

BIG INDIA VERSUS BIG U.S.

Megha Patnaik, Mert Akan, Shelby Buckman, Nick Bloom and Pete Klenow

19 July 2024

We are grateful to the Stanford King Center on Global Development for funding this research.

THIS PAPER

- ▶ Size distribution of firms has many small firms, especially in poor countries.
- ▶ These small and unproductive firms lower aggregate TFP.
- ▶ However, there is still an overlap in the **right tail** of the firm size distributions in rich and poor countries.
- ▶ Are the large firms in poor countries “World Class”? i.e. are they comparable to similar-sized firms in rich countries?
- ▶ We conduct a firm survey focusing on firms in the right tail of the Indian firm size distribution, which account for 60-80% of total output.
- ▶ We plan to compare firms on relevant characteristics with US firms of similar size using US Census datasets.

THIS PAPER

- ▶ We study innovation, management and customer dimensions:
 - Innovation: Most studies on innovation focus on patenting and R&D, but these are affected by the propensity to patent or report. At least half of product innovation comes from firms that never patent in the US (Argente, Baslandze, Hanley and Moreira, 2020). This may be higher for firms in developing countries due to adoption of existing technologies (Verhoogen, 2023).
 - Management practices: Management associated with patenting and R&D (Bloom, Brynjolfsson, Foster, Jarmin, Patnaik, Saporta-Eksten and Van Reenen, 2019). Managerial skills may be important for adapting technologies to local conditions (Acemoglu, Aghion and Zilibotti, 2006).
 - Customer importance: Customers account for a large part of sales variation in the US (Klenow, Levin and Murciano-Goroff, 2022). Limited evidence from developing countries.

PREVIEW OF RESULTS FOR INDIA

We document five facts that can be summarized as follows:

1. Big firms sell to more customers.
2. Big firms sell more products.
3. Most products are not improved from year to year, and most innovation takes the form of the firm improving its own products rather than introducing brand new products to the market or imitating existing products in the market.
4. Structured management is associated with more products, customers, and innovation.
5. Management practices are correlated with introducing new products to the market and improving products, but not with product imitation.

RELATED LITERATURE

- ▶ Growth and Development: Hsieh and Klenow (2009), Hsieh and Klenow (2014) La Porta and Shleifer (2014) Peters and Zilibotti (2023)
- ▶ Product innovation: Klette and Kortum (2004), Broda and Weinstein (2006), Broda and Weinstein (2010), Garcia-Macia, Hsieh and Klenow (2019), Argente et al. (2020), Hottman, Redding and Weinstein (2016), Berlingieri, De Ridder, Lashkari and Rigo (2024).
- ▶ Management and Innovation: Bloom et al. (2019) Akcigit, Alp and Peters (2021) Bloom, Iacovone, Pereira-López and Van Reenen (2022) Bloom et. al (2023).
- ▶ Importance of Customers: Eaton, Kortum and Kramarz (2004), Eaton, Eslava, Kugler and Tybout (2007), Fitzgerald, Haller and Yedid-Levi (2016), Bernard, Dhyne, Magerman, Manova and Moxnes (2022), Afrouzi, Drenik and Kim (2023), Li (2021), Klenow et al. (2022), Arkolakis (n.d.), Faber and Fally (2022).

DATA

We have developed, piloted and are conducting a phone-based firm survey in India:

1. Currently the sample has 1602 firms.
2. The sampling frame for the survey is 15,891 firms from Prowess and First Source for which sales and other financial data is available.
3. Reference year for the survey is 2021 for 1145 observations and 2022 for 457 most recent observations.
4. The current response rate is 27.2%. Respondents are typically top managers (72%), CEOs or CFOs (10%), in Finance positions (15%) or in HR (3%).
5. We collect the following firm characteristics in the survey: employment, family ownership and management, exporting activity, whether the firm is headquartered in India, if the firm is a standalone or subsidiary business.
6. We link the survey data to firm financials (sales, capital, salaries, profits, expenses ...) and to patents at the firm level in the Orbis Intellectual Property dataset.

