Removing Small-Scale Reservations and Quality Upgradation: Evidence from India*

Kamalesh Pahurkar† Vidhya Soundararajan‡

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Abstract

Product quality is an important marker of economic growth and development. We study the impact of dismantling product reservation for small-scale industry production in India on product quality, shedding light on the relationship between firm size constraints, competition, and quality improvements. Exploiting the Indian government's phased dereservation of previously reserved products be-tween 2000 to 2007, we find that dereservation incentivized incumbent firms to produce better quality products. The effect is predominantly driven by large and productive firms. Firms constrained by the SSI policy (within the range of 5-10 million rupees investment in plant and machinery) also experienced an increase in quality, indicating a firm-size expansion effect. Large firms that improved the quality after dereservation also experienced an increase in capital intensity and skill intensity. We found that quality up-gradation also depends on the industry's quality ladder (scope for product differentiation). Firms with a long industry quality ladder compete purely on quality catch-up, whereas firms operating in industries with a short quality ladder experience a decline in prices. We also observed the decline in quality-adjusted prices, indicating an improvement in consumer welfare. The quality results remain consistent across different variants of quality measures and alternate quality measure based on variable markups. To estimate heterogeneous treatment effects arising from the staggered treatment setup, we employ the De Chaisemartin and d'Haultfoeuille (2022) estimator. Our results are robust to a range of fixed effects and trends, including industry-year fixed effects, industry-time trends, state-year fixed effects, state-time trends, and product-specific time trends.

Keywords: Size-based industrial policies, Dereservation, Deregulation, Prod-uct Quality, Firm Behavior.

JEL Codes: L53, L25, O14, O25

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†Pahurkar: Department of Economics, Indian Institute of Technology Bombay; pahurkar.kamalesh@iitb.ac.in

‡Soundararajan: Centre for Advanced Financial Research and Learning (promoted by the Reserve Bank of India), and Indian Institute of Technology Bombay; vidhya.srajan@cafral.org.in.

1 Introduction

Quality is an important source of heterogeneity among firms. Improving quality is a key form of innovation which can foster growth (Garcia-Macia et al., 2019; Grossman and Helpman, 1991). Quality and per capita income of countries are positively correlated (Hallak and Schott, 2011). What policies promote or encourage quality improvement, and which ones contribute to maintaining lower quality levels? For example, can encouraging competition spur quality upgradation among firms? In this study, we focus on size-based policies that promote micro, small and medium enterprises by protecting them from competing with large firms.[1] A large body of evidence shows that dismantling size-based favouritism fosters competition, and increases output, employment, and productivity (Martin et al., 2017; García-Santana and Pijoan-Mas, 2014; Chiplunkar, 2019). However, we know little about their impact on product quality. Given that product quality plays a crucial role in driving growth, it is crucial to rigorously explore this relationship.

We study the staggered dismantling of a domestic, size-based, product-specific industrial policy in India. The Small Scale Industries (SSI) reservation policy of 1967 in India exclusively reserved some products to be produced by small-scale firms. In an important policy reform, most of these products were "dereserved" between 2000-2008 allowing any firm (small or large) to manufacture these products. We exploit the plausibly exogenous timing of the dereservation of these products and employ a difference-in-differences approach based on treatment firms that produced dereserved products and control firms that did not produce any dereserved products, and estimate the effect of dereservation on the quality of dereserved products. We quantify product quality for Indian manufacturing firms based on Khandelwal et al. (2013). This is based on a demand-residual approach, where by the residual demand after controlling

[1]The policies protecting small and medium firms are widely used in developing countries with the aim of fostering employment and growth. Another objective of such policies is to protect small and medium firms from the competition of large firms and support them at their initial stage. Measures to protect small firms include credit support, fiscal concessions, technological support, and exclusive reservation of production.

for prices helps measure quality.

Our results indicate that SSI dereservation resulted in an enhancement of the quality of the products produced by the firm. The positive quality effect is monotonically increasing in size and is prominently driven by large and high-productive firms. These results are consistent with Martin et al. (2017) who showed that dismantling reservation policy increase firm-level employment, output, and investment among large incumbent firms. These large firms also increased their capital-labor ratio, and skill-intensity as a result of the reform, indicating that capitalization and skill upgradation were two mechanisms through which firms improved quality. These results are consistent with Dingel (2017) who find that usage of factors of production such as capital and skills is positively related to quality.

We also find that firms charge lower quality-adjusted prices. However, the comovement of quality improvements and price competition leads to a null effect on observed output prices. Since quality is costly to produce, we also observe an increase in the input costs of firms. However, these firms also experience efficiency gains, offsetting the cost increase and resulting in no significant change in marginal cost. Further heterogeneity analysis reveals that, in response to competitive pressure, firms in markets with greater scope for differentiation tend to upgrade product quality, while those in markets with limited differentiation opportunities primarily compete by reducing prices.

