descriptive statistics for all firms, while panel B reports the statistics for standalone firms. From the overall sample of firms in Prowess for the period starting from 1989 to 2016, we exclude all financial firms, firms owned by central and state governments, and firms with less than 3 years of data with positive values of total assets and sales, and drop observations with a ratio of investment to lagged total assets and leverage greater than 1. Further, we keep firm-year observations with nonmissing values for assets, firm age, cash flow, and profitability. All the financial variables are adjusted for inflation using the Wholesale Price Index at 2010 constant prices. We also correct for changes in the financial reporting year by adjusting values for the number of months. To mitigate the effect of outliers, we winsorize ratios at 1% tails and total factor productivity at 2.5% tails. All variables are defined in Internet Appendix Table 14. Data source: CMIE Prowess.

Table 2
Productive efficiency and investment around GQ upgrades

Dependent variable	TFP	Days sales of inventory	Investment
	(1)	(2)	(3)
PostGQ	0.146^{**}	-3.961^{*}	0.026^{**}
	(0.067)	(2.350)	(0.012)
Fixed effects:			
Firm	Yes	Yes	Yes
Industry × year	Yes	Yes	Yes
State × year	Yes	Yes	Yes
Adjusted-R^2	0.79	0.63	0.70
Observations	21,494	21,053	24,709
Sample: All firms	Yes	Yes	Yes

This table reports changes in productive efficiency and investment for firms located along GQ around the upgrade of the road network. The dependent variable in column 1 is *TFP*, the total factor productivity, which is estimated using the methodology outlined in Levinsohn and Petrin (2003). The dependent variable in column 2 is *Days sales of inventory*, defined as the ratio of ending inventory to cost of goods sold multiplied by 365, and the dependent variable in column 3 is *Investment*, defined as the net capital expenditure divided by lagged total assets. *PostGQ* is an indicator variable taking the value of 1 for all years, including and after the GQ upgrade in the city. All regressions include firm, industry-year, and state-year fixed effects. Note that in column 1, TFP is estimated for manufacturing firms, and in column 2, we restrict the sample to firms with days sales of inventory between 5 and 150 days to mitigate the effect of outliers. Standard errors, reported in parentheses, are corrected for heteroscedasticity and autocorrelation and clustered at the city level. All variables are defined in Internet Appendix Table 14. $^{*}p < .1$; $^{**}p < .05$; $^{***}p < .01$. Data source: CMIE Prowess.

Table 3
Business group prevalence and standalone investment

Dependent variable	Investment	
	(1)	(2)
PostGQ	0.038	0.039
	(0.029)	(0.028)
PostGQ × *High BGS*	-0.012^{***}	-0.038^{***}
	(0.000)	(0.012)
Fixed effects:		
Firm	Yes	Yes
High BGS × industry × year	No	Yes
High BGS × state × year	Yes	Yes
Adjusted-R^2	0.70	0.70
Observations	15,842	15,842
Sample: Standalone firms	Yes	Yes

This table reports estimates from regressions relating business group prevalence to standalone firms' investment around GQ upgrades. *PostGQ* is an indicator variable taking the value of 1 for all years including and after the GQ upgrade in the city. *High BGS* is an indicator variable set to 1 if the share of assets of group-affiliated firms from that city is in the top quartile in the year before the announcement of the GQ road network upgrades. Regressions include firm fixed effects, *High BGS* × state × year, and *High BGS* × industry × year fixed effects (in column 3). Standard errors, reported in parentheses, are corrected for heteroscedasticity and autocorrelation and clustered at the city level. All variables are defined in Internet Appendix Table 14. $^{*}p < .1$; $^{**}p < .05$; $^{***}p < .01$. Data source: CMIE Prowess.