SURVEY QUESTIONS: MANAGEMENT PRACTICES

Module based on US MOPS (Bloom et al., 2019) to capture the presence of management practices using close-ended questions:

10. What best describes what happened at this business when a problem in the production process arose?

Examples: Finding a quality defect in a product or a piece of machinery breaking down.

*Please select one option**

10a. We fixed it but did not take further action	
10b. We fixed it and took action to make sure that it did not happen again	
10c. We fixed it and took action to make sure that it did not happen again, and had a continuous improvement process to anticipate problems like these in advance	
10d. No action was taken	

- 9 questions on three dimensions of management (Monitoring, Targets & Incentives).
- Overall management score computed as the unweighted average of all questions, normalized to have mean zero and standard deviation one.
- Low scores indicating lower use of structured management practices.

SURVEY QUESTIONS: CUSTOMERS

- ▶ What was the number of unique customers as per your order book?
- ▶ What was the growth rate of the number of unique customers over the previous year?
- ▶ What was the share of sales in FY2022-23 from new customers?
- ▶ What is the average distance of your customers from your manufacturing plant?

SURVEY QUESTIONS: PRODUCTS

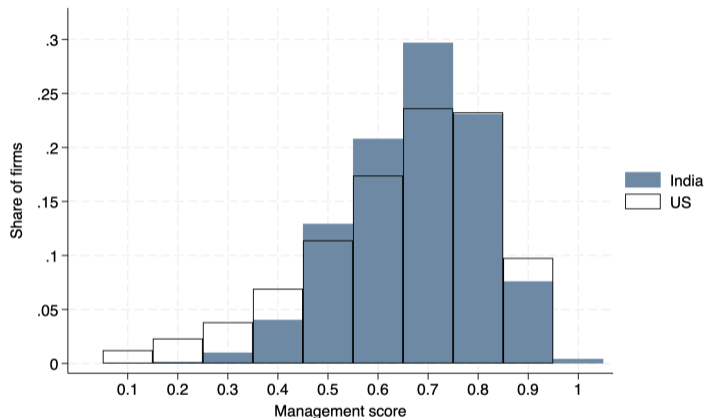
- ▶ What was the number of unique products sold by your business?
- ▶ Of these unique products, how many did a typical customer purchase?
- ▶ What percent of sales from your products was from the top 1-3 products and top 4-10 products?
- ▶ What percent of sales from your products was from identical versions of previous products, improved versions of previous products, products new to you but existing in the market, and products new to the market?
 - ▶ Share of sales from products new to you but existing in the market.
- ▶ What share of products were introduced because customers requested, you thought customers would purchase, competitors have similar products?
- ▶ Product discontinuation
 - ▶ Share of sales to products discontinued.

SUMMARY STATISTICS

	Mean	SD	p(10)	p(25)	p(50)	p(75)	p(90)	Obs
Sales USD (mil.) 2021-2022	48.1	174.7	1.2	4.8	14.6	37.6	90.1	1178
Employment	867.9	3266.8	40	100	275	650	1500	1567
Family Owned	0.72	0.5	0	0	1	1	1	1601
Exporter	0.58	0.5	0	0	1	1	1	1557
Customers 2021-2022	750.6	7471.3	5	14	40	155	500	1243
Products	267.8	415.0	6	6	56	551	551	1588
Standalone	0.84	0.4	0	1	1	1	1	1599
Headquartered outside India	0.051	0.2	0	0	0	0	0	1601
Management Score	0.62	0.1	0.5	0.5	0.6	0.7	0.8	1600