A major challenge is to estimate product quality. Since quality is directly unobserved, various proxies have been used in the past, namely, prices and price indices (Hallak, 2006; Bastos and Silva, 2010; Eckel et al., 2015) or product features or certification information (Medina, 2022; Hallak and Sivadasan, 2009). Prices serve as a good proxy because quality is costly to produce and firms charge higher prices for higher quality products. However, prices are also an imperfect measure of quality because prices reflect other information besides than quality, such as, productivity or cost of production.[2] Further, prices are an imperfect measure of quality in markets with a short quality ladder. In such markets, the variation in product quality is limited, mak-

[2]For example, prices can be high or low to due its high or low cost of production. Further, in a trade context, export prices may also reflect exchange rate differences (Hallak and Schott, 2011).

ing it difficult for prices alone to reflect differences in quality (Khandelwal, 2010). Also, product features, such as the input quality, as in Medina (2022) or product certification, as in Hallak and Sivadasan (2009) are typically not available in most databases, and might be applicable only in certain industries.[3]

We estimate product quality based on Khandelwal et al. (2013). This is a demand residual-based approach, where quality is defined using the residual of demand function after controlling for prices. The intuition is that, conditional on prices, higher demand for a firm's product (or "variety") implies higher quality. This approach relies on the theory of consumer demand and the indirect utility perceived by a consumer from purchasing a good, where quality acts as a demand shifter. The first step is to the estimate the demand function, and the second step is to obtain quality as the residual from the demand function. A challenge in estimating the demand function is that of endogeneity in prices due to its correlation with unobserved demand shocks. To overcome this, we use an instrumental variable (IV) for product prices, namely, the electricity price per unit paid by the firm. Electricity prices are plausibly exogenous because, conditional on the firm's activity, electricity prices affect the demand for products only through their impact on output prices (Fontagné et al., 2018).[4] Using the IV methodology, we estimate the demand function, and consequently estimate quality of domestic products at the firm-product level.

For both the quality estimation and for our difference-in-difference estimates, we utilize panel data of factories from the Annual Survey of Industries (ASI) between the years 2000 and 2007. The availability production data at the firm-product level for domestic firms was crucial both for identifying treated firms that were producing dereserved products, and for estimating quality at the firm-product level.

We contribute to multiple strands of literature. First, we contribute to the literature on the impact of size-based policies. Studies examine the impact of programs targeted

[3] Hallak and Sivadasan (2009) used the ISO 900 certification as a proxy for product quality in India. ISO 900 certification is provided by the International Organization for Standardization based on the quality management principles satisfied by the organization.

[4] Fontagné et al. (2018) use electricity costs to instrument for export prices and provide a first estimate of the elasticity of firm-level exports to export prices using French firm level data.

to small and medium enterprises on employment creation and find modest temporary impacts (De Mel et al., 2019; Grimm and Paffhausen, 2015). Other studies focus on their implications on aggregate welfare and productivity. Specifically, studies show that size-based labor laws have distorted firm-size distribution and reduced aggregate output and productivity, with counterfactual simulations suggesting that eliminating these regulations enhance labor distribution among firms, increasing output per worker (Gourio and Roys, 2014; Garicano et al., 2016; Braguinsky et al., 2011; Besley and Burgess, 2004).[5] In addition to size-based employment regulations, research indicates that financial policies aimed at supporting small firms can also hinder their growth. Bhue et al. (2022) exploit discontinuities in size-based eligibility of direct finance to small firms in India, and show that small-firm lending programs can slow real growth among these very firms the policies targeted.

We directly speak to the literature that examines the impact of the Indian Small Scale Industry (SSI) dereservation policy. These studies show that product dereservation improved output, investment and employment (García-Santana and Pijoan-Mas, 2014; Martin et al., 2017; Tewari and Wilde, 2019). Martin et al. (2017) particularly show that large incumbent firms that were size-constraint due to reservation policy were the ones to grow and expand after dereservation. García-Santana and Pijoan-Mas (2014) use plant level data to find that lifting product reservations increases output by 6.8% in manufacturing and 2% in the overall economy, and Total Factor Productivity by 2% and 0.75% respectively. A few studies examine the impact on product scope. Boehm et al. (2016) found that after dereservation, firms are more likely to adopt prod-

[5] Garicano et al. (2016) found that size-based labor laws in France constrained productive firms from achieving their optimal size and distorted the firm size distribution in the economy with a large number of small firms below the threshold. Labor laws in France are applicable to firms with more than 50 workers and impose additional costs related to workers such as setting up work councils, workers unions, health facilities, firing costs, etc. (see Garicano et al. (2016) for more details). Gourio and Roys (2014) showed that the size-based regulations in France effectively impose a sunk cost equivalent to about one year of an average employee's salary and a minor payroll tax of 0.04%. Counterfactual simulations suggest that eliminating these regulations would enhance labor distribution among firms, ultimately increasing output per worker by just under 0.3% in the steady-state, assuming the number of firms remains constant.Braguinsky et al. (2011) find that Portugal's labor market institutions that are applicable only to large firms are preventing more productive firms from reaching their optimal size, thereby constraining GDP per capita. Their calibration exercises suggest substantial growth effects that could arise if the distortions were lessened or abolished altogether.

ucts that are horizontally and vertically linked to their input usage. Chiplunkar (2019) found that after dereservation, firms dropped the unreserved products and added the products reserved earlier; welfare gains were induced by both the reallocation of resources across firms and the change in the product mix. Tewari and Wilde (2019) found that the product scope adjustment triggered by market competition helps firms to improve their productivity. To the best of our knowledge, there is no empirical evidence showing the effect of any size-based policy on the quality of manufactured products.

