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Beyond size: Unpacking the effects of small-scale de-reservation policy on innovation and performance of manufacturing plants in India

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Abstract

India's small-scale industry (SSI) product reservation policy was an unusual instrument: instead of subsidizing firms, it reserved products for exclusive manufacture by small units. Starting in the late 1990s, the policy was dismantled gradually - product by product, creating a rare opportunity to study what happens when a long-standing protection is withdrawn. Using plant-level panel data with product detail from India's Annual Survey of Industries (1999–2016), we estimate the causal effects of de-reservation on product scope (new product introductions and the sales share of new products) and on performance (labour productivity and sales growth). We exploit staggered treatment timing using a recent multi-period difference-in-differences framework. The main finding is straightforward: de-reservation is associated with more new product introductions and faster sales growth on average. But the more important and more policy-relevant finding is that the gains are highly uneven. Larger plants within the SME universe, innovative units, and establishments that adopt new inputs are the ones that consistently translate liberalization into improved outcomes. Small plants, by contrast, show at best a modest rise in product switching, with little evidence of performance gains. The takeaway is not that small firms are inherently disadvantaged, but rather that capabilities—not just size—mediate who benefits when protections are removed, highlighting the importance of policy design that strengthens SME capabilities by addressing these uneven adjustment dynamics.

Keywords: Small scale industries, Product de-reservation, Product scope, Firm performance, Innovation, India
JEL codes: O14, O24, O25, L25, L53

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1 Introduction

Developing countries have long used SME policies to pursue multiple objectives at once: jobs, regional dispersion, social inclusion, and political legitimacy. The trouble is that these objectives rarely line up neatly with efficiency. India's Small Scale Industry (hereafter SSI) product reservation regime is a case in point. From 1967 onward, the state reserved an expanding list of products for manufacture by small-scale units (defined by investment thresholds). The rationale was straightforward: small firms were presumed to be labour intensive, vulnerable to large-firm competition, and socially valuable in their ability to spread entrepreneurial opportunity. Reservation therefore acted as a protective barrier around specific product markets.

But policies that protect can also distort. If the most productive firms are prevented from entering particular product lines—or if firms choose to remain artificially small to retain eligibility—then reservation can become a mechanism for misallocation and for locking an economy into low-productivity equilibria. India eventually moved in the opposite direction: beginning in 1997, products were de-reserved in stages, removing exclusive rights and reopening product space to wider competition. This paper asks a simple question with not-so-simple implications: i) What is the average effect of de-reservation on plant product scope and performance? ii) Who benefits—and who doesn't—when protection is withdrawn? The second question is the more important one. Policy debates tend to devolve into slogans ("SMEs need protection" versus "competition boosts efficiency"), but those neat claims can break down once you take firm heterogeneity seriously. Plants differ enormously in organizational capacity, financial slack, skill intensity, learning potential, and ability to absorb shocks. So the relevant issue is not whether liberalization "works," but under what conditions it works, and for whom.

Critics of small-scale industry protection emphasize misallocation as a central concern: by channeling resources away from more productive firms and sectors toward less productive ones, such policies can generate sizable aggregate productivity losses (Hsieh and Klenow, 2009). A large body of work supports this view, showing that size-based regulations and related distortions depress overall productivity by constraining the expansion of more efficient enterprises (Restuccia and Rogerson, 2008; Bento and Restuccia, 2017; Guner et al., 2008). Moreover, these policies can create perverse incentives at the firm level—encouraging establishments to remain artificially small in order to continue qualifying for benefits—thereby turning support measures into barriers to growth Tsuruta (2020). In this sense, India's product reservation policy may have discouraged firm upgrading and slowed the broader expansion of manufacturing. By tying continued access to reserved product lines to investment thresholds, the regime created incentives for firms to remain small, potentially delaying scale-up and discouraging technology upgrading Mohan (2002). At the same time, restricting a large set of products to exclusive SME production limited the ability of more productive firms to enter and expand in those categories, which may have constrained India's export potential in the affected product lines Panagariya (2008). More broadly, small-scale protection does not necessarily deliver on its stated objectives: it may fail to safeguard employment while also dampening investment and technology upgrading Bertrand and Kramarz (2002). Consistent with these concerns, India's reservation system is associated with suboptimal firm size and with aggregate productivity and output losses—both in reserved and non-reserved markets—through linkage effects (Garcia-Santana and Pijoan-Mas, 2014). Beginning in 1997, the policy was gradually dismantled in stages (Velayudhan, 2004; Martin et al., 2017). However, there is limited evidence on how plants responded to this policy change in terms of product scope and performance outcomes. However, there is limited evidence on how plants responded to this policy change in terms of product scope and performance outcomes.

A small set of studies has has evaluated what happened when India began dismantling its product reservation regime. The evidence so far suggests that the effects were not uniformly negative: for instance, Martin et al. (2017) finds that although reservation was originally justified as an employment-generating strategy for labor-intensive SMEs, its removal was associated with higher aggregate employment. Likewise, Tewari and Wilde (2019) documents post–de-reservation adjustments in output, employment, wages, and investment. What remains less well understood, however, is how establishments adjusted on the product margin—whether they changed their product mix, introduced new products, or altered their innovation behaviour once protection was withdrawn.

In this paper, we address this gap by studying outcomes in the product market. We examine how de-reservation affected establishments' product scope—changes in product mix and sales from new products—alongside standard performance measures, and we ask whether these effects vary systematically across plants. Specifically, we focus on two primary research questions: (i) what was the overall impact of small-scale de-reservation on plants' product scope and performance? and (ii) does this impact vary systematically with plant characteristics such as size, innovation activity, and technological orientation of the products produced? Put differently, we test for heterogeneous responses by scale (small vs. large), engagement in innovation, input-use patterns, and product sophistication. This emphasis on heterogeneity is motivated by evidence of substantial dispersion in performance even among similarly sized firms within the same industry (Bernard et al., 2022; Hottman et al., 2016; Mathew, 2017). Larger or more innovative plants may be better positioned to exploit new opportunities created by de-reservation, while smaller or less innovative plants may find it harder to adjust once protection is removed.

To address these questions, we use plant-level panel data with detailed product information from India's Annual Survey of Industries (ASI). This dataset allows us to track manufacturing establishments over time and observe the products they produce, which is crucial for measuring changes in product scope. Using a difference-in-differences empirical strategy that exploits the staggered removal of products from the reservation list, we identify the causal impact of de-reservation on firm behavior and outcomes. Deviating from the conventional reduced-form causal inference using standard Difference-in-Differences (DiD) or regression approaches, we employ a Difference-in-Differences framework with multiple time periods as proposed by Callaway and Sant'Anna (2021), taking into account the staggered removal of products from the reservation list.

Our findings indicate that removing the small-scale reservation policy had a positive overall effect on product scope expansion and performance, but these benefits were not uniform across all plant units. Overall, de-reservation encouraged establishments to introduce new products and was associated with improvements in output and productivity. Yet these average gains mask substantial heterogeneity. Large establishments (those with above-median employment) experienced significant increases in both new product introductions and performance metrics following de-reservation, whereas smaller plants (below-median employment) saw no statistically significant effects. Moreover, units that were engaged in innovation by developing new products benefited more from de-reservation than non-innovative units. Finally, plants manufacturing technologically sophisticated products realized larger gains from the policy change compared to those producing more traditional or basic products. These findings suggest that the gains from relaxing size-based regulatory constraints accrue disproportionately to firms with greater scale or innovation capabilities, underscoring the importance of firm-level capability building in translating policy changes into improved outcomes for growth and competitiveness.

The rest of the paper is organized as follows. Section 2 provides background on the small-scale industry reservation policy and its phased removal in India, drawing on existing studies and identifying key gaps in the literature. Section 3 describes the data sources, key variables, and summary statistics. Section 4 outlines the empirical strategy and econometric specifications. Section 5 presents the estimation results and discusses the heterogeneous effects in detail. Finally, the last section concludes the study.

2 Small Scale Industry (SSI) reservation and de-reservation in India

2.1 Post-Independence Industrial Strategy and small-scale product reservation

In India's industrial policy landscape, the term "Small Scale Industry" (SSI) refers to a manufacturing enterprise with investment in plant and machinery below a defined threshold, historically INR 10 million, later revised to INR 50 million under the MSME Act (2006).[1] While often used interchangeably with Small and Medium Enterprises (SMEs), SSIs constitute a formal subcategory of manufacturing SMEs specifically eligible for certain policy benefits such as product reservation.[2] Soon after India's independence, Small and Medium Enterprises (SMEs) accounted for nearly 40 percent of the industrial sector's added value and were the second largest employer, with agriculture being the first (Boehm et al., 2022). Among the mix of support for the small-scale units, arguably the most prominent and unique policy in India was the small scale product reservation, implemented in the third Five Year Plan (Tewari and Wilde, 2019). The roots of the small-scale reservation policy are deeply embedded in India's post-independence development strategy, that prioritized self-sufficiency, import substitution, and a state-led, socialist-leaning approach to industrial growth (Bala Subrahmanya, 1998). Under this regime, a plant whose total stock of investment in plant and machinery at historical cost less than 10 million INR was considered as a SSI (small scale industry) unit and allowed to manufacture product(s) which are categorized as SSI products. By the Micro, Small and Medium Enterprise Act (2006), this limit got raised to INR 50 million.[3] The reservation policy started in 1967 with 47 products, which increased to 504 in 1978 and to 836 in 1989 (Sen and Ray, 2015). By the year 1997, the number of products that were under SSI reservation reached its peak of around 1000, ranging from primary sector to chemicals.[4]. The consideration for the reservation of an item is its suitability and feasibility for being made in the small scale sector without compromising on quality aspects (Velayudhan, 2004).