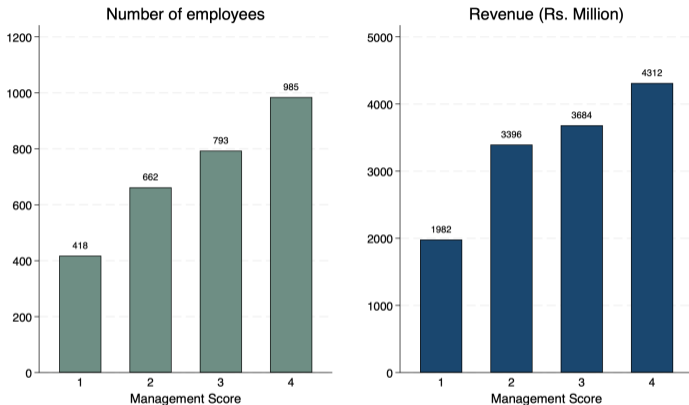
Note: Sales measured using response to the question “What was the total sales in FY 2021-22?” in Rs Crores and converted to USD million. Sales and customers are from 2021-2022 which was asked about in both reference year versions of the survey (2021-2022 and 2022-2023). Employment includes full-time equivalents of contract workers. The values of all other variables are reported based on the pooled sample over the 2 reference years. Exporter is an indicator variable that takes value 1 if the firm reports positive sales outside India in the survey. The management score is the unweighted average of question-wise responses.

MANAGEMENT SCORE DISTRIBUTION



Note: Management score is the unweighted average of the score for each of the 8 questions, where each question is first normalized to be on a 0–1 scale. Sample for the US is from deciles for the US MOPS (2015). The Census Bureau has reviewed this data product for unauthorized disclosure of confidential information and has approved the disclosure avoidance practices applied to this release. DRB Approval Number: CBDRB-FY22-CES008-004.

MANAGEMENT AND FIRM SIZE



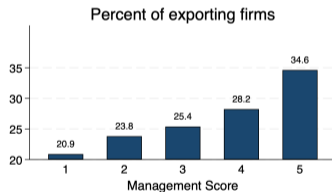
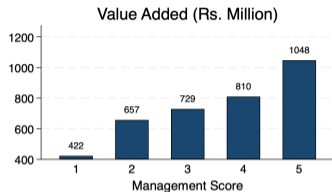
Note: Employment is measured as response to the question “How many full-time employees are there at your business (this includes all workers, contract employees, payroll employees, and managers)”? Revenue is measured as the response to the question “Sales is measured as the response to the survey question: “What was the total sales in FY 2021-22?”. The x-axis shows quartiles of the standardized management score. Employment and Revenue are winsorized at 1%.

MANAGEMENT AND FIRM SIZE

	(1)	(2)	(3)	(4)
	Ln(Emp)	Ln(Emp)	Ln(Sales)	Ln(GFA)
Management Score	0.380*** (10.72)	0.382*** (10.75)	0.330*** (6.60)	0.390*** (7.88)
Reference Year FEs	Yes	Yes	Yes	Yes
Industry FEs	No	Yes	Yes	Yes
Observations	1566	1396	1057	1130

Note: Employment is measured as response to the question “How many full-time employees are there at your business (this includes all workers, contract employees, payroll employees, and managers)?” Revenue is measured as the response to the survey question: “What was the total sales in FY 2021-22 (2022-23)?” as per the reference year. Gross Fixed Assets is calculated by matching firms to Prowess and using perpetual inventory to convert capital to market value. The management score is normalized to have mean 0 variance 1.

MANAGEMENT AND FIRM PERFORMANCE



Note: The sample is restricted to all survey responses which had a match to CMIE Prowess. Value Added is measured as $(\text{Total Income} + \text{Change in Stock}) - \text{Intermediate Inputs}$. Profit is measured as Profits Before Interest, Taxes, Depreciation, and Amortization (PBITDA). R&D Exporters are defined as firms with positive earnings from exports in FY 2021-2022. Management score is normalized to have mean 0 and variance 1. Each outcome is winsorized at 1%.