Second, we contribute to the literature on quality estimation. We estimate quality based on Khandelwal et al. (2013). Studies tend to use demand elasticities estimated from other papers in their own context, in order to arrive at the residual demand -based estimate of quality. For example, demand elasticities from Broda et al. (2006) are commonly used in other papers (Bas and Strauss-Kahn (2015) and Hu et al. (2021)). However, the methods used by Broda et al. (2006) assume the independence of demand and supply shocks, which can be violated in the case of vertical differentiation (quality is costly to produce) (Piveteau and Smagghue, 2019). Ours is among the few studies that applied an instrumental variable approach to estimate the demand function based on our specific context, and the consequently estimate quality. Other studies that do so include Khandelwal, 2010; Gervais, 2015; Roberts et al., 2018; Piveteau and Smagghue, 2019; Orr, 2022. For instance, Piveteau and Smagghue (2019) use firm's import-weighted exchange rate as an instrumental variable for prices to estimate demand function, and subsequently the residual quality of French firms' exports. Fontagné et al. (2018) use the same instrumental variable to estimate the export price elasticity of French firms. Further, most studies estimate quality for the product-country imports and firm-product-country levels export data (Martin and Mejean, 2014; **?**; Bas and Strauss-Kahn, 2015; Bernini and Tomasi, 2015; Piveteau and Smagghue, 2019). In contrast, we estimate quality for domestic products using detailed production information at the firm-product level.[6]

[6] We also estimate the quality using price elasticities for India from Broda et al. (2006), as a robustness check. Further, we employed an alternative instrumental variable for output price, namely, the initial

Our results are critical in the context of the policy debates surrounding poor quality of Indian manufactured products, and their lack of global competitiveness (Lakshmanan et al., 2007).[7] While high import tariffs and unfavorable business environment are often viewed as inhibiting factors for reviving manufacturing growth and export quality, little focus is placed on potential detrimental impacts of size-based policies. Small and Medium Enterprises (SME) sector is an important contributor to India's growth and exports. The sector accounts for 40 percent of the gross value of output in the manufacturing sector and around 35 percent of the country's exports (Planning Commission, 2002). Still, it is unclear if resources are allocated to the firms in this sector in the best possible way without distortions. [8] Previous research show that output and productivity increases if the resources are redirected to the most productive firms (Hsieh and Klenow, 2009). Do dismantling size-based policies reduce distortions, and improve firm outcomes? While previous research shows that dismantling these policies increases firm output and productivity, we show that it also increases product quality, an important marker for export competitiveness and growth.

The paper is organized as follows. Section 2 provides the background and context; Section 3 describes the quality estimation methods (Section 3.1) and the difference-in-difference methodology (Section 3.2) to estimate the impact of SSI dereservation on product quality; Section 4 presents the data sources; Section 5 presents the results, both for demand function and quality estimation (Section 5.1) and the impact of SSI dereservation policy including the discussions on mechanisms and robustness checks (Section 5.2); Section 6 concludes.

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coal-based thermal share of a state's installed electricity generation capacity times the coal prices paid by power utilities in a respective year, as in, Abeberese (2017), to estimate quality. Our original measure of quality was comparable and highly correlated with these alternative measures.

[7] India's export quality index was 0.545 in the year 2000, behind the other emerging economies such as Singapore, Malaysia, Philippines, Thailand, and China (Industrial Development Report, UNIDO, 2004).

[8] Rakesh Mohan, a former deputy government of the Reserve Bank of India writes that the reservation policy failed to account for the significance of quality differentials within the product and adversely impacted the quality of output. It also denied the opportunity for technological degradation and to accrue the benefits of economies of scale for the SSI firms (Mohan, 2002).

2 Background and Context

Before the 1991 liberalization reforms, India adopted protective measures aimed at fostering growth and employment in its small and medium-scale industries, safeguarding them from intense competition. These sectors benefited from various supportive policies, including tax concessions, subsidized loans, and technological assistance. The cornerstone of this approach was the Small Scale Industries (SSI) Product Reservation Policy, introduced in 1967. Under this policy, some products were exclusively reserved for production by small-scale firms. The main argument for this reservation was the protection of these small firms from the competition of large-scale firms. Small Scale Industries (SSIs) were initially defined as industrial undertakings with fixed assets not exceeding Rs 500,000 and employing fewer than 50 employees. The employment restriction was dropped in 1960 and by 1999, industrial enterprises with up to Rs 10 million in plant and machinery (based on historical cost) were designated as Small Scale Industries (SSIs). At the time of reservation, the existing large-scale firms that were producing these reserved products were permitted to continue their operations indefinitely. However, their production capacity was limited to the present levels and could not be increased. Some large firms were allowed capacity expansion under the condition of exporting at least 75 percent of their production (Mohan, 2002).

There were no concert criteria for the selection of products to be reserved; it was reserved based on their feasibility of being produced by small-scale firms, and the labor-intensive nature of the manufacturing process (Mohan, 2002). In 1967, the reservation policy started with 47 products, but over time the number of products increased considerably. In 1997, 1045 reserved products on the list (Martin et al., 2017).

After the liberalization policy of 1991, SSIs had to face competition from imports and large firms. With advancements in technology and rising demand for high-quality products in the market, the viability of SSIs was called into question. This prompted the formation of a special committee (Hussain, 1997) to reassess the SSI reservation policy. Following the recommendations of this committee, the process of product dereservation commenced in 1997. The gradual dereservation of products continued till the end of 2015. Between 2003 and 2008, around 100 to 250 products were dereserved annually, leaving only 22 products still under reservation by the end of that period (Martin et al., 2017).

3 Data Sources and Methodology

3.1 Data Sources

Our primary dataset is the Annual Survey of Industries (ASI) between the years 2000 and 2007. In this dataset, the enumeration unit is a plant.[9] The data includes the census and sample scheme; all manufacturing plants with > 100 workers come under a census frame. A sample frame comprises the plants with 10 or more workers with electricity and plants with 20 or more workers without electricity. All plants under the census frame are sampled, whereas those under the sample frame are sampled using the sampling strategy of ASI.