Apart from the normative reason, the official rationale for the small-scale reservation policy was multi-faceted, reflecting a broader set of socio-economic goals that went beyond pure economic efficiency. Firstly, the policy was conceived as a powerful tool for employment generation. In a country characterized by an abundant labor force and scarce capital, leveraging the perceived labor-intensive nature of small firms was seen as a logical strategy to absorb India's vast workforce (Bala Subrahmanya, 1998). Secondly, policymakers believed that without a protective shield, nascent and resource scarce small enterprises would be unable to compete with large enterprises (Martin et al., 2017), and therefore it is essential to create exclusive and low-barrier niches to encourage more individuals and small groups to venture into manufacturing activities, thereby democratizing industrial activity and dispersing entrepreneurial skills more widely.

[1] https://samadhaan.msme.gov.in/WriteReadData/DocumentFile/MSMED2006act.pdf

[2] Throughout this paper, we use the term SSI when referring to firms eligible under the product reservation regime, and SME in broader contexts.

[3] https://samadhaan.msme.gov.in/WriteReadData/DocumentFile/MSMED2006act.pdf

[4] A concrete example is the biscuit industry, which remained under reservation until 1997. Before this policy change, only small scale units were allowed to manufacture biscuits, effectively shielding them from competition by larger or multinational firms. However, the policy also constrained modernization and scale efficiencies. After de-reservation in July 1997, firms like Britannia and Parle were able to enter or expand in the market, helping transform India into one of the largest biscuit producers globally

2.2 From Reservation to De-reservation

A growing literature argues that size-based regulations and product reservation can lock economies into suboptimal production structures, slowing reallocation toward more productive firms and thereby depressing aggregate productivity and growth. In the Indian context, Aghion et al. (2008) documents that protectionist and regulatory barriers imposed sizable—though heterogeneous—costs for both growth and productivity. Quantitative work points to meaningful aggregate stakes: using a span-of-control framework calibrated to Indian data from 2001 (when reservations were still largely in place), Garcia-Santana and Pijoan-Mas (2014) simulate that dismantling the reservation regime would raise manufacturing output per worker by roughly 7 percent, a magnitude that appears broadly consistent with subsequent evidence following reform (Martin et al., 2017). Micro-level patterns align with these concerns. Survey evidence suggests that output growth for reserved products was significantly slower than for comparable non-reserved items produced by small enterprises, and reserved product space seems to have represented a relatively limited segment of the SSI universe (Debroy et al., 2006). These findings fit with a broader misallocation perspective: Hsieh and Klenow (2009) argues that a substantial share of the productivity gap between countries such as India and the United States can be traced to plant-level distortions that impede efficient resource allocation, including policies that constrain firm size to promote smaller units.

The case for de-reservation strengthened further under trade liberalization, as SSI units could remain protected from domestic non-SSI competitors while facing intensified foreign competition as importing became easier. These inefficiencies contributed to the government's decision to relax reservation gradually. De-reservation may also matter through input–output linkages: removing upstream entry barriers can improve access to inputs for downstream firms, and related evidence shows that reducing input-market barriers can shift firms' product choices toward activities that use similar input bundles (Boehm et al., 2022). From a policy perspective, progressive de-reservation was explicitly framed as a way to enable technology upgrading, promote exports, and realize economies of scale to enhance SME competitiveness under liberalization (Ministry of Micro, Small and Medium Enterprises, Government of India, 2009). Yet adjustment is likely to be uneven, since very small firms may face substantial barriers to upgrading and scaling; in garments, for example, minimum efficient scale may require around 5,000 sewing machines, while domestic-market plants in India average closer to 20 (Lewis, 2005).

Though existing studies—including Martin et al. (2017)—examine the effects of de-reservation and show that it was associated with higher aggregate output and employment, the literature remains limited in three important respects that this study aims to address.

First, there is relatively little plant-level evidence on product scope and performance dynamics, largely because suitable plant-level panel data from the Annual Survey of Industries (ASI) have not been widely available. Most existing work, including Martin et al. (2017), focuses on broad outcomes such as total employment, output, or wages, effectively treating firms' production portfolios as a black box and providing limited insight into how establishments adjust their product mix in response to regulatory change. A notable exception is Tewari and Wilde (2019), which documents product churning following de-reservation. However, that study covers a shorter period (2001–2010) and relies on a standard Difference-in-Differences (DiD) approach. Given that de-reservation occurred in a staggered manner, additional evidence using methods designed for staggered treatment timing is needed to capture the nuances of how the reform affected product scope and performance outcomes.

Second, the literature has paid limited attention to heterogeneous effects across firm types within the same policy setting. Prior research often treats "incumbents" or "entrants" as relatively homogeneous groups. Yet responses to deregulation are unlikely to be uniform. Recent work in trade and industrial organization highlights substantial dispersion in performance even among similarly sized firms (Bernard et al., 2022; Hottman et al., 2016). Existing studies on de-reservation have not sufficiently examined whether the gains from deregulation are concentrated among a subset of firms—such as those that are already larger or more capable—while smaller establishments struggle to adjust.

Third, there is limited evidence on how de-reservation interacts with innovation-related capabilities. While Garcia-Santana and Pijoan-Mas (2014) emphasizes productivity losses from misallocation, there is relatively little empirical work linking de-reservation outcomes to firms' technological orientation or innovation activity. This matters because the broader literature shows a well-established link between innovation and productivity (Mairesse et al., 2025; Morris, 2018), and evidence suggests that the returns to innovation can depend on the competitive environment (Friesenbichler and Peneder, 2016). These insights reinforce the idea that firm characteristics interact with market conditions in shaping performance, underscoring the importance of examining heterogeneous responses to industrial deregulation.

We address these gaps using a comprehensive plant-level panel from the ASI covering 1999–2016. Exploiting the staggered de-reservation of products and applying methods suited to staggered policy changes, we provide new evidence on how relaxing size-based constraints affects establishments' product scope and performance, with particular attention to heterogeneous responses by plant size and innovation capabilities.

3 Data, Variable definition and Summary statistics

3.1 Data source

We utilize a plant-level panel data-set of India's manufacturing sector, drawn from the Annual Survey of Industries (ASI). While this dataset was previously available as a repeated cross section, the new dataset provides unique identifiers for plant units, allowing us to establish the link over the years. Prior research, such as Goldberg et al. (2010a,b); Dosi et al. (2020), among others, has used the CMIE-Prowess database, created and maintained by the Center for Monitoring Indian Economy (CMIE). While this database has been useful for studying the behavior of large firms in terms of pricing, mark-ups, privatization, firm size distribution, innovation, technological activities, product switching, and firm dynamics, the ASI data offers a more comprehensive view of the organized or registered component of the Indian manufacturing sector.

The ASI dataset covers industrial units registered as 'factories' under the Factories Act 1948 and includes all manufacturing units with more than 10 workers using electricity or 20 workers without electricity.[5] The sampling universe for the ASI consists of factories registered under $2m(i)$ and $2m(ii)$ of the Factories Act, units registered under the Bidi and Cigar Workers Act, and several utility providers. All factories with more than 100 employees are surveyed on year-on-year basis and one-fifth of the total factories with fewer than 100 employees are sampled for survey every year. Our dataset often includes enterprises that may be larger in terms of number of employees but are small with respect to capital investment, adhering to the SSI standards. A noteworthy feature of the ASI dataset is that it provides product-specific information on inputs, including both imported and domestically purchased items, as well as products manufactured.[6] This detailed data, spanning from 1999-2000 to 2015-16, is particularly well-suited for understanding how plants

[5] See Factories Act 1948

[6] In one among the series of papers by GKPT that cover the time period from 1989 to 2003, Goldberg et al. (2010b) mention the main rationale to use CMIE Prowess is that though ASI gives product level information of manufacturing plants, the datasets are not available in panel format. However, we were fortunate to get access to the panel dataset with unique factory identifiers covering from 1998-99 to 2015-16, thanks to Ministry of Statistics and Programme Implementation, Government of India. In this paper we used the data from 1999-2000 to 2015-16 as we found substantial missing values for some relevant variables in 1998-1999 data set

adjust their product portfolio in response to SSI de-reservation policies and how it affected performance outcomes as product de-reservation began in late 1990s.

3.2 Sample construction and concordance procedure

ASI data is subdivided into various parts called 'Blocks', which are thematic sub-units of data. To construct the sample, we use all non-missing observations from Blocks A (basic information), B (additional information), C (capital and investment), D (finished goods), E (employment), G (receipts), H (inputs, including fuel and electricity), I (imports), and J (production). We restrict our sample to manufacturing plants, i.e., industries 15 to 36 of India's NIC 2004 classification, and drop a small number of observations with unreliable data. Table 2 provides a brief overview of our data.

3.2.1 Concordance from NPC-MS to ASICC product codes

As mentioned, the basic unit of the ASI is an 'establishment', otherwise called a 'factory' in the ASI dataset. From 1999-2000 to 2009-10 in our sample, establishments report products as ASI Commodity Classification (ASICC) codes, which is a five digit product level classification system at the national level. However, from 2010-11 to 2015-16, the products are reported in NPCMS (National Product Classification for Manufacturing sector), which is analogous to the Central Product Classification (CPC) of the United Nations Statistical Division.[7]. To ensure consistent product classification across the entire sample period (1999-2000 to 2015-16), we performed a concordance from NPCMS to ASICC for each year of data to ensure that the product codes are in a uniform series.[8]

3.2.2 Concordance from SSI product codes to ASICC product codes

The main objective of our paper is to see the effect of SSI de-reservation on plants' product scope and performance. Small scale de-reservation specifically targeted products rather than firms. Having organized the product level data uniformly in ASICC series, our next task is to identify the set of products that are subject to de-reservation. These products are provided by the Ministry of Small and Medium Enterprises, but in SSI product codes.[9]. Once we have made the products data in a uniform series of ASICC, we created a concordance between the SSI product codes and ASICC product codes manually based on the text descriptions of the products and mapped these products to our panel of manufacturing establishments. This allows us to identify the factories that make the SSI products and the years in which they are subject to the de-reservation policy. The factories that do not produce SSI products are not subject to the product de-reservation policy. A sample of the concordance between NPC-MS and ASICC to SSI product codes is given in table A.1 in the appendix.