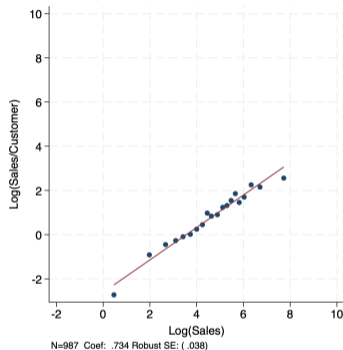
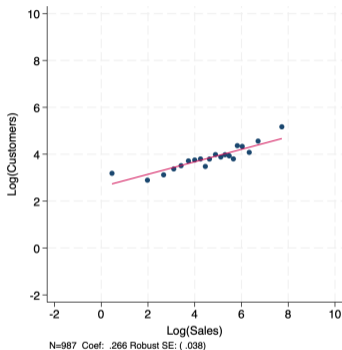
CUSTOMERS AND SALES

To quantify the importance of customers to a firm's sales, we decompose total sales as follows:

$$\text{Sales} \equiv \frac{\text{Sales}}{\text{Customer}} \times \text{Customers}$$

We take logs of both sides and separately regress each right-hand-side component on log sales to get elasticities.

CUSTOMERS AND SALES



Note: Sales is measured as the response to the survey question: “What was the total sales in FY 2021-22?” in Rs Crores. Log(Customers) is calculated using the response to the survey question: “What was the approximate number of unique customers in FY2021-22 as per your order book?”

CUSTOMERS AND SALES

The estimation gives us:

$$0.73 \ln \left(\frac{\text{Sales}}{\text{Customer}} \right) + 0.27 \ln(\text{Customers}) \equiv \ln(\text{Sales})$$

i.e. The number of customers accounts for 27% of sales variation.

- ▶ Low relative to US: the number of customers accounts for about 80% of sales variation. (Klenow et al., 2022).
- ▶ The result is robust to using sales measured from financial accounts.
- ▶ What drives this difference?
 - US vs India.
 - Retail vs. Manufacturing.
 - Choice of sample.
 - Geographical dispersion in Indian firms low even with size: Coefficient same irrespective of average customer distance, share of sales from exporting, share of online sales.

CUSTOMERS AND FIRM SIZE, VALUE ADDED

	(1)	(2)	(3)	(4)	(5)
	Log(Sales)	Log(Emp)	Log(GFA)	Log(VA)	Log(VA/worker)
Log(Customers)	0.253*** (7.90)	0.161*** (6.84)	0.191*** (5.98)	0.253*** (6.53)	0.0996*** (3.93)
Reference Year FEs	Yes	Yes	Yes	Yes	Yes
Industry FEs	Yes	Yes	Yes	Yes	Yes
Observations	881	1089	878	630	619

Note: Sales is measured as the response to the survey question: “What was the total sales in FY 2021-22 (2022-23)?” as per the reference year. Employment is measured as response to the question “How many full-time employees are there at your business (this includes all workers, contract employees, payroll employees, and managers)?” Gross Fixed Assets is calculated by matching firms to the Prowess database and using perpetual inventory to convert capital to market value. Value Added is measured by matching firms to the Prowess database and calculating (Total Income + Change in Stock) - Intermediate Inputs.

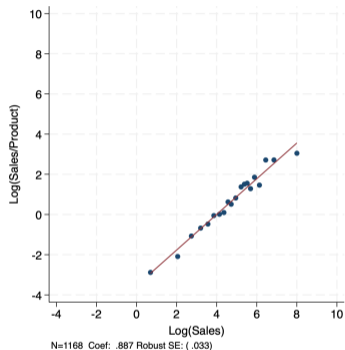
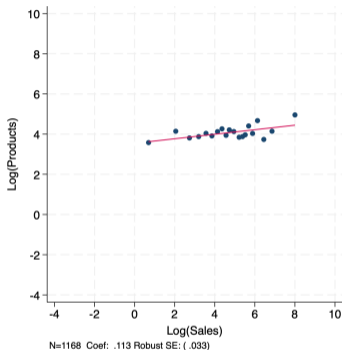
PRODUCTS AND SALES

Similarly as we did with customers, we can quantify the importance of products to a firm's sales. We decompose total sales as follows:

$$\text{Sales} \equiv \frac{\text{Sales}}{\text{Product}} \times \text{Products}$$

We take logs of both sides and regress each right-hand-side component on log sales to get the elasticities.