Table 4
Pre-GQ firm and regional characteristics by business group share

	A. Standalone firm characteristics		
	High business group share	Low business group share	High − Low (1)−(2)
	(1)	(2)	(3)
Firm size	5.20	5.49	−0.29
	(5.05)	(5.10)	(−0.05)
Firm age	19.42	16.87	2.55
	(14.00)	(14.00)	0.00
Cash flow	0.06	0.06	0.00
	(0.06)	(0.06)	(0.00)
Profitability	0.08	0.11	−0.03
	(0.09)	(0.11)	(−0.02)
Investment	0.41	0.47	−0.06
	(0.40)	(0.49)	(−0.09)
Debt	0.25	0.28	−0.02
	(0.25)	(0.24)	(0.01)
Total factor productivity	3.46	2.73	0.73**
	(3.18)	(2.73)	0.45
Days sales of inventory	80.5	86.7	−6.2
	(78.8)	(90.0)	−11.2
	B. Regional characteristics		
1. Financial development			
Bank branches (per 100,000)	4.95	4.28	0.67
	(4.04)	(4.06)	0.26
Fraction of listed firms	0.70	0.73	−0.03
	(0.72)	(0.74)	−0.01
2. Physical infrastructure			
Bad Roadways (rating)	6.92	6.77	0.15
	(7.00)	(7.00)	0.00
Obstacle to growth, transport (1=yes)	0.26	0.34	−0.08
	(0.00)	(0.00)	0.00
3. Labor market conditions			
Labor constraint in contracting (1=yes)	0.07	0.07	0.00
	(0.00)	(0.00)	0.00
Obstacle to growth, labor (1=yes)	0.36	0.26	0.09
	(0.00)	(0.00)	0.00
Time to fill manager vacancy (weeks)	3.97	3.20	0.77
	(2.00)	(2.00)	0.00

This table compares the means (and medians in parentheses) of firm and regional characteristics as a function of the prevalence of business groups in the local area. Panel A presents firm characteristics, while panel B presents regional characteristics. Specifically, panel A displays the means (medians) for standalone firms 1 year before the commencement of GQ upgrades. Column 1 displays mean (and median) for high-business-group share regions while column 2 displays mean (and median) for low-business-group share regions. Column 3 tests the difference in means (medians). *High BGS* is an indicator variable set to 1 if the share of assets of group-affiliated firms from that city is in the top quartile in the year before the GQ road network upgrades. The firm characteristics we focus on are: *Firm size*, *Firm age*, *Cash flow*, *Profitability*, *Investment*, *Debt*, *Total factor productivity*, and *Days sales of inventory.* The regional characteristics we focus on are: *Bank branches*, *Fraction of listed firms*, *Bad roadways*, *Obstacle to growth, transport*, *Labor constraint in contracting*, *Obstacle to growth, labor*, *Time to fill manager vacancy*, and *Average time to fill skilled worker vacancy.* All variables are defined in Internet Appendix Table 14. $^{*}p < .1$; $^{**}p < .05$; $^{***}p < .01$. Data sources: CMIE Prowess, Reserve Bank of India, and World Bank Enterprise Survey.

Table 5
Horse Race Regressions

Dependent variable	Investment				
	A. Definition using all firms				
	(1)	(2)	(3)	(4)	(5)
PostGQ	0.039	0.046*	0.020	0.002	−0.028
	(0.028)	(0.027)	(0.042)	(0.035)	(0.043)
PostGQ × *High BGS*	−0.038***	−0.084***	−0.106***	−0.105**	−0.170***
	(0.012)	(0.029)	(0.029)	(0.041)	(0.058)
PostGQ × *High Listed Share (all firms)*		−0.216**			−0.262***
		(0.095)			(0.083)
PostGQ × *High Firm Age (all firms)*			0.048		0.092
			(0.054)		(0.056)
PostGQ × *High Firm TFP (all firms)*				0.006	0.012
				(0.025)	(0.025)
Fixed effects:					
Firm	Yes	Yes	Yes	Yes	Yes
High BGS × industry × year	Yes	Yes	Yes	Yes	Yes
High BGS × state × year	Yes	Yes	Yes	Yes	Yes
Adjusted-R^2	0.70	0.70	0.70	0.66	0.66
Observations	15,842	15,842	15,842	11,520	11,520
Sample: Standalone firms	Yes	Yes	Yes	Yes	Yes

	B. Definition using standalone firms				
	(1)	(2)	(3)	(4)	(5)
PostGQ	0.039	0.061**	0.005	0.007	0.105*
	(0.028)	(0.030)	(0.059)	(0.036)	(0.052)
PostGQ × *High BGS*	−0.038***	−0.099***	−0.095***	−0.110**	−0.116**
	(0.012)	(0.032)	(0.029)	(0.041)	(0.044)
PostGQ × *High Listed Share (standalones)*		−0.065**			−0.009
		(0.025)			(0.055)
PostGQ × *High Firm Age (standalones)*			0.051		0.075
			(0.055)		(0.088)
PostGQ × *High Firm TFP (standalones)*				−0.026	−0.060
				(0.031)	(0.036)
Fixed effects:					
Firm	Yes	Yes	Yes	Yes	Yes
High BGS × industry × year	Yes	Yes	Yes	Yes	Yes
High BGS × state × year	Yes	Yes	Yes	Yes	Yes
Adjusted-R^2	0.70	0.70	0.70	0.66	0.66
Observations	15,842	15,842	15,842	11,520	11,520
Sample: Standalone firms	Yes	Yes	Yes	Yes	Yes