[7]The National Product Classification for Manufacturing Sector (NPCMS) is a classification system used in India to categorize manufacturing products based on their characteristics and uses. The classification system includes a hierarchical structure that groups products into broader categories and subcategories. The NPCMS is used to collect and analyze data on manufacturing products in India, particularly by the Central Statistical Office (CSO). The classification is periodically revised to keep pace with changes in the manufacturing sector

[8]The concordance table provided by the Central Statistical Office (CSO) of India from NPCMS 2011 to ASICC can be accessed from https://mospi.gov.in/sites/default/files/main_menu/national_product_classification/Concordance_of_ASICC_with_NPCMS_18apr12.pdf

[9]The SSI products list and year-wise de-reservation list can be accessed from https://www.dcmsme.gov.in/publications/reserveditems/resvex.htm

3.2.3 Sub-samples to measure the heterogeneous effects of de-reservation policy

To examine heterogeneous effects of de-reservation by plant size, we divide establishments into "small" and "large" groups based on employment. Plants with employment less than or equal to the sample median are classified as small, while those with employment above the median are classified as large. In our manufacturing sample, the median employment level is 33.

Because innovative and non-innovative SMEs can differ markedly in performance and in their responsiveness to policy (Expósito and Sanchis-Llopis, 2019), we also analyze heterogeneous effects by innovation status. To identify products that are novel to the establishment, we apply two rules to avoid ambiguity. First, products reported in a plant's first observed year in the dataset are not treated as "new" unless that year coincides with the plant's incorporation year. Second, if a product is introduced, subsequently discontinued, and later reintroduced, we do not classify it as new upon reintroduction. An establishment is classified as innovative if it introduces at least one new product before the end of the de-reservation period; non-innovators are those that never introduce a new product under this definition.

We further split the sample into new input users and other plants. To identify new input users, we construct a dummy that equals 1 if an establishment uses an input for the first time in our panel—whether imported or domestically sourced—and 0 otherwise. As with our definition of innovators, we impose two restrictions to avoid misclassification. First, we do not treat inputs purchased in the plant's first observed year in the dataset as "new," since the input may have been used prior to the plant entering the panel. Second, if an input is purchased, discontinued in the subsequent year, and later repurchased, we do not count it as new upon repurchase, since the plant has already used that input before.

We also construct sub-samples of importing and non-importing units. To do so, we define an import dummy that equals 1 if an establishment imports at least one input and 0 otherwise. Finally, we examine heterogeneity by the technological sophistication of the products plants produce. Following Galindo-Rueda and Verger (2016), we classify 2-digit industries by technology intensity into low-, medium-low-, medium-high-, and high-technology categories. We conduct the sub-sample analysis for the first three groups; no products in the high-technology category were subject to the de-reservation policy.

3.3 Variable definition

We define a plant's product scope in two ways: (i) the introduction of new products and (ii) the share of sales accounted for by new products. A new product is an ASICC five-digit product code that appears in a plant's product mix in year t but was absent in year $t-1$, conditional on the plant being observed in both years. To avoid misclassification, we impose two restrictions. First, a product reported in a plant's first observed year in the dataset is not treated as new unless that year coincides with the plant's incorporation year. Second, if a product is introduced, subsequently dropped, and later reintroduced, we do not count it as new upon reintroduction.

To measure firm performance, we use labour productivity and sales growth. Labour productivity is defined as the log of real output per employee. Sales growth is measured as the log of total sales in period t minus the log of total sales in period $t-1$, with sales deflated using the Wholesale Price Index (WPI) at the NIC 2-digit industry level.[10]

To identify de-reservation status, we construct a binary indicator equal to 1 if the establishment's main product has been de-reserved in a given year. Once a plant becomes de-reserved, it remains classified as de-

[10] Industry-wise Wholesale Price Index data can be accessed from the Office of the Economic Advisor, Government of India at https://eaindustry.nic.in/.

Table 1: **Definition of Variables**

Variable	Definition
Outcome Variables	
New Product	Dummy variable takes the value 1 if a plant has introduced a new product to the unit in year t and 0 otherwise
New Product Share	Ratio of sales of new products in total sales of the establishment
Labour Productivity	Log value of real output (in million INR) divided by Number of employees
Sales Growth	Log value of real gross sales in year t minus Log value of real gross sales in year $t-1$
Treatment Variable	
De-res status	Dummy variable takes the value 1 if a plant is subject to de-reservation policy in year t and 0 otherwise
Control Variables	
Multi Product dummy	Dummy variable takes the value 1 if a plant has more than one product in it's portfolio in year t and 0 otherwise
Private Ownership dummy	Dummy variables takes the value 1 if the unit is privately owned and 0 if it is publicly listed
Plant Age	Log value of the number of years since the year of beginning of production
Factory Size	Log value of the number of employees in year t
Working Capital	Real working capital in year $t-1$ in million INR
Wages	Real wage and salaries in year $t-1$ in million INR
Welfare Expenses	Real staff Welfare Expenses in year $t-1$ in million INR
Cash holdings	Real Cash-in-hand in year $t-1$ in million INR
Sales	Real gross sales in year $t-1$ in million INR

reserved in all subsequent years. If an enterprise produces multiple products that are de-reserved in different years, we assign treatment based on the first year in which any of its de-reserved products becomes eligible.

We also control for plant characteristics that may shape both treatment and outcomes, including multi-product status, public listing, and plant age, as well as size, sales, working capital, cash holdings, and staff welfare expenses.[11] Table 1 provides detailed definitions of all variables used in the study.

3.4 Summary statistics

In figure 1, we present an overview of the share of output from reserved products in total output and the share of plants producing reserved products in the total number of plants. Even though the process of de-reservation started in the late 1990s, de-reservation on a large scale occurred from 2004 to 2008. We see that until 2003, the output share from reserved products was increasing, and there was a commensurate increase

[11] Plant age and size are proxied by the logarithms of age and employment, respectively. Sales, working capital, cash holdings, and staff welfare expenses are measured in million INR and deflated using the industry-wise WPI.

in the number of plants that produced these SSI products. The increase in the number of plants could be attributed to the new entry of firms into the reserved product space. However, once de-reservation started on a massive scale, we see a reduction in output and the exit of firms from this product space. The reduction in the share of output is faster than the reduction in the number of plants producing these products.

3.4.1 Small vs large units

From the summary statistics, small firms appear slightly more likely to introduce new products than their larger counterparts (Table 2). This pattern is consistent with the argument in Audretsch and Acs (1991) that innovativeness per employee may decline as firms grow—at least up to very large sizes—partly because larger firms tend to channel innovation effort toward process improvements (often R&D-backed), whereas smaller units more often pursue product introductions. Related evidence shows that larger firms allocate a higher share of their R&D spending to process innovation than smaller firms, even though both product and process R&D rise less than proportionately with firm size (Fritsch and Meschede, 2001). Product scope is also shaped by multiproduct status: multiproduct plants can add products through incremental innovations more easily than single-product producers. In our sample, however, the share of multiproduct establishments is broadly similar across small and large firms, suggesting that differences in new product introduction are not driven simply by differences in multiproduct prevalence.

Consistent with prior evidence for India on productivity gaps between larger formal firms and smaller firms (Bloom et al., 2013; Goldar and Kumari, 2003; Goldar, 2015), larger establishments in our sample exhibit higher labour productivity than small units. Differences in sales growth can be interpreted in the same light, as more productive firms tend to expand faster (Aw, 2002).

The de-reservation status indicator captures whether an establishment is exposed to the policy change. A value of 1 in year t implies that the unit becomes de-reserved in that year; once treated, it remains classified as de-reserved in subsequent years. Importantly, the eligibility thresholds underlying reservation are capital-based rather than labour-based. As a result, within the SSI sample there are plants that qualify as "small" by reservation criteria while employing relatively large workforces.

Not surprisingly, a much larger share of the "large" plants in our sample are publicly listed (17%), compared with only 4% among smaller plants. Small units are also younger on average, by roughly two years. Finally, establishments with 33 employees or more report substantially higher working capital, cash holdings, wage bills, staff welfare expenses, and sales turnover on average.

3.4.2 Innovators vs non-innovators

Firms are heterogeneous even within specific size classes (Anyadike-Danes et al., 2015). Prior research generally finds that innovative firms outperform non-innovative ones for several reasons (Evangelista and Vezzani, 2010). Innovation can improve product quality or reduce production costs, raising sales and market share and, through greater internal efficiency and higher value added, increasing profitability and profit margins. A large body of evidence also links innovation to higher productivity and faster growth (Hall et al., 2009; Grazzi et al., 2016; Morris, 2018; Mohnen and Hall, 2013). Innovation is further associated with a higher likelihood of exporting and greater export intensity, strengthening firms' competitive advantage and market reach (Freel, 2000).

Our summary statistics are consistent with these patterns. Table 3 shows that roughly two-thirds of sales among innovating units come from new products. Innovators also display higher sales growth than non-innovators, in line with earlier findings (Coad et al., 2020, 2016; Cassiman and Golovko, 2011; Freel, 2000; Expósito and Sanchis-Llopis, 2019), and they are more productive on average. Notably, 51% of innovative firms in our sample are subject to de-reservation, compared with about half that share among non-innovative units. Across other characteristics—sales, employment size, working capital, wage bills, cash holdings, and staff welfare expenses—innovating units are larger on average than non-innovators, and they are also slightly older.

3.4.3 New input users, importers and non-importers

Enterprises differ markedly in their use of new inputs. Plants that adopt new inputs are likely to be more connected to suppliers and customers—and to face stronger pressures and opportunities to upgrade—than plants that do not. Consistent with this view, Table 3 shows that new-input users are, on average, larger and more innovative: they are more likely to introduce new products and have a higher share of sales coming from new products. They are also more often multiproduct establishments. The same pattern holds across other indicators of scale and resources—working capital, sales, staff welfare expenses, wages, and cash holdings—which are all higher among new-input users. Notably, these plants are at least four years older on average, suggesting that greater market experience may facilitate access to higher-quality inputs and new suppliers. They also exhibit higher labour productivity.