PRODUCTS AND SALES



Note: Sales is measured as the response to the survey question: “What was the total sales in FY 2021-22?” in Rs Crores. Products measured using midpoints of the response to the binned survey question: “What was the approximate number of unique customers in FY2021-22 as per your order book?”

PRODUCTS AND SALES

The estimation gives us:

$$0.89 \ln \left(\frac{\text{Sales}}{\text{Product}} \right) + 0.11 \ln(\text{Products}) \equiv \ln(\text{Sales})$$

i.e. The number of products accounts for about 9% of sales variation.

- ▶ Preliminary comparison with the US values shows the elasticity is lower in India.

PRODUCTS AND FIRM SIZE, VALUE ADDED

	(1)	(2)	(3)	(4)	(5)
	Log(Sales)	Log(Emp)	Log(GFA)	Log(VA)	Log(VA/worker)
Log(Products)	0.109*** (3.92)	0.160*** (7.78)	0.108*** (3.90)	0.122*** (3.96)	-0.0122 (-0.66)
Reference Year FEs	Yes	Yes	Yes	Yes	Yes
Industry FEs	Yes	Yes	Yes	Yes	Yes
Observations	1047	1383	1123	765	749

Note: Sales is measured as the response to the survey question: “What was the total sales in FY 2021-22 (2022-23)?” as per the reference year. Employment is measured as response to the question “How many full-time employees are there at your business (this includes all workers, contract employees, payroll employees, and managers)?” Gross Fixed Assets is calculated by matching firms to the Prowess database and using perpetual inventory to convert capital to market value. Value Added is measured by matching firms to the Prowess database and calculating (Total Income + Change in Stock) - Intermediate Inputs.

PRODUCT INNOVATION

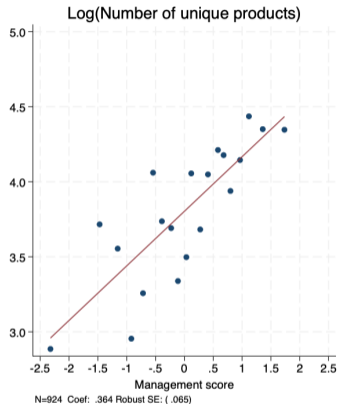
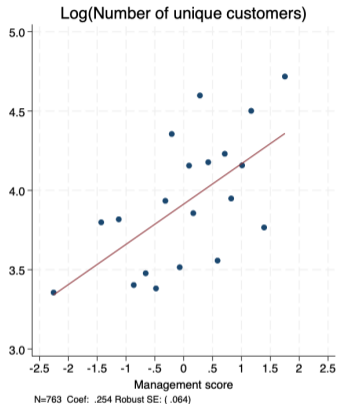
33.	What percent of sales from your products in FY2021-22 was from each of the following? (in%)	<ul style="list-style-type: none">a. Identical versions of products that you sold in FY2020-21 (%)b. Improved versions of products you sold in FY2020-21 (%)c. Products new to you in FY2021-22 but existing in the market (%)d. Products new to the market in FY2021-22 (%)
-----	---	---