This table reports estimates from horse race regressions that relate business group prevalence to standalone firms' investment. We consider the following covariates: *Listed share*, *Firm age*, *Firm size*, and *TFP*. For each covariate, we define an indicator variable, which is set to 1 if the specific characteristic of firms from that city is in the top quartile in the year before the announcement of the GQ road network upgrades. Panel A defines the indicator based on all firms while panel B defines the indicator using only standalone firms. *PostGQ* is an indicator variable taking the value of 1 for all years including and after the GQ upgrade in the city. *High BGS* is an indicator variable set to 1 if the share of assets of group-affiliated firms from that city is in the top quartile in the year before the announcement of the GQ road network upgrades. All regressions include firm fixed effects, *High BGS* × state × year, and *High BGS* × industry × year fixed effects. As TFP is estimated for manufacturing firms, columns 4 and 5 restrict the sample to these industries. Standard errors, reported in parentheses, are corrected for heteroscedasticity and autocorrelation and clustered at the city level. All variables are defined in Internet Appendix Table 14. $^*p < .1$; $^{**}p < .05$; $^{***}p < .01$. Data source: CMIE Prowess.

Table 6
Investment by firm type around GQ upgrades

Dependent variable	Investment		
Sample	All firms (1)	Standalone (2)	Business Group (3)
PostGQ	0.037*	0.039	0.024
	(0.021)	(0.028)	(0.057)
PostGQ × *High BGS*	−0.007	−0.038***	0.009*
	(0.005)	(0.012)	(0.005)
Fixed effects:			
Firm	Yes	Yes	Yes
High BGS × industry × year	Yes	Yes	Yes
High BGS × state × year	Yes	Yes	Yes
Adjusted-R^2	0.69	0.70	0.65
Observations	24,319	15,842	8,102

This table reports estimates from regressions relating the prevalence of business groups to investment around GQ road network upgrade for different sample of firms. Column 1 focuses on all firms while column 2 (column 3) focuses on the sample of standalone (group-affiliated) firms. Across all columns, the dependent variable is *Investment*. *PostGQ* is an indicator variable taking the value of 1 for all years including and after the GQ upgrade in the city. *High BGS* is an indicator variable set to 1 if the share of assets of group-affiliated firms from that city is in the top quartile in the year before the announcement of the GQ road network upgrades. All regressions include firm fixed effects, *High BGS* x state x year, and *High BGS* x industry x year fixed effects. Standard errors, reported in parentheses, are corrected for heteroscedasticity and autocorrelation and clustered at the city level. All variables are defined in Internet Appendix Table 14. $^{*}p < .1$; $^{**}p < .05$; $^{***}p < .01$. Data source: CMIE Prowess.

Table 7
Aggregate bank lending around GQ upgrades: District-level evidence

Dependent variable	Log (1+credit)			
	(1)	(2)	(3)	(4)
PostGQ	0.120**	0.125***	0.115**	0.104**
	(0.047)	(0.046)	(0.052)	(0.050)
PostGQ × *High BGS*			0.032	0.128
			(0.095)	(0.114)
Fixed effects:				
District	Yes	Yes	Yes	Yes
Year	Yes	No	Yes	No
State × year	No	Yes	No	Yes
Adjusted-R^2	0.97	0.98	0.97	0.98
Observations	6,862	6,862	6,862	6,862

This table reports estimates from regressions relating the effect of business group prevalence on overall district-level lending. The dependent variable, *Log (1+credit)*, is defined as the natural logarithm of 1 plus the total credit disbursed, adjusted for inflation, in a district-year. *PostGQ* is an indicator variable taking the value of 1 for all years including and after the GQ upgrade in the city. *High BGS* is an indicator variable set to 1 if a district consists of more than three cities with the share of assets of group-affiliated firms from that city in the top quartile in the year before the GQ road network upgrades. All regressions include district fixed effects. Additionally, specifications in columns 2 and 4 include state × year fixed effects to control for local macroeconomic confounds, while columns 1 and 3 include year fixed effects to control for time trends. Standard errors, reported in parentheses, are corrected for heteroscedasticity and autocorrelation and clustered at the district level. All variables are defined in Internet Appendix Table 14. $^{*}p < .1$; $^{**}p < .05$; $^{***}p < .01$. Data source: Reserve Bank of India.