A similar pattern emerges for importing plants. Consistent with theory and evidence (Vogel and Wagner, 2010; Foster-McGregor et al., 2014; Abreha, 2019), importers are typically larger than non-importers. In the Indian context, Nataraj (2011) shows that smaller firms continue to have substantially lower access to international markets than larger firms even after major trade reforms. Importing is also associated with a higher likelihood of achieving high-growth status, even among otherwise comparable firms (Cruz et al., 2021). In our sample (Table 3), importing plants display higher sales growth, working capital, wage bills, cash holdings, and staff welfare expenses, and they are larger in terms of employment.

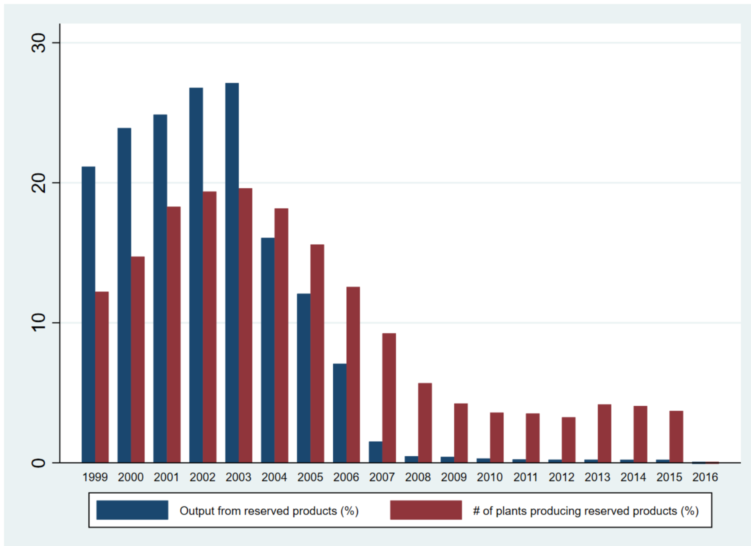
3.4.4 Nature of products

Table 3 shows clear differences across technology categories. The likelihood of introducing new products and the share of new products in total sales rise as we move from low- to medium-technology sectors, and a similar upward pattern is evident for sales growth. By contrast, the share of multiproduct firms is slightly higher in low-technology industries, and low-technology establishments are, on average, somewhat older than medium-technology units. Consistent with these patterns, measures of scale and resources—working capital, wages, staff welfare expenses, and cash holdings—also increase steadily from low- to medium-technology sectors. Finally, in terms of sales levels, medium-high-technology firms record the highest average sales, followed by low-technology enterprises.

3.5 Data limitations and coverage considerations

While the Annual Survey of Industries (ASI) panel provides unusually rich plant- and product-level information for a large segment of India's manufacturing sector, it has a few important limitations. First, the panel is unbalanced, reflecting both the rotating sampling design for smaller establishments (particularly those with fewer than 100 employees) and genuine entry and exit over time. As a result, plants are not observed in every year, and the composition of the sample can change across periods, raising the possibility of attrition and compositional shifts. Second, we drop the earliest year of the panel (1998–99) because several key variables—notably employment, sales, cash holdings, working capital, and staff welfare expenditures—contain extensive missing values. Our analysis therefore covers 1999–2000 to 2015–16 and is restricted to observations with complete information on the core variables. Third, although the ASI targets the organized

Figure 1: **Share of output from reserved products in total output and share of plants producing reserved products out of total plants**



Source: Authors' calculation using Annual Survey of Industries datasets

Table 2: **Size-wise comparative summary statistics**

	Full Sample		Small units		Large units	
Variable	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev
New Product dummy	0.22	0.41	0.24	0.43	0.21	0.41
New Product Share	0.16	0.35	0.19	0.38	0.14	0.33
Labour Productivity	5.89	0.67	5.79	0.63	5.98	0.69
Sales Growth	0.06	0.75	0.01	0.84	0.09	0.70
De-reservation status	0.30	0.46	0.32	0.46	0.29	0.45
Multi Product dummy	0.25	0.43	0.25	0.43	0.25	0.44
Ownership dummy	0.12	0.32	0.04	0.19	0.17	0.38
Plant Age	17.62	16.20	16.55	13.92	18.66	18.06
Factory Size	1.61	0.68	1.06	0.32	2.17	0.45
Working Capital	63.48	2486.04	4.30	112.99	121.68	3498.26
Wages	24.85	198.93	1.01	4.48	48.81	279.60
Welfare Expenses	2.05	26.65	0.05	0.80	3.75	36.14
Cash holdings	20.48	611.50	1.37	74.70	39.30	857.89
Sales	717.16	13604.98	29.47	392.38	1348.05	18813.05

Table 3: **Comparative summary statistics based on firm characteristics**

	Innov. Units		Non-innovative Units		Low tech Units		Med-low Units		Med-high Units		New Input Users		No New Input		Importing Units		Non-Importing Units	
Variable	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
New Product dummy					0.19	0.39	0.24	0.42	0.24	0.43	0.47	0.50	0.06	0.24	0.40	0.49	0.19	0.39
New Product Share	0.74	0.38			0.13	0.32	0.19	0.37	0.18	0.36	0.35	0.45	0.04	0.20	0.25	0.40	0.15	0.34
Labor productivity	6.03	0.62	5.82	0.68	5.88	0.66	5.85	0.67	5.92	0.66	5.95	0.64	5.82	0.69	6.29	0.53	5.79	0.66
Sales growth	0.10	0.79	0.04	0.72	0.05	0.75	0.07	0.74	0.07	0.75	0.10	0.73	-0.01	0.77	0.11	0.63	0.05	0.79
De-reservation status	0.51	0.50	0.24	0.43	0.33	0.47	0.27	0.44	0.27	0.44	0.41	0.49	0.23	0.42	0.44	0.50	0.28	0.45
Multi-product dummy	0.53	0.50	0.17	0.38	0.26	0.44	0.22	0.41	0.25	0.43	0.38	0.49	0.17	0.38	0.50	0.50	0.21	0.41
Ownership dummy	0.19	0.39	0.10	0.30	0.10	0.31	0.09	0.29	0.14	0.35	0.19	0.39	0.07	0.26	0.37	0.48	0.08	0.27
Plant age	19.23	15.70	17.02	16.34	18.56	18.42	17.03	14.10	16.87	14.52	19.54	16.36	15.89	15.85	18.86	16.50	17.38	16.13
Factory size	1.75	0.68	1.56	0.67	1.63	0.69	1.53	0.64	1.64	0.68	1.74	0.68	1.49	0.65	2.27	0.59	1.48	0.62
Working capital	113.19	2811.89	44.45	2349.05	45.99	1529.97	70.44	1393.33	80.70	3827.51	91.69	2693.60	36.92	2273.47	272.02	4947.29	21.51	1577.22
Wages	39.50	273.53	19.22	160.93	19.31	108.11	24.18	201.96	32.63	273.70	14.28	90.35	0.92	7.48	102.01	460.48	9.26	57.07
Welfare expenses	3.73	34.79	1.47	23.19	1.42	16.28	1.90	20.89	2.96	38.74	1.17	12.40	0.08	1.30	10.28	65.08	0.55	7.29
Cash holdings	34.06	934.27	15.25	426.12	15.84	697.32	17.07	236.77	29.33	697.02	11.21	176.17	0.49	23.47	88.96	1328.21	6.66	303.58
Sales	1155.14	21441.72	511.48	7482.40	741.51	19819.34	437.86	2867.45	913.03	8866.93	248.28	2169.15	8.81	107.80	2865.29	30779.43	207.16	1662.78

manufacturing sector, some registered small firms may still be under-represented due to reporting problems or data inconsistencies, which may limit the external validity of results for the very smallest establishments.

To minimize the influence of these data issues, we apply a consistent cleaning procedure across years and exclude observations with missing values in key variables. Nevertheless, selection concerns remain if establishments with incomplete records differ systematically from those retained. Our empirical approach is designed to mitigate these concerns to the extent possible. In particular, we use the multi-period Difference-in-Differences estimator proposed by Callaway and Sant'Anna (2021), which accommodates staggered adoption and treatment-effect heterogeneity and estimates effects from comparisons among treated and control units with similar observed characteristics within timing-defined groups. Finally, we note that the ASI does not cover the informal or unregistered manufacturing sector, which accounts for a substantial share of India's industrial activity. Accordingly, our analysis pertains to registered factories in the organized sector. Taken together, these considerations suggest that while the ASI panel supports robust longitudinal analysis of formal manufacturing establishments, the results should be interpreted in light of these data constraints.

4 Methodology and Econometric Specification

This section outlines our empirical strategy for estimating the effects of SSI de-reservation on establishment-level outcomes—specifically product scope and performance—and for assessing how these effects vary with firm characteristics. Difference-in-Differences (DiD) is a widely used research design for causal policy evaluation. However, the canonical two-period, single-treatment-date setup is often not well suited to settings with multiple time periods and staggered treatment timing, where units adopt treatment at different points in time. In such cases, identifying and estimating treatment effects requires methods that explicitly accommodate multi-period settings and variation in treatment timing. A large and active recent literature addresses these challenges by extending DiD to staggered adoption environments (Goodman-Bacon, 2021; Sun and Abraham, 2021; Borusyak et al., 2021; Callaway and Sant'Anna, 2021). These approaches retain the core identifying ingredients—most importantly, parallel trends—while allowing for multiple treatment cohorts and appropriate inference with clustered data.

The policy change that we address in this paper fits well within the staggered-adoption framework. Product de-reservation was implemented gradually from the late 1990s over roughly a decade, with different sets of products removed from the reserved list in different years. As a consequence, the timing of exposure to de-reservation varies across establishments depending on the products they manufacture. In our data, nearly 70% of SSI-product-producing units became de-reserved between 2004 and 2007, and the long sample window (1999–2000 to 2015–16) provides multiple pre- and post-treatment years for most plants.