Our sample comprises 429, 772 observations with 108,959 unique firms and 5132 unique 5-digit products. The 46,750 firms are multi-product firms, whereas 76,593 are single-product producers. Before 2004, the ASI followed the NIC (National Industries classification)-1998 industry classification. In 2004, ASI adopted the NIC-2004 classification. Therefore, we did a crosswalk between NIC 2004 and NIC 1998 classification.

Estimating quality at the firm-product level requires data on production and value at the product level. The ASI reports the product level information on sales and revenue at 5-digit ASICC (Annual Survey of Industries Commodity Classification) level. From this, we calculate price as the unit value of a product. We have dropped the firm-product observations for which the quantity sold is missing. We also dropped the "other products/by-products" corresponding to ASICC code "99211" from our analysis.[10]

[9]The words plant and firm are used interchangeably in the paper.

[10]The nature and scope of by-products and other products is particular to each firm; so, we believe that one firm's by-product cannot be compared to another's and classified as a different varieties of

To estimate the impact of SSI dereservation on different firm-product level outcomes, we first obtained a list of products dereserved from the Indian government portal (https://msme.gov.in/). We then mapped these official product codes to the ASICC product code because the ASI reports products based on the latter codification. For the crosswalk between the official product list and ASICC codes, we used the concordance by Martin et al. (2017). The concordance is based on both 5-digit ASICC (Annual Survey of Industries Commodity Classification) codes and 5-digit NIC industry code descriptions. While some official product description perfectly matched the ASICC codes product description, the remaining products were aligned with industry code descriptions. If an SSI product description corresponds with the industry description, even partially, it is then matched with ASICC products within that industry. This allows us to create a panel of ASI manufacturing firms with the status of their products being reserved or dereserved over time. Our sample consists of 351 official products mapped to 511 ASICC products from 2000 to 2007. Table 3 reports the descriptive statistics of the estimation sample corresponding to the baseline regression (10).

3.2 Quality Estimation

We use the Khandelwal et al. (2013) CES demand function residual-based approach to estimate the quality of Indian manufacturing products. The representative consumer's utility is represented by the constant elasticity of substitution (CES) utility function where quality is a utility shifter. Due to the constant elasticity of substitution, it assumes markup is constant across the firms.[11] This method is based on the notion that higher demand implies higher quality, conditional on price.

$$U = \left[\int_{j\in\Omega} (\lambda_j q_j)^{\alpha} \delta_j\right]^{\frac{1}{\alpha}} \tag{1}$$

the same product category.

[11]Note that the nested logit-based demand system of Khandelwal (2010) also assumes a constant price elasticity of substitution across different varieties within a nest, thereby ignoring the variation in prices due to markups.

The elasticity of substitution, $\sigma = 1/(1-\alpha) > 1$ and $0 < \alpha < 1$. The demand function for product j derived form the utility function is defined as:

$$q_j = P^{\sigma-1}\lambda_j^{\sigma-1}p_j^{-\sigma}E \tag{2}$$

where P is the price index and E is the total expenditure in the market. λ_j and p_j are the quality and price of product j respectively. In the logarithmic form, it will be,

$$\log q_j + \sigma \log p_j = \log E + (\sigma - 1)\log P + (\sigma - 1)\log \lambda_j \tag{3}$$

Given our data structure, product prices, quantity, and quality vary across the firms and over time. The market expenditure and price index vary over time. The demand specification can be re-written as:

$$\log q_{ijt} + \sigma \log p_{ijt} = \log E_t + (\sigma - 1)\log P_t + (\sigma - 1)\log \lambda_{ijt} \tag{4}$$

Where "ijt" is for firm-product-year combination. The time-varying component of demand can be captured by the time-fixed effect (δ_t), and adding product fixed effect (δ_j) to account for across-product heterogeneity in prices and quantities gives:

$$\log q_{ijt} + \sigma \log p_{ijt} = \delta_t + \delta_j + \mu_{ijt} \tag{5}$$

After estimating the value of σ, the left-hand side can be regressed on the time and fixed effects to obtain the demand residuals. The quality measure is defined as,

$$\log \hat{\lambda}_{ijt} = \frac{\hat{\mu_{ijt}}}{\sigma - 1} \tag{6}$$

To retrieve the quality measure, we first need to estimate the demand function at the variety level. The variety of a product is defined as a firm-product combination.[12] The challenge in estimating the demand equation is that price is endogenous as it is correlated with the unobserved demand and supply shocks. The potential source of en-

[12]This method is based on the constant elasticity of substitution across varieties within a product.

dogeneity is the simultaneity bias caused by the correlation between prices and quality. Moreover, assuming that quality is costly to produce and that the prices reflect the high production cost, but at the same time, demand is increasing in quality which may obscure the actual effect of prices on demand. The other source of endogeneity is the measurement error in prices. We do not observe market prices directly in the data, but use unit values calculated as a ratio of revenue to quantity sold of a variety. To address the endogeneity issue, we estimate σ in equation (5) using an instrumental variable approach (Piveteau and Smagghue, 2019; Gervais, 2015). The demand specification, in this case, changes to:

$$logq_{ijt} = -\sigma \log p_{ijt} + \delta_t + \delta_j + \mu_{ijt} \tag{7}$$

After obtaining the σ estimates through the instrumental variable estimation, we can calculate the quality, $\log \hat{\lambda}_{ijt}$ as the estimated residuals from demand equation (7) adjusted for (σ - 1), as specified in Equation 6.[13]

In the literature, average price (Bernini and Tomasi, 2015), import-weighted real exchange rate (Piveteau and Smagghue, 2019), electricity price shocks (Fontagné et al., 2018), physical labor productivity (Gervais, 2015), and average price of same inputs in other output markets (Orr, 2022) have been used as an instruments for prices for demand system estimation. We use electricity prices paid by firms to purchase electricity from the market as an instrument for output prices. Electricity is an essential input for production, and its cost is reflected in the prices as a component of production cost. Fontagné et al. (2018) used electricity prices as an instrument to estimate the price elasticity of French firms' exports.