Table 8
Loan-level regressions: Bank lending to standalone firms

Dependent variable	Δ Log loan size	
	(1)	(2)
Group exposure	-0.185^{**}	-0.191^{**}
	(0.071)	(0.072)
Firm fixed effects	Yes	Yes
Weighted by firm size	No	Yes
Adjusted-R^2	0.432	0.431
Number of loans	163	163
Sample: Standalone firms	Yes	Yes

The table reports estimates from regressions that examine changes in bank lending for the set of standalone firms borrowing from multiple banks around the upgrade of GQ road network. All loans are time-collapsed into a single pre- and post-period of 5 years around the start of the GQ upgrade. The sample includes standalone firms that borrow from multiple banks. The dependent variable, ΔL_{ib}, is the change in the average loan amount to standalone firms 5 years after relative to 5 years before the GQ upgrade. The independent variable, *Group exposure*, is defined for each bank as the total lending to group affiliates before the start of the GQ upgrade, which we standardize to have a mean of zero and a standard deviation of one, for ease of interpretation of the coefficient estimate. The empirical specification includes firm fixed effects that control for the firm-specific credit demand. Standard errors, reported in parentheses, are corrected for heteroscedasticity and autocorrelation and clustered at the bank level. All variables are defined in Internet Appendix Table 14. $^{*}p < .1$; $^{**}p < .05$; $^{***}p < .01$. Data source: Ministry of Corporate Affairs.

Table 9
Mechanism: Crowding out demand for standalone firms' output

Dependent variable	Investment	
Sample industries	Manufacturing	High-exporting
	(1)	(2)
PostGQ	−0.008	0.013
	(0.030)	(0.044)
PostGQ × *High BGS*	-0.081^{***}	-0.049^{*}
	(0.000)	(0.028)
Fixed effects:		
Firm	Yes	Yes
High BGS × industry × year	No	Yes
High BGS × state × year	Yes	Yes
Adjusted-R^2	0.66	0.69
Observations	11,521	9,081
Sample: Standalone firms	Yes	Yes

The table reports estimates from regressions that rule out the alternative mechanism whereby group-affiliated firms crowd out demand for standalone firms' output in product markets. Column 1 focuses on the subsample of firms operating in manufacturing industries while column 2 focuses on the subsample of firms operating in "high exporting" industries. We define "high-exporting" industries as those with a ratio of export earnings to sales above the median before the GQ upgrade. *PostGQ* is an indicator variable taking the value of 1 for all years including and after the GQ upgrade in the city. *High BGS* is an indicator variable set to 1 if the share of assets of group-affiliated firms from that city is in the top quartile in the year before the announcement of the GQ road network upgrades. All regressions include firm fixed effects and *High BGS* × state × year fixed effects, while column 2 additionally includes *High BGS* × industry × year fixed effects. Standard errors, reported in parentheses, are corrected for heteroscedasticity and autocorrelation and clustered at the city level. All variables are defined in Internet Appendix Table 14. $^{*}p < .1$; $^{**}p < .05$; $^{***}p < .01$. Data source: CMIE Prowess.

Table 10
Mechanism: Rival investment opportunities

Dependent variable	Investment		
	All products (1)	All products (2)	SA dominant products (3)
PostGQ	−0.013	−0.015	−0.260***
	(0.038)	(0.053)	(0.078)
PostGQ × *High BGS*	−0.152***	−0.171***	−0.236***
	(0.043)	(0.044)	(0.061)
Fixed effects:			
Firm	Yes	Yes	Yes
High BGS ×	Yes	No	No
Industry × year	Yes	Yes	Yes
State × year	Yes	Yes	Yes
Adjusted-R^2	0.66	0.66	0.63
Observations	2,544	2,657	298
Sample: Standalone firms	Yes	Yes	Yes

The table reports estimates from regressions that rule out the alternative mechanism whereby group-affiliated firms are adept at seizing investment opportunities sooner, therby crowding out investments by standalone firms in high-business-group share regions. For this test, we focus on the subsample of reserved products, defined as those that were restricted from being manufactured by large firms (Martin, Nataraj, and Harrison 2017). The products are identified using the five-digit industrial classification. Columns 1 and 2 focus on all products, while column 3 focuses on products for which standalone firms have a dominant market share (average market share $\geq$ 90%). *PostGQ* is an indicator variable taking the value of 1 for all years including and after the GQ upgrade in the city. *High BGS* is an indicator variable set to 1 if the share of assets of group-affiliated firms from that city is in the top quartile in the year before the announcement of the GQ road network upgrades. All regressions include firm fixed effects, state × year, and industry × year fixed effects. Additionally, Column 1 interacts *High BGS* with state × year, and industry × year fixed effects. Standard errors, reported in parentheses, are corrected for heteroscedasticity and autocorrelation and are double-clustered at the five-digit product industry and city level. All variables are defined in Internet Appendix Table 14. $^{*}p < .1$; $^{**}p < .05$; $^{***}p < .01$. Data source: CMIE Prowess.

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