Accordingly, we estimate treatment effects using a DiD design with multiple treatment periods and staggered timing, adopting the methodology of Callaway and Sant'Anna (2021), which is well suited to our setting and flexible in its assumptions.

To begin with, we identify establishments that are ever observed producing at least one product that was ever on the reserved list. For these establishments, we then determine the year in which their relevant SSI product(s) were de-reserved. We construct a binary indicator, Deres, which switches from 0 to 1 in the year an establishment's manufactured product becomes de-reserved and remains equal to 1 thereafter. The baseline DiD model is as follows:

$$Y_{it} = \alpha + \beta \cdot Deres_{it} + \gamma \cdot T_t + \delta \cdot (Deres_{it} \times T_t) + X'_{it-1}\beta + \epsilon_{it} \tag{1}$$

This equation models the outcome (Y_{it}) for unit i at time t as a function of $Deres$, time period (T_t), and their interaction.

where:

Y_{it} is the outcome for unit i at time t, $Deres_{it}$ is a treatment indicator (1 if unit i is treated in period t, 0 otherwise), T_t is a time indicator (1 if the observation is in the post-treatment period, 0 otherwise). α is the constant term and β captures the difference between the treatment and control groups before the treatment. γ captures the time effect common to both groups. δ is the coefficient of interest, the average treatment effect of the policy, identified by the interaction $Deres_{it} \times T_t$, which equals 1 for treated observations in the post-treatment period. $X'_{it-1}\beta$ represents control variables as mentioned in table 1 for unit i at time $t-1$. ϵ_{it} is the error term.

Our empirical approach follows the four key conditions highlighted by Callaway and Sant'Anna (2021). First, we assume that no unit is treated in the first year of the panel, ensuring at least one pre-treatment period for all treated cohorts. Second, we exclude units that are treated in all years, since they do not provide pre-treatment information and therefore cannot contribute to identification. Third, treatment is defined in a staggered and absorbing way: once a unit becomes de-reserved, it is treated as de-reserved in all subsequent years. Finally, we assume that the parallel trends condition holds conditionally—that is, treated and control units would have followed similar outcome trends in the absence of treatment after conditioning on observed covariates.

The covariates we include are plant age, plant size, an ownership dummy, a multiproduct dummy, working capital, wages, staff welfare expenses, cash holdings, and sales. These characteristics help account for differences in experience, resilience to shocks, financial capacity, and workforce quality, among other factors that may shape both treatment timing and outcomes. The multi-period DiD specification is given by:

$$Y_{it} = \alpha + \beta \cdot Deres_{it} + \sum_{t=1}^{T} \gamma_t \cdot T_t + \sum_{t=1}^{T} \delta_t \cdot (Deres_{it} \times T_t) + X'_{it-1}\beta + \mu_i + \lambda_t + \epsilon_{it} \tag{2}$$

where:

Y_{it} is the outcome for unit i at time t, $Deres_{it}$ is a treatment indicator (1 if unit i is subject to de-reservation in year t, 0 otherwise), T_t is a set of time dummies (1 if the observation is in time period t, 0 otherwise). α is the constant term, β captures the difference between the treatment and control groups before the treatment and γ_t captures the time effects common to both groups. δ_t are the coefficients of interest, representing the average treatment effect in each time period. $X'_{it-1}\beta$ represents control variables for unit i at time $t-1$. μ_i and λ_t are unit-specific and time-specific fixed effects, respectively. ϵ_{it} is the error term.

To be precise, in this equation, T time periods exist $(1, 2, \ldots, T)$, each with its own coefficient (γ), allowing for the potential of varying treatment effects over time. The δ coefficient signifies the average treatment effect on the treated (ATT), now contingent on the specific time period under examination.

Based on the assumption of the staggered treatment adoption in the model proposed by Callaway and Sant'Anna (2021), we define G as the time period when a unit first becomes de-reserved. For all units that eventually participate in the treatment, G defines which 'group' they belong to. The units that do not participate are 'never treated,' and we use this as our comparison group. We define G_g to be a binary variable that is equal to 1 if a unit was first treated in time g.

Our outcome variables are the introduction of new products, the share of new product sales in total sales, labor productivity, and sales growth. To identify the heterogeneous effects, we have implemented the DID with multiple time periods for different sub-samples. These sub samples include small and large units within SMEs, innovators and non-innovators, new input users and others, importers and non-importers, and lastly, enterprises producing technologically sophisticated products and others.

As in the case of other doubly robust methods, for example Słoczyński and Wooldridge (2018), Callaway and Sant'Anna (2021) specify two models: the treatment model and the outcome model. The treatment model is the regression model that relates the treatment status to any observed covariates. The goal of the treatment model is to estimate the propensity score, which is the conditional probability of receiving treatment given the observed covariates. This can be used to balance the distribution of covariates between treated and untreated units, which can help to reduce bias in estimating treatment effects. It is important to choose a set of covariates that are predictive of treatment assignment as well as a functional form for the relationship between these covariates and treatment. By default, the csdid package in Stata uses inverse probability weighting for the treatment model. Assuming that treatment adoption occurs at different times for different units, the treatment model can be specified to account for this staggered adoption. The model is as follows:

$$Deres_{it} = \gamma_0 + \sum_{t=1}^{T} X'_{it}\gamma_t + \sum_{t=1}^{T} Z'_{it}\delta_t + \epsilon_{it} \tag{3}$$

Here $Deres_{it}$ is the treatment indicator for unit i at time t, equal to 1 if the unit is treated at time t, and 0 otherwise, γ_0 is the intercept term and X_{it} is a vector of observed covariates for unit i at time t. γ_t is a vector of coefficients for the covariates in X_{it}, which may vary over time. Z_{it} is a vector of observed covariates specific to the time period t that may influence the timing of treatment and δ_t is a vector of coefficients for the time-specific covariates in Z_{it}. ϵ_{it} is the error term. This model allows the treatment assignment to vary over time, reflecting the staggered nature of treatment adoption.

The outcome model is the regression model that relates the outcome variable to the treatment status and other covariates. It is important to choose a functional form for this model that accurately captures the relationship between the outcome and treatment, as well as any potential confounding factors that may affect both. We use least squares for the outcome model. After controlling for the potential covariates, our model satisfies the pre-trend assumption, which implies that both the treatment group and the comparison group are comparable before the treatment begins. The equation that accounts for multiple time periods and group fixed effects is as follows. We report the aggregate group-time ATTs reflecting the overall treatment effects.

$$Y_{it} = Y_{i,t}(0) + \sum_{g=2}^{T} (Y_{i,t}(g) - Y_{i,t}(0)) \cdot G_{i,g} + X'_{it}\beta + \mu_g + \lambda_t + \epsilon_{it} \tag{4}$$

In the outcome model, Y_{it} is the observed outcome for unit i at time t, $Y_{i,t}(0)$ is the potential outcome for unit i at time t if it had never received the treatment and $Y_{i,t}(g)$ is the potential outcome for unit i at time t if it first became treated in period g. $G_{i,g}$ is a binary indicator that equals 1 if unit i first became treated in period g, and 0 otherwise. $X'_{it}\beta$ represents the control variables for unit i at time t, with β as the vector of coefficients. In this equation, μ_g is the group fixed effect which captures any time-invariant differences between groups that may affect the outcome. λ_t is the time fixed effect for time t. ϵ_{it} is the idiosyncratic error term for unit i at time t.

5 Results

5.1 Effects of de-reservation on plant level outcomes: full sample

Table 4 reports the effects of small-scale de-reservation on plant-level outcomes related to product scope and performance. The estimates indicate that de-reservation is associated with a higher likelihood of introducing new products and with faster sales growth in the full sample.

The positive average effect on new product introductions is consistent with two complementary mechanisms. First, greater competitive pressure following de-reservation may induce firms to differentiate their product offerings in order to defend market share, in line with Schumpeterian and competition-driven innovation arguments (Aghion et al., 2005). Second, de-reservation relaxes size-based regulatory constraints that previously segmented product markets, allowing firms—especially those with stronger capabilities and greater scale—to reallocate resources toward more profitable product lines. More generally, prior work suggests that policy changes affecting entry conditions, competition, or innovation incentives can increase innovation output (Smith, 2020; Ivus et al., 2021; Cin et al., 2017). For instance, policies that reduce barriers to entry or provide financial incentives for research and development (R&D) can stimulate innovation, product launches, and productivity improvements (Bronzini and Piselli, 2016; Czarnitzki and Delanote, 2015; Love and Roper, 2015). At the same time, introducing new products does not necessarily imply that these products quickly account for a large share of revenues. Market uptake depends on factors such as absorptive capacity and product–market fit, which can shape the extent to which new products translate into sales (Cohen and Levinthal, 1990; Fu et al., 2011; Crescenzi and Gagliardi, 2018).

Before de-reservation, selected products were reserved exclusively for small-scale units to promote their development, but this also limited entry by larger firms into those product spaces. The phased removal of reservations opened these markets to larger producers, with the stated objective of strengthening competition and efficiency. The positive effects on sales growth reported in Table 4 are consistent with this interpretation. These average effects, however, may mask substantial heterogeneity across plants, motivating the sub-sample analyses reported in the following tables.[12]

Table 4: Effects of product de-reservation on product scope and performance

	(1) New product	(2) New product share in sales	(3) Labour productivity	(4) Sales Gr.
Full Sample				
ATT	0.0341***	0.0105	0.0132*	0.0388***
	(0.0109)	(0.0088)	(0.0072)	(0.0138)
ATT Pre Average	-0.0010	-0.0036	0.0114	0.0312
	(0.0161)	(0.0180)	(0.0078)	(0.0222)
ATT Post Average	0.0295**	0.0046	0.0123	0.0410***
	(0.0139)	(0.0107)	(0.0101)	(0.0157)
Number of observations	86070	86070	80559	80793
Pre Trend p value	0.2281	0.6541	0.0003	0.0435

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Treatment model: Inverse probability and Outcome model: Least squares

[12] Event-study plots for the full sample and sub-samples are available from the authors upon request.