Our identification strategy relies on the features of the electricity market in India, like reform by the Electricity Act of 2003, resulting in the independent state electricity regulatory commissions (SERC) at the state level, tariff rationalization[14], allowing

[13] We also have variants of quality measures obtained from the demand equation 5 after controlling for various fixed effects such as firm, firm-year, firm-product, and state-year fixed effects. See subsection 5.1 for details.

[14] It refers to the reforms taken for the removal or reduction in cross-subsidization of electricity tariffs.

for independent power producers, private participation in distribution, etc (Sen and Jamasb, 2012). Jain and Nandan (2019) in their study showed that institutional and political factors such as the number of power distribution companies, the presence of SERC, political competition, and center-sate government relations significantly affected the tariff for the small (5KW & 10KW) and medium (50KW) industrial slab whereas the economic factors such as industrial demand do not influence the electricity tariff. In India firms face the tariffs as per the usage of electricity, such that the firms in a slab of 10KW of electricity usage face different tariffs than firms falling in a 50KW slab. This incremental tariff structure creates an across-firm heterogeneity in the tariffs paid by the firms. Given the market structure for electricity in India, the electricity price is not identical across the locations, seasons, firm size, and also over time. We can see that firm-level variation in electricity prices comes from the factors that are exogenous to firm activity (such as regulatory changes, location, seasons, political factors, and market competition) as well as endogenous factors such as usage of electricity by the firm.

The rationale for using firm-level electricity prices as an instrument for product prices is that conditional on firm size, electricity price affects the demand for a product only through its effect on product prices (exclusion restriction). We control for the firm size proxied by firm-level employment in our demand specification. We also control for the proportion of self-generated electricity in the firm's total electricity consumption in our demand specification. In our sample, some firms produce their own electricity which can reduce our instrument strength. However, only 37 percent of firms in our sample generate some portion of their total electricity usage on their own whereas only 0.3 percent of firms depend solely on self generated electricity. We estimate the following system of equations.

$$\log q_{ijt} = \alpha_1 + \sigma \log{(Price)_{ijt}} + \alpha_2 \log(Firm\ size_{it}) + \alpha_3 (Own\ electricity\ share)_{it} + \delta_t + \delta_j + \mu_{ijt} \tag{8}$$

$$\log(Price)_{ijt} = \beta_1 + \beta_2 \log(Electricity\ price)_{it} + \beta_3 \log(Firm\ size_{it}) + \beta_4(Own\ electricity\ share)_{it} + \delta_t + \delta_j + \epsilon_{ijt} \tag{9}$$

Equation (8) is our structural demand equation where quantity is a function of prices. Equation (9) is our first stage equation for identifying the relationship between the output prices and the firm's electricity prices.

Various studies have used the elasticity of substitution (σ) estimated by Broda et al. (2006) (Copestake and Zhang, 2023; Stiebale and Vencappa, 2018; Hu et al., 2021; Bas and Strauss-Kahn, 2015).[15] The concern using elasticities by Broda et al. (2006) is that it is estimated using import data, whereas the elasticities in the domestic market can be different. Further, the methods used by Broda et al. (2006) assume the independence of demand and supply shocks, which can be violated in the case of vertical differentiation (quality is costly to produce). In addition to estimating the demand equation (7) using electricity prices as an instrumental variable, we also estimate the CES demand equation (5) with the median price elasticity of substitution for India ($\sigma = 3.7$) from Broda et al. (2006), and subsequently estimate quality using 6.

3.3 Effect of dereservation on Product Quality

Our strategy exploits the heterogeneity in the timing of product dereservation. We use the difference-in-differences setup to estimate the impact of product dereservation on their quality. The treatment is defined as the product level.

$$y_{ijt} = \beta_0 + \beta_1 Productderes_{jt} + \tau_{jt} + \gamma_{ij} + \gamma_t + \mu_{ijt} \tag{10}$$

Here, y_{ijt} refers to the outcome variables, such as, quality, prices, marginal cost, or markups. $Productderes_{jt}$ defines the status of product dereservation. Firms producing dereserved products are in the treated group, and others are in the control group. Since our estimation strategy relies on the variation in the timing of dereservation, any

[15] Broda et al. (2006) use HS6 product-level COMTRADE data for year 1994-2003 and estimate the import demand elasticity of substitution for 73 countries.

potential endogeneity arising from a strategic dereservation of products during certain years will bias our results (Martin et al., 2017). To address this concern, following Martin et al. (2017), we control for the event-time variable τ_{jt} which is equal to the current year minus the year of de-reservation. For example, τ_{jt} is equal to 1 for year after dereservation, 0 in the year of dereservation, and -1 before dereservation, and so on. Further, τ is equal to 0 for firms that do not produce reserved products. The event-time variable allows us to account for any potential preexisting linear trend in the outcome of interest in the years preceding dereservation. The γ_{ij}, and γ_t are the firm-product (variety), and year-fixed effects. The sample includes all firms; that is, it includes firms that produced dereserved products, firms that did not produce dereserved products, and firms that produced never-reserved products.