PRODUCT INNOVATION



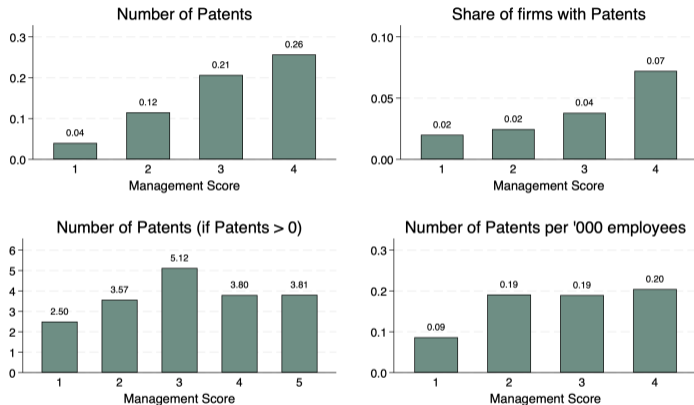
Note: Binscatters of each of the 4 categories in response to the survey question “What percent of sales from your products in FY 2021-22 was from each of the following? (in %)”. Sample is restricted to the 1275 survey respondents who answered the question. The 4 options always add up to 100%. Sales on the x-axis is taken to be the contemporaneous value of sales.

MANAGEMENT AND CUSTOMERS AND PRODUCTS



Notes. The y-axis in the left graph shows responses to the survey question: “What was the approximate number of unique customers in FY2021-22 (FY 2022-23) as per your order book?” and the right graph shows responses to the survey question: “What was the number of unique products sold by your business in FY 2021-22 (FY 2022-23)?”. The x-axis shows the normalized management score.

MANAGEMENT AND PATENT COUNT



Note: Patents include all live patents (pending or granted) published in the last 5 years, i.e. after 1 January 2020. The sample is all firms in the sampling frame for which BvD ID is found restricted to those that have patent info. The x-axis shows the normalized management score.

MANAGEMENT AND PRODUCT INNOVATION



Note: Binscatters of each of the 4 categories in response to the survey question “What percent of sales from your products in FY 2021-22 was from each of the following? (in %)”. Sample is restricted to the 1197 survey respondents who answered the question (Note: the 4 options always add up to 100%).

CONCLUSION

We collected new evidence from a firm survey focusing on management, innovation and customers in large firms in India.

- ▶ We validate the relationship between management and size and management and performance seen in the literature.
- ▶ We document five new facts:
 1. Big firms sell to more customers (coefficient = 0.27)
 2. Big firms sell more products. (coefficient = 0.89)
 3. Most products are not improved from year to year, and most innovation takes the form of the firm improving its own products rather than introducing brand new products to the market or imitating existing products in the market.
 4. Structured management is associated with more products, customers, and innovation.
 5. Management practices are correlated with introducing new products to the market and improving products, but not with product imitation.

Next we will compare firms in our sample with similar sized US firms.

REFERENCES

- Acemoglu, Daron, Philippe Aghion, and Fabrizio Zilibotti**, “Distance to frontier, selection, and economic growth,” *Journal of the European Economic association*, 2006, 4 (1), 37–74.
- Afrouzi, Hassan, Andres Drenik, and Ryan Kim**, “Concentration, Market Power, and Misallocation: The Role of Endogenous Customer Acquisition,” Technical Report, National Bureau of Economic Research 2023.
- Akcigit, Ufuk, Harun Alp, and Michael Peters**, “Lack of selection and limits to delegation: firm dynamics in developing countries,” *American Economic Review*, 2021, 111 (1), 231–275.
- Argente, David, Salomé Baslandze, Douglas Hanley, and Sara Moreira**, “Patents to products: Product innovation and firm dynamics,” 2020.
- Arkolakis, Costas**, “Market penetration costs and the new consumers margin in international trade,” *Journal of political economy*, 118.
- Berlingieri, Giuseppe, Maarten De Ridder, Danial Lashkari, and Davide Rigo**, “Growth through Innovation Bursts,” March 21 2024.
- Bernard, Andrew B, Emmanuel Dhyne, Glenn Magerman, Kalina Manova, and Andreas Moxnes**, “The origins of firm heterogeneity: A production network approach,” *Journal of Political Economy*, 2022, 130 (7), 1765–1804.
- Bloom, Nicholas, Erik Brynjolfsson, Lucia Foster, Ron Jarmin, Megha Patnaik, Itay Saporta-Eksten, and John Van Reenen**, “What drives differences in management practices?,” *American Economic Review*, 2019, 109 (5), 1648–1683.