5.2 Heterogeneous effects of de-reservation on plants of different size

The role of firm size in shaping responsiveness to policy remains contested. Many firm-targeted policies are designed for small and medium enterprises, yet smaller firms often respond less—partly because they face tighter constraints and partly because they participate less in policy programmes (Blanes and Busom, 2004). In our setting, product de-reservation expanded eligibility by allowing all establishments to produce goods that had previously been reserved for small-scale units. Importantly, however, SSI producers were not a homogeneous group. Reservation thresholds were capital-based, and employment varies substantially across SSI establishments. It is therefore plausible that de-reservation generated heterogeneous effects by plant size.

To examine this, we split establishments at the sample median employment level (33 workers), classifying plants with employment less than or equal to the median as "small" and those above the median as "large." Table 5 shows that de-reservation had limited effects for smaller plants: apart from a modest increase in the probability of introducing a new product (significant at the 10% level), we find no statistically meaningful effects on labour productivity or sales growth. In contrast, the effects are clearer among larger establishments, for which de-reservation is associated with significant increases in new product introductions, labour productivity, and sales growth.

This pattern is consistent with evidence that smaller enterprises face stronger resource constraints (Ayyagari et al., 2007), which can translate into weaker capabilities (Chirita et al., 2025) and limit their ability to adjust to policy-induced changes in market conditions. Larger plants are typically better positioned to exploit new opportunities because they have greater access to finance (including internal funds), managerial depth, and skilled labour. These advantages may help them undertake capital deepening, reorganize production, and absorb the fixed adjustment costs associated with expanding product scope. In line with Garcia-Santana and Pijoan-Mas (2014), productivity gains following de-reservation may arise through improved factor allocation and embodied technological change—channels that are more readily realized by establishments with greater scale and capacity.

The modest increase in new product introductions among smaller plants may reflect a different adjustment margin. For these plants, new product introduction may be a defensive response to intensified competition from larger producers—especially new entrants into formerly reserved product space after de-reservation. For larger plants, by contrast, de-reservation likely relaxed binding constraints, enabling them to expand investment and reorganize toward new product lines. Consistent with this interpretation, we do not find significant effects of de-reservation on sales growth or labour productivity among smaller establishments.

5.3 Heterogeneous effects of de-reservation on innovators and non innovators

Product innovation is a central form of innovative effort and can benefit firms by strengthening market position and facilitating entry into new markets (Pavitt, 1998). At the same time, the mere introduction of a new product does not indicate its commercial viability or long-term survival. As emphasized in evolutionary and capability-based approaches, successful product innovation depends on—and is constrained by—the stock of knowledge embedded within the organization (Nelson and Winter, 1982; Teece et al., 1994; Dosi et al., 2017). Establishments therefore differ in their underlying knowledge stocks, product breadth, and learning capacity, which may also co-evolve with size. These differences are likely to shape how plants respond to market-opening reforms such as de-reservation and how such reforms translate into performance outcomes.

From a theoretical standpoint, innovation status is a proxy for firms' dynamic capabilities and absorptive capacity. Firms that innovate accumulate knowledge and routines that help them identify, assimilate, and

Table 5: Heterogeneous effects of product de-reservation on product scope and performance: Small vs large

	(1) New product	(2) New product share in sales	(3) Labour prod.	(4) Sales Gr.
Small units				
ATT	0.0435*	0.0083	-0.0205	0.0159
	(0.0228)	(0.0187)	(0.0150)	(0.0288)
ATT Pre Avg.	-0.0118	0.0069	0.0126	0.0445
	(0.0311)	(0.0222)	(0.0169)	(0.0468)
ATT Post Avg.	0.0222	-0.0056	-0.0400*	-0.0006
	(0.0306)	(0.0250)	(0.0220)	(0.0333)
Number of observations	19699	19699	19990	19013
Pre Trend p value	0.7284	0.9104	0.3115	0.6140
Large units				
ATT	0.0303**	0.0086	0.0176**	0.0578***
	(0.0130)	(0.0104)	(0.0077)	(0.0149)
ATT Pre Avg.	-0.0137	-0.0091	0.0074	0.0238
	(0.0201)	(0.0213)	(0.0090)	(0.0239)
ATT Post Avg.	0.0253	-0.0014	0.0208*	0.0680***
	(0.0170)	(0.0128)	(0.0107)	(0.0169)
Number of observations	61777	61777	58588	58699
Pre Trend p value	0.0060	0.0758	0.0001	0.0126

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Treatment model: Inverse probability and Outcome model: Least squares

Table 6: Effect of product de-reservation on performance: innovative vs non-innovative plants

	Innovative Units		Non-Innovative Units	
	Labour prod.	Sales. Gr.	Labour prod.	Sales. Gr.
ATT	0.0237**	0.0698***	0.0015	0.0165
	(0.0102)	(0.0203)	(0.0092)	(0.0180)
ATT Pre Avg.	0.0258**	0.0329	0.0056	0.1041**
	(0.0108)	(0.0336)	(0.008)	(0.0462)
ATT Post Avg.	0.0033	0.0847***	0.0066	0.0221
	(0.0207)	(0.0295)	(0.0141)	(0.0236)
Number of observations	60486	60810	60114	60292
Pre Trend p value	0.0751	0.5605	0.2044	0.3882

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Treatment model: Inverse probability and Outcome model: Least squares

exploit new opportunities. De-reservation expands the opportunity set by relaxing size-based constraints and intensifying competitive pressures, but only firms with sufficient internal capabilities are likely to translate these changes into sustained productivity and growth improvements (Nelson and Winter, 1982; Teece et al., 1994; Dosi et al., 2017). Our results are consistent with this logic.

Table 6 reports heterogeneous effects of de-reservation for innovative and non-innovative plants. The estimates show that the performance gains from de-reservation are concentrated among innovators: de-reservation is associated with higher labour productivity and faster sales growth for plants that introduce new products. By contrast, we find no statistically significant effects for non-innovative plants. This pattern is consistent with prior evidence that a firm's innovation capability conditions its responsiveness to policy interventions (Heijs, 2005).

There are several reasons why innovators may benefit more from de-reservation. First, de-reservation increases contestability in product markets that were previously segmented by size, intensifying competitive pressure. Innovative firms are more likely to respond to such pressure by reorganizing production, improving efficiency, and upgrading, thereby generating productivity and growth gains. Second, innovators are typically better positioned to take advantage of the expanded set of feasible products and inputs that become accessible when regulatory barriers are relaxed. In this sense, de-reservation does not mechanically raise performance; rather, it raises the returns to capability. This interpretation aligns with a broader literature showing that innovative firms tend to be more adaptive and better able to exploit new opportunities (Segarra and Teruel, 2014; Audretsch et al., 2014; Coad and Rao, 2008; Mathew, 2017), whereas non-innovative firms often struggle to adjust due to weaker learning capacity and limited innovation-related capabilities.

5.4 Heterogeneous effects of de-reservation on plants that use new inputs and others

The adoption of new inputs reflects firms' engagement in input diversification and learning-by-using, both of which can be important for expanding product scope and improving performance. New inputs—especially imported intermediates—may embody superior technologies and knowledge that complement product innovation. Establishments that experiment with new inputs may therefore be better positioned to adjust their production processes and introduce new products when regulatory constraints are relaxed.

Table 7 reports the effects of de-reservation separately for plants that use new inputs and those that do not. Our measure of new input use combines both imported and domestically sourced inputs that are new to the plant. Examining heterogeneity along this dimension is particularly relevant in our setting because the reservation regime operated through product markets, and adjustments in product scope are likely to depend on firms' access to, and ability to deploy, new inputs. This channel is also salient in the Indian context following the major trade reforms of the early 1990s, which expanded the availability and variety of intermediate inputs. Goldberg et al. (2010a), for example, shows that roughly two-thirds of intermediate import growth after liberalization occurred in products that were not imported prior to the reforms, alongside a sharp increase in the number of imported inputs.

The results indicate clear heterogeneity by new input use. For plants that adopt new inputs, de-reservation has a stronger and statistically significant effect on the likelihood of introducing a new product. Moreover, de-reservation is associated with higher sales growth for these plants, whereas we do not find comparable effects for establishments that do not use new inputs. Overall, the stronger response among new-input users suggests that de-reservation interacts with input-side capabilities, pointing to complementarities between market opening and firms' capacity for technological and organizational upgrading.

5.5 Heterogeneous effects of de-reservation on importers and non-importers

Importing firms often outperform non-importers, in part because access to foreign intermediates can improve input quality, facilitate technology diffusion, and generate learning-by-importing effects, alongside potential economies of scale and scope (Halpern et al., 2015; Castellani and Fassio, 2019; Bas and Strauss-Kahn, 2014; Vogel and Wagner, 2010; Amiti and Konings, 2007). Given these advantages, one might expect importers to respond more strongly to market-opening reforms such as de-reservation. However, Table 8 shows little evidence of large differential effects between importing and non-importing plants.

Specifically, de-reservation is associated with higher likelihood of introducing new products and faster sales growth for both importers and non-importers. The main dimension along which the effects differ is the sales share of new products, for which we find a statistically significant positive effect only among non-importing units. Overall, the absence of strong differential effects suggests that importing, by itself, does not guarantee greater responsiveness to de-reservation. While imported inputs can support productivity improvements through learning and technology adoption, the results we observe suggests that their impact depends on complementary firm capabilities—such as organizational know-how, skilled labour, and effective positioning in value chains. Without these complements, access to imported inputs may not translate into superior performance gains following deregulation (Pietrobelli et al., 2021; Amiti and Konings, 2007; Kasahara and Rodrigue, 2008).