Next, we explore the heterogeneity in the effects of dereservation on quality across the firm size distribution. The intuition is that firms of different sizes have different abilities and scope to absorb economic shocks. We hypothesized that the positive impact on quality from dereservation increases in the firm size.

$$Quality_{ijt} = \beta_0 + \sum_{q=1}^{4} \beta_1^q Productderes_{jt} * \sum_{q=1}^{4} Q_{it}^q + \tau_{jt} + \gamma_{ij} + \gamma_t + \mu_{ijt} \tag{11}$$

where Q_{it}^q are the dummy variables that take the value 1 if the firm is in firm-size quartile q, and 0 otherwise. We define firm size based on the total number of employees employed in the baseline year, and define quartiles based on this measure. The baseline year is the initial year the firm is observed in the estimation sample of baseline quality regression (Equation 10). Each coefficient on the interaction terms reflects the impact of dereservation on the product quality of firms within the corresponding quartile of the size distribution.

We also similarly analyze how firm productivity plays a role in the quality effect of the dereservation. We use labor productivity (output per unit of labor) as a measure of firm productivity. Firms are categorized into four quartiles based on the distribution of labor productivity in their initial year in the estimation sample. To obtain the impact of dereservation across the firms with differential productivity levels, similar to equation

11, we interact product dereservation treatment with the dummies of productivity quartiles.

4 Results

4.1 Demand Function and Quality Estimation

Panel A of Table 1 reports the results from pooled OLS estimation of the demand equation (7). As discussed earlier, the estimated price elasticity of demand (σ) is likely to be biased due to endogeneity arising from a positive association between the quality of a variety and its price. Panle B of Table 1 reports the results from IV estimation. The first stage regression shows that our electricity price instrument has a positive and statistically significant impact on prices, with a first stage F-statistic of 35.07. The price elasticity based on IV estimation is more negative than the OLS estimation, indicating significant improvement upon the downward bias due to endogeneity.

Next, following Piveteau and Smagghue (2019), we obtain industry-specific price elasticity estimates by incorporating an interaction term between the predicted log price from the first-stage pooled regression and an industry-specific dummy variable. This approach allows us to capture variations in price elasticity estimates across different industries, providing a more granular and tailored analysis of pricing behavior within each industry. The summary of industry-specific price coefficients is reported in panel A of Table 2.

After obtaining industry-specific price elasticity estimates, we calculated the quality as in equation (6), where $\hat{\mu_{ijt}}$ are the demand residuals from the regression of equation (5). In panel B of Table 2, we report the summary statistics of our estimated quality measure. Our estimated σ is comparable with the σ of Gervais (2015), who estimated the quality of domestic sales of US manufacturing firms for each of 149 product categories and reported the mean of -1.97 for price elasticity of demand. Foster et al. (2008) has estimated quality for 11 homogeneous products of the US and obtained a mean of price elasticity of demand equal to -2.41. Piveteau and Smagghue (2019) estimated the quality of French firms' exports and obtained a price elasticity of demand equal to -4.26.

As a robustness check, we used another instrument to estimate the demand function. Following Abeberese (2017), we used the initial coal-based thermal share of a state's installed electricity generation capacity times the coal prices paid by power utilities in a respective year as an instrument for prices. This instrument leverages exogenous variation in a firm's electricity cost of production, impacting its output prices.[16] We also estimated quality using the median price elasticity of substitution ($\sigma = 3.7$) estimated from Broda et al. (2006) (Hu et al., 2021; Stiebale and Vencappa, 2018; Khandelwal et al., 2013). The Broda et al. (2006) has estimated the elasticity of substitution for each 3-digit products for 73 countries, including India.

4.2 Impact of SSI Product dereservation

The findings of the baseline specification (10) of the impact of dereservation on quality are reported in panel A of Table 4. We can see that the impact of dereservation on the quality of dereserved products is positive and statistically significant. This suggests that the dereservation policy led to improvements in the quality of products that were previously subject to reservation. To account for the industry and state-specific unobserved fixed and time-varying effects, we have controlled for the, industry-year fixed effects, state-year fixed effects, industry-time trend, and state-time trend, etc, in our regression equations (column 2 to 5). The quality effect of dereservation is robust across all specifications. Recent studies have emphasized that the two-way fixed effects (TWFE) estimates may be biased due to heterogeneous treatment adoption and the comparison between early- and late-treated units (so-called forbidden comparisons)[17] (Sun and Abraham, 2021; Borusyak et al., 2024; De Chaisemartin and d'Haultfoeuille,

[16]The identification strategy relies on the fact that the electricity used by the firms is largely produced and sold by the state‘s power utilities, so any changes in the cost of production (coal prices) affect the market prices of electricity for firms. Coal is the major source of energy for thermal power plants in India, accounting for about 83 percent of thermal generation installed capacity. The coal prices set by coal companies are different for the power utilities and others.See Abeberese (2017) for the detailed discussion on the exogeneity of the instrument.

[17]See Borusyak et al. (2024) for more detail discussion on "forbidden comparisons".