Table 7: Heterogeneous effects of product de-reservation on product scope and performance: New input users and others

	(1) New product	(2) New product share in sales	(3) Labour prod.	(4) Sales Gr.
New inputs users				
ATT	0.0393***	0.0068	0.0071	0.0480**
	(0.0141)	(0.0111)	(0.0081)	(0.0180)
ATT Pre Avg.	-0.0329	-0.0219	0.0066	-0.0075
	(0.0309)	(0.0266)	(0.0100)	(0.0272)
ATT Post Avg.	0.0389*	0.0098	0.0108	0.0569**
	(0.0203)	(0.0152)	(0.0128)	(0.0263)
Number of observations	51260	51260	50931	50983
Pre Trend p value	0.1417	0.1877	0.5458	0.0405
Without new inputs				
ATT	0.0034	0.0056	0.0082	0.0297
	(0.0236)	(0.0186)	(0.0156)	(0.0335)
ATT Pre Avg.	-0.0217	-0.0024	-0.0065	-0.0278
	(0.0315)	(0.0264)	(0.0191)	(0.0463)
ATT Post Avg.	0.0108	-0.0034	-0.0257	0.0020
	(0.0310)	(0.0236)	(0.0221)	(0.0480)
Number of observations	19520	19520	16460	16601
Pre Trend p value	0.0731	0.0091	0.2853	0.0001

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Treatment model: Inverse probability and Outcome model: Least squares

Table 8: Heterogeneous effects of product de-reservation on product scope and performance: Importers vs non-importers

	(1) New product	(2) New product share in sales	(3) Labour prod.	(4) Sales. Gr.
Importers				
ATT	0.0360**	0.0051	0.0049	0.0317*
	(0.0164)	(0.0128)	(0.0096)	(0.0196)
ATT Pre Avg.	0.0245	0.0039	0.0031	-0.0054
	(0.0318)	(0.0176)	(0.0136)	(0.0476)
ATT Post Avg.	0.0422	0.0047	0.0024	0.0336
	(0.0199)	(0.0151)	(0.0129)	(0.0221)
Number of observations	38674	38674	36752	36815
Pre Trend p value	0.1014	0.4722	0.0332	0.1145
Non-importers				
ATT	0.0390***	0.0191*	0.0123	0.0446**
	(0.0142)	(0.0115)	(0.0098)	(0.0189)
ATT Pre Avg.	0.0565**	0.0633	0.0177*	0.0800**
	(0.0230)	(0.0648)	(0.0095)	(0.0401)
ATT Post Avg.	0.0211	0.0082	0.0136	0.0501**
	(0.0187)	(0.0154)	(0.0159)	(0.0239)
Number of observations	51955	51955	48152	48276
Pre Trend p value	0.7353	0.4984	0.0631	0.1103

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Treatment model: Inverse probability and Outcome model: Least squares

5.6 Heterogeneous effects of product de-reservation on product scope and performance: Technology orientation of products

A useful way to think about heterogeneity by technology orientation is through complementarities between technology, skills, and competition. Firms operating in more technology-intensive segments are often better able to attract and retain skilled workers and stronger managers, which can confer a performance advantage (Friesenbichler and Peneder, 2016). These human-capital and organizational strengths also translate into higher absorptive capacity—the ability to recognize, assimilate, and implement new ideas. In the context of de-reservation, where competitive pressure increases and previously segmented product markets become more contestable, establishments producing more technology-oriented products may therefore be better positioned to adjust, upgrade, and respond effectively.

Table 9 shows that the effects of de-reservation are highly heterogeneous across technology categories. Notably, none of the products subject to reservation/de-reservation fall into the high-technology category. Across the remaining groups, the estimated effects become more positive as technology orientation increases from low to medium-high technology.

For plants producing low-technology products, de-reservation is associated with a decline in the sales share of new products and shows no statistically significant effects on the other outcomes. Moving to medium-low technology, the policy has a positive and significant effect on product-scope measures, but the performance effects remain weak; in fact, we estimate a negative effect on labour productivity. By contrast, for plants producing medium-high-technology products, de-reservation has positive and statistically significant effects on both product scope and performance outcomes.

This gradient is consistent with differences in learning intensity and capability requirements across sectors. Medium and medium-high technology industries typically involve more complex production processes and greater scope for knowledge accumulation, learning-by-doing, and innovation-driven growth. Firms in these sectors are therefore more likely to translate deregulation into product upgrading and productivity-enhancing investments. In low-technology sectors, by contrast, production is often shaped more by cost competition than by innovation, which may limit the ability of firms to respond positively to increased competitive pressure. In this sense, rising technology intensity may represent a capability threshold: once firms operate in product spaces that reward learning and upgrading, regulatory liberalization is more likely to translate into both expanded product scope and improved performance, consistent with evidence on innovation-led growth in Indian manufacturing (Mathew, 2017).

Table 9: Heterogeneous effects of product de-reservation on product scope and performance: Nature of products

	(1)	(2)	(3)	(4)
	New product	New product share in sales	Labour productivity	Sales. Gr.
Low Technology				
ATT	-0.0397	-0.0596***	0.1061	0.0540
	(0.0308)	(0.0220)	(0.0774)	(0.1129)
ATT Pre Average	-0.0088	0.0093	0.0107	0.0349
	(0.0149)	(0.0110)	(0.0085)	(0.0237)
ATT Post Average	-0.0858	-0.1285***	-0.0296	0.0497
	(0.0550)	(0.0478)	(0.2296)	(0.1721)
Number of observations	33206	33206	31006	31075
Pre Trend p value	0.4252	0.1111	0.2161	0.3708
Medium Low Technology				
ATT	0.1186**	0.1051**	-0.1207**	0.0358
	(0.0469)	(0.0471)	(0.0484)	(0.0460)
ATT Pre Average	0.4392***	0.3024***	0.0491	0.2186
	(0.0341)	(0.0763)	(0.0738)	(0.2324)
ATT Post Average	0.1863*	0.2278**	-0.2625**	0.0706
	(0.1102)	(0.1101)	(0.1131)	(0.1314)
Number of observations	14563	14563	13635	13702
Pre Trend p value	0.0001	0.0002	0.0001	0.0001
Medium High Technology				
ATT	0.0776***	0.0387**	0.0420***	0.0618**
	(0.0241)	(0.0197)	(0.0143)	(0.0303)
ATT Pre Average	0.7558**	0.1776	-0.0047	0.0693
	(0.3275)	(0.2677)	(0.1990)	(0.4509)
ATT Post Average	0.0615	0.0254	0.0392	0.0703*
	(0.0399)	(0.0321)	(0.0245)	(0.0423)
Number of observations	23959	23959	22289	22323
Pre Trend p value	0.2898	0.6279	0.0032	0.0123

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Treatment model: Inverse probability and Outcome model: Least squares

5.7 Robustness Checks: alternative firm-size thresholds

To assess whether our baseline “small” versus “large” classification based on the sample median (33 employees) is sensitive to the choice of cutoff, we conduct robustness checks using alternative employment thresholds. This exercise is motivated by two considerations. First, there is no single universally accepted definition of SMEs in India: commonly used criteria vary across investment in plant and machinery, annual turnover, and employment. Second, policy discussions typically rely on discrete size cutoffs, making it important to verify that our heterogeneity results are not an artefact of the median split.

Accordingly, we re-estimate our baseline specifications by redefining plant size using three alternative cut-offs—20, 50, and 100 employees—and report the results in Table 10. These thresholds span a plausible range of “small” definitions and allow us to test whether the size-gradient in effects persists under more restrictive or more inclusive classifications.

Two findings stand out. First, the pattern of heterogeneity is stable across thresholds. Across all three cutoffs, the effects of de-reservation are consistently stronger for establishments above the threshold, particularly for sales growth (and to a lesser extent for labour productivity). In each case, the estimated ATT on sales growth for the above-threshold group (> 20, > 50, > 100) is positive and statistically significant. By contrast, the corresponding estimates for plants below the threshold (≤ 20, ≤ 50, ≤ 100) are generally smaller and less precisely estimated, indicating that our main conclusion does not depend on the specific choice of 33 employees.

Second, the results for product-scope outcomes are broadly consistent with the baseline interpretation. The likelihood of introducing a new product increases for both smaller and larger plants, but the evidence is typically stronger among establishments above the threshold. The sales share of new products remains comparatively weak across most size definitions, suggesting that the reform primarily affects product entry and growth outcomes rather than the composition of sales.

Overall, these robustness checks reinforce the interpretation that scale-related capabilities mediate responsiveness to de-reservation. Larger plants are more likely to possess the financial resources, managerial capacity, and skilled labor needed to absorb fixed adjustment costs, reorganize production, and exploit newly opened product-market opportunities. This is consistent with our baseline heterogeneity analysis and with the broader view that smaller enterprises often face binding constraints that limit their ability to translate policy-induced opportunities into sustained performance gains.

Table 10: Heterogeneous effects of product de-reservation by firm size

	(1)	(2)	(3)	(4)
	New product	New product share in sales	Labour prod.	Sales Gr.
< 20 employees				
ATT	0.0452	0.0113	-0.0191	0.0142
	(0.0277)	(0.0223)	(0.0182)	(0.0356)
ATT Pre Avg.	0.0158	0.0354	0.0101	-0.0350
	(0.0357)	(0.0237)	(0.0177)	(0.0616)
ATT Post Avg.	0.0399	0.0060	-0.0518*	-0.0178
	(0.0362)	(0.0291)	(0.0266)	(0.0399)
Number of observations	13356	13356	12804	12820
Pre Trend p value	0.5923	0.3543	0.6958	0.7427
> 20 employees				
ATT	0.0324***	0.0091	0.0157**	0.0503***
	(0.0123)	(0.0099)	(0.0075)	(0.0143)
ATT Pre Avg.	-0.0043	-0.0073	0.0090	0.0256
	(0.0189)	(0.0191)	(0.0086)	(0.0230)
ATT Post Avg.	0.0280*	0.0036	0.0206**	0.0619***
	(0.0158)	(0.0121)	(0.0105)	(0.0165)
Number of observations	68371	68371	64688	64809
Pre Trend p value	0.0066	0.0153	0.0010	0.1177
< 50 employees				
ATT	0.0461**	0.0136	-0.0095	0.0293
	(0.0207)	(0.0172)	(0.0143)	(0.0261)
ATT Pre Avg.	-0.0052	0.0161	0.0078	0.0414
	(0.0289)	(0.0210)	(0.0135)	(0.0428)
ATT Post Avg.	0.0225	-0.0026	-0.0285	0.0169
	(0.0268)	(0.0222)	(0.0211)	(0.0313)
Number of observations	24176	24176	23388	23422
Pre Trend p value	0.8171	0.9588	0.6446	0.4820
> 50 employees				
ATT	0.0270**	0.0077	0.0106	0.0565***
	(0.0137)	(0.0110)	(0.0080)	(0.0156)
ATT Pre Avg.	-0.0153	-0.0089	0.0061	0.0156
	(0.0206)	(0.0222)	(0.0093)	(0.0248)
ATT Post Avg.	0.0241	-0.0010	0.0109	0.0668***
	(0.0180)	(0.0136)	(0.0110)	(0.0177)
Number of observations	57017	57017	54117	54222
Pre Trend p value	0.0043	0.0448	0.0001	0.0400
< 100 employees				
ATT	0.0396**	0.0150	0.0014	0.0247
	(0.0177)	(0.0145)	(0.0124)	(0.0236)
ATT Pre Avg.	-0.0021	0.0050	0.0087	0.0139
	(0.0207)	(0.0158)	(0.0105)	(0.0328)
ATT Post Avg.	0.0177	0.0074	-0.0071	0.0103
	(0.0225)	(0.0183)	(0.0188)	(0.0304)
Number of observations	33391	33391	32398	32440
Pre Trend p value	0.4387	0.7854	0.6897	0.6245
> 100 employees				
ATT	0.0307**	0.0101	0.0067	0.0488***
	(0.0154)	(0.0122)	(0.0087)	(0.0157)
ATT Pre Avg.	0.0038	-0.0053	0.0012	0.0211
	(0.0185)	(0.0147)	(0.0093)	(0.0276)
ATT Post Avg.	0.0303	0.0018	0.0120	0.0618***
	(0.0199)	(0.0150)	(0.0119)	(0.0182)
Number of observations	46913	46913	44623	44700
Pre Trend p value	0.0334	0.3057	0.0004	0.0832

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Treatment model: Inverse probability and Outcome model: Least squares

6 Concluding Remarks

This paper studies a policy change that economists and policymakers talk about surprisingly little: not the introduction of SME support, but its withdrawal. India's product reservation regime carved out entire product lines for small-scale producers; de-reservation removed that protection, gradually, over time. The natural question is whether the removal of protection simply hurts the intended beneficiaries—or whether it instead unlocks upgrading and growth. The few existing studies of policy reversals suggest that the answer can be uncomfortable: withdrawing support may reduce upward transitions and growth for smaller firms, as shown by Auwalin (2021) in the context of revoking mandatory MSE credit in Indonesia. Our evidence from India points to a more nuanced, but equally important, lesson: the effects of an SME policy reversal are highly uneven, and they vary systematically with firm capabilities.

Across the full sample, de-reservation is associated with greater product experimentation (new product introductions) and higher sales growth. But these averages hide the central result. Larger establishments within the SSI universe respond far more strongly: they are more likely to introduce new products and they register clearer gains in labour productivity and sales growth. Smaller establishments, by contrast, exhibit a limited response: beyond a modest increase in the probability of introducing a new product, we find little evidence of improvements in performance. This pattern is consistent with the idea—emphasized in work such as Ayyagari et al. (2007) and Garcia-Santana and Pijoan-Mas (2014)—that smaller enterprises face tighter constraints and adjust less when the environment changes.

The deeper implication is that what looks like "size heterogeneity" is, at least in part, a capabilities story. De-reservation expands the opportunity set by increasing contestability in product markets and relaxing size-based segmentation. Yet only some firms can translate these new opportunities into sustained gains. Establishments with stronger innovation capabilities benefit disproportionately: innovators respond more strongly in both productivity and sales growth, while non-innovators show limited adjustments. Similarly, plants that adopt new inputs (imported or domestically sourced) exhibit larger responses in product scope and growth, consistent with the view that access to, and effective deployment of, better inputs complements market-opening reforms. This finding resonates with evidence from India's broader liberalization episode: Goldberg et al. (2009, 2010a) show that intermediate input imports expanded sharply after liberalization, including many inputs that had not been imported previously. In our setting, the ability to experiment with and integrate new inputs appears to be an important margin through which firms cope with and capitalize on de-reservation.

At the same time, importing per se does not produce starkly different responses to de-reservation. The effects are broadly similar for importers and non-importers, suggesting that access to imported inputs is not a stand-alone route to improved performance. What matters is whether firms can assimilate and deploy those inputs effectively—through complementary skills, organizational know-how, and innovation routines, and through strategies that place them advantageously within value chains. This points to a policy lesson that goes beyond "encourage importing": capability to use imported resources productively is itself a scarce asset that policy can help build.

Technology orientation provides an additional lens on these differences. Plants producing medium- and medium-high-technology products benefit more—both in product scope and performance—than plants concentrated in low-technology product space. A natural interpretation is that sectors differ in learning intensity and in the returns to upgrading: where production is more knowledge-intensive and opportunities for learning-by-doing and innovation are greater, competitive pressure and regulatory liberalization are more likely to translate into productivity-enhancing change. Where competition is primarily cost-based and upgrading opportunities are thinner, the same policy shock may generate weaker gains or even adverse adjustments.

What follows for policy is not that small firms should not be supported, and it is certainly not that deregulation is a magic wand. The evidence instead suggests a diagnostic principle: market-opening reforms raise the returns to capability, but they do not create capability on their own. If the objective is broad-based upgrading rather than gains concentrated among the firms already best positioned to respond, de-reservation needs complements—especially for smaller and non-innovative establishments. These complements include improving access to finance and markets, supporting technology adoption and input upgrading, strengthening managerial and technical skills, and facilitating linkages with larger firms and external markets. For relatively larger SMEs, the priority is different: ensuring that competitive gains are sustained through continued upgrading in the face of rapidly evolving technologies and market conditions.

This study is not without limitations. First, the ASI covers registered manufacturing units and excludes the informal/unregistered MSME sector, which accounts for a large share of India's industrial base.[13] Our results therefore speak to the organized manufacturing segment rather than the MSME universe as a whole. Second, the ASI panel is unbalanced and smaller firms may be underrepresented due to sampling design, missing observations, and reporting inconsistencies. Third, innovation is measured using product introductions (new to the firm), because other indicators such as R&D expenditures, patents, or standardized innovation outputs are not consistently available.

These limitations also suggest clear directions for future work. Linking ASI plants to richer financial and trade data would help clarify how credit constraints, input access, and export/import engagement mediate responses to de-reservation. More granular measures of human capital and management practices would allow sharper tests of the capabilities channel suggested by our heterogeneity results. Finally, extending analysis to settings where informality is directly observed would help assess how policy reversals reshape the broader manufacturing ecosystem beyond the registered sector.

[13] As per India's 4th Census of MSMEs, a large majority of manufacturing MSMEs are unregistered; see discussion and references at https://www.ideasforindia.in/topics/macroeconomics/is-small-beautiful-a-critical-evaluation-of-msme-policy-and-performance-in-india.html.

Appendix

Table A.1: Concordance of Products - Sample

NPCMS code	ASICC code	SSI Product code	Product Description	Year of De-reservation
2342001	13401	20530101	Biscuits	1999
4481604	77712	363708	Hair driers - All types.	1999
2933000	44302	291102	Leather shoes	2001
3529045	36504	314401	Tooth paste	2002
4823200	91325	380310	Drawing instruments	2002
4849005	91422	38210101	Wall clocks pendulam type etc	2002
3413930	32347	310673	Methyl salicylate	2002
3532333	36212	314601	Hair oil	2003
3641004	44108	293903	Leather cases	2003
3632099	42202	303704	Plastic collapsible tubes	2003
2323003	12652	219504	Tapioca flour	2004
3214923	55313	280402	Waxed paper	2004
3440099	12526	315105	Pine oil	2004
4992204	82406	34200601	Wheel chairs	2004
2669023	63323	260101	Cotton cloth knitted	2005
3626031	41471	302102	Hot water bag	2005
3611302	41118	300301	Tubes-Cycle and Cycle rickshaw	2005
3416027	39026	316201	Polyster resins	2006
3422022	31274	31012401	Zinc Oxide	2006
4153699	74137	33130401	Flexible metallic pipe	2006

Source: Ministry of Statistics and Programme Implementation, Government of India

Table A.2: Classification of NIC 2004 Two-Digit Codes by Technology Level

Low Technology Products	
NIC 2 Digit Code 2004	**Description**
15	Manufacture of food products and beverages
16	Manufacture of tobacco products
17	Manufacture of textiles
18	Manufacture of wearing apparel, dressing and dyeing of fur
19	Tanning and dressing of leather, manufacture of luggage handbags, saddlery & harness and footwear
20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plating materials
21	Manufacture of paper and paper products
22	Publishing, printing and reproduction of recorded media
36	Manufacturing of Furniture and other manufacturing n.e.c
Medium Low Technology Products	
NIC 2 Digit Code 2004	**Description**
25	Manufacture of rubber and plastic products
26	Manufacture of other non-metallic mineral products
27	Manufacture of basic metals
28	Manufacture of fabricated metal products, except machinery and equipments
Medium High Technology Products	
NIC 2 Digit Code 2004	**Description**
23	Manufacture of coke, refined petroleum products and nuclear fuel
24	Manufacture of chemicals and chemical products
29	Manufacture of machinery and equipment n.e.c
30	Manufacture of office, accounting and computing machinery
31	Manufacture of electrical machinery and apparatus n.e.c
32	Manufacture of radio, television and communication equipment and apparatus
33	Manufacture of medical, precision and optical instruments, watches and clocks
34	Manufacture of motor vehicles, trailers and semi-trailers
35	Manufacture of other transport equipment

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