2020; Callaway and Sant'Anna, 2021). Given the large universe of untreated (control) groups, our TWFE estimates are less likely to be biased. Nevertheless, we also employ the estimator proposed by De Chaisemartin and d'Haultfoeuille (2020). The results from this estimator is reported in panel B of Table 4. Our findings on the quality effects of dereservation are positive, statistically significant, and robust. Figure 1 presents the event-study plot of the effect of dereservation on product quality, estimated using the De Chaisemartin and d'Haultfoeuille (2020) method. We observe a marked upward shift in the estimated effect after the dereservation policy.

Next, we estimate the impact of dereservation on quality in the quartiles of the size distribution of firms (Equation 11). We hypothesize that the quality effect of the dereservation increases in firm size. We define the firm size distribution based on the total number of employees of a firm in the baseline year. The baseline year for a firm is defined as the initial year in which the firm is observed in the sample. The results presented in Table 5 show that the quality effect of dereservation increases monotonically in firm size in most specifications. However, the effect is only significant for firms in the 2^{nd}, 3^{rd} and 4^{th} quartile. The firms in the 4^{th} quartile observed an around 55 percent increase in their product quality after dereservation. It is evident that large firms are the primary drivers of the quality effect of dereservation, while the effect is not statistically significant for firms in the smaller quartiles. Next, we used the investment in plant and machinery by a firm as a measure of firm size and re-estimated the quality effect across the quartiles of firm size distribution. The heterogeneity results based on this measure are reported in Table 6. The results are consistent with the fact that large firms are the main drivers in improving product quality.

Large firms are relatively more capable of facing competition from new entrants into the dereserved product market. This could be due to the ability of large firms to invest more in high-quality inputs, R & D, and technologies to improve quality compared to smaller firms. When compared to small firms, large firms can use better-quality inputs because they can spread the fixed cost of quality across more production units. Martin et al. (2017) has shown that the removal of SSI dereservation leads to an increase in investment, employment, and output by the large incumbent firms.

We also analyze how the firm's productivity plays a role in the quality effect of the dereservation. We use labor productivity as a measure of firm productivity. The firms are categorized into four quartiles based on the baseline labor productivity. To obtain the impact of dereservation across the firms with differential productivity levels, we interacted the treatment variable with the dummy of productivity quartiles. The findings are reported in Table A3 of Appendix. It shows that the firms at the highest quartiles have significantly increased the quality of dereserved products. In other words, highly productive firms adapt to the competition and environment after dereservation and successfully improve their product quality. In contrast, less productive firms could not increase the quality of their products. In the literature, the relationship between quality and productivity is inconclusive. Our objective here is to check for the differential response to dereservation in terms of quality across high- and low-productive firms. This also indicates that the quality effect is dominated by large firms.

4.3 Within and Over SSI Limit

As mentioned earlier, the policy defined SSI firms as those with up to 10 million investment in plant and machinery. However, there was some relaxation, such as the firms were allowed to expand beyond the SSI limit, conditional on that they export a minimum 75 percent of their production (Mohan, 2002; Martin et al., 2017). In this section we look at the impact across the firms below and above the SSI limit. The findings are reported in Table 7. We found that large firms over the SSI limit have substantially increased their product quality; however, there is no statistically significant increase in product quality of firms within the SSI limit.

Our sample includes both incumbent and entrant firms. Incumbents refer to those producing dereserved products before dereservation. Entrants are those firms that started producing a dereserved product only after dereservation. To assess whether the observed quality effects are driven by incumbent or entrant firms, we estimate separate impacts for each group. We interact our treatment variable with the dummies for incumbent and entrant firms. Table 8 shows the results from the estimation (columns 1 and 2). We found that the quality effect is only statistically significant for the incumbent firms, whereas there is no significant impact for the entrant firms. Columns 3 and 4 report the estimated effects separately for incumbents and entrants, distinguishing between firms within and over the SSI threshold. It shows that the quality impact is largely driven by the overs SSI incumbent firms. These findings reiterate the role of firm size as a key determinant of a firm's capacity to improve product quality (Kugler and Verhoogen, 2012).

Further, We estimate the impact of dereservation based on firms' average investment in plant and machinery before the policy change. We distribute the firms into 6 categories with a different range of investment in plant and machinery. Our objective is to check whether the constraint firms within the SSI limit increased the quality. The results are reported in Table 9. We find that not only did firms above the SSI threshold (> 10 million) improve product quality, but even firms constrained within the SSI limit (5–10 million) also showed quality gains. The findings suggest that improvements in product quality are driven not only by increased competition but also by firm expansion. Removal of size-based constraints facilitates investment and capacity growth, enabling firms to enhance the quality of their products. Martin et al. (2017) shows that constrained incumbent firms significantly increased their investment in plant and machinery following dereservation.

4.3.1 Mechanisms

How did large firms improve quality? To improve quality, firms need to invest more, which should be reflected in their capital intensity of production. We have checked the impact of dereservation on a firm's capital intensity. Capital intensity refers to the ratio of gross capital (closing) to total employees. We can see that the large firms in the 4th quartile of the firm size distribution have significantly increased their capital intensity. On the other hand, small firms had reduced the capital intensity (see Table 10). We calculated the firm size quintiles by using the total revenue from sales in the base year.

The enhancement in quality following the removal of reservations can be ascribed to the heightened capital intensity of these firms.

The high-skilled labor is another source to enhance the quality of production. The SSI reservation's major objective was to absorb the surplus labor and so most of the reserved products were labor-intensive (Martin et al., 2017). In our data, we do not have any observable measure of the skill intensity of the firms. We use the ratio of regular workers' wages to the total wages of the firm as a proxy for the skill intensity of the firm. In the ASI data, firms report the employment and wages for regular and contract workers. Regular workers are full-time workers, more skilled, and are generally paid more than contractual workers. The findings on skill intensity are reported in Table 11. We can see the firms in the higher quartile of size distribution have significantly increased the proportion of wage bills for the regular workers, after dereservation. We can see that small firms experienced a fall in the share of wages paid to the regular workers.

These results align with the conclusions drawn by Kapoor (2020) that capital and skill intensity exhibit a complementary relationship. By analyzing ASI data from 2000-01 to 2010-11, they demonstrate that firms with a higher capital-labor ratio allocate a greater share of wages to skilled workers than unskilled workers. From the above findings, we can conclude that the large firms increased both the capital and skill intensity after dereservation, which helps them to enhance their product quality.

4.3.2 Prices, Marginal Cost, and Markups

In this section, we look at how firms respond in terms of other product-level measures such as price, marginal cost, and markup etc. We expect that due to increased competition after dereservation, there will be a decline in prices. The new entrants can put pressure on the incumbent firms, which can result in a decline in the prices of dereserved products. Table 12 presents the results. Surprisingly, we could not find any statistically significant impact of dereservation on prices. The null effect on prices can be due to the quality upgrading by the firms. As argued by Kugler and Verhoogen

(2012), high-quality goods require high-quality inputs, and both the output and input quality differences across plant size bring in a positive relationship between both input and output prices and plant size. In other words, large plants use high-quality, high-price inputs, produce high-quality products, and charge higher prices. Since quality is costly to produce, there will be some cost pass-through into the output price. The interaction of these two opposing forces may offset each other, resulting in no net effect on prices.

Next, we look at the impact of dereservation on quality-adjusted prices. The quality-adjusted price is measured as the difference between log price and log quality, i.e., $ln(price_{ijt}) - ln\lambda_{ijt}$ (Khandelwal et al., 2013; Fan et al., 2015; Stiebale and Vencappa, 2018). In Table 13, we found a statistically significant negative impact on quality-adjusted prices. As argued before, post-dereservation competition leads to a fall in quality-adjusted prices of dereserved products.

The broader picture suggests that firms face both quality-based and price-based competition in the market. Some firms may have competed based on quality; however, others have competed based on price. The quality-based competence is feasible only when there is enough scope for quality differentiation in the market. The scope of quality differentiation indicates opportunities for firms to innovate and differentiate their products from those of competitors. When there is competition in the market, firms with a large scope for quality differentiation upgrade their product quality (Fan et al., 2015). Following Khandelwal (2010), we construct the 5-digit industry-level quality ladder as the difference between the maximum and minimum quality within an industry, fixed at the base year 2000. We construct a dummy for the short and long quality ladder based on the median of the industry-level quality ladder. Industries with values above the median are classified as having a long quality ladder, while those below the median are classified as having a short ladder. The long quality ladder represents the higher scope for quality differentiation and vice versa. We estimate the impact of dereservation on product quality across the short and long quality ladder. The findings are there in Table 14. We found the impact on quality is only significant for the firms operating under the long quality ladder. In other words, the firms having a large scope for quality differentiation have increased their product quality after dereservation. We also estimate the impact on prices across the short and long quality ladder. The results on price are reported in Table 15. We can see that there is a statistically significant negative impact on price for the products under a short quality ladder. This implies that firms operating in a market with lower scope for quality differentiation compete on prices. We conclude that firms with higher scope for differentiation compete on quality, whereas those with less scope for differentiation compete on prices after dereservation.

Given that producing higher quality entails higher production costs, we empirically examine the effect of dereservation on the marginal cost of production of firms. Whether the quality improvement comes with a higher production cost for the firm. To answer this question, we require a measure of marginal cost at the firm-product level. We applied the De Loecker et al. (2016) method to estimate the production function at the firm-product level and calculate the markups and marginal cost of production. Once we estimate the markups at the product level, we can calculate the marginal cost as a ratio of the product price to its markup. The detailed estimation procedure of markups and marginal costs is described in Section A3 of the Appendix. Table 16 shows that overall, the dereservation has no significant impact on the marginal cost of production. This finding on marginal cost is surprising, as producing higher quality generally entails higher production costs. Next, we check whether there is an increase in the input cost, which is a direct cost of production to the firm. In Table 17, we estimate the impact of dereservation on the input prices paid by firms. We found that there is a significant increase in the input price paid by a firm after dereservation. The question is why there is null effect on marginal cost. One possible explanation for the insignificant effect on marginal cost is that firms may have experienced efficiency gains post-dereservation. To verify this, we examine whether firms producing a dereserved product experienced any increase in total factor productivity. The quantity total factor productivity is estimated using a production function estimation of De Loecker et al. (2016). Table 18 shows that there are productivity gains to the firm after dereservation. To validate these findings, we also estimate the impact on labor productivity in Table 19. It shows that there is an increase in labor productivity. The findings indicate that input cost increased; however, concurrent efficiency gains could have neutralized its impact, leading to no significant change in marginal cost.

Under the backdrop of the effects on quality, price, and marginal costs, we are further interested in seeing how dereservation affects the markups charged by the firms. As discussed in Section A3 of the Appendix, markups at the product level are estimated using the De Loecker et al. (2016) method. Markups are defined as a relative difference between price and the marginal cost of production. Table 20 shows that the overall impact of dereservation on product-level markups is weakly significant (statistically insignificant, except column 4). This is consistent with our null effects on price and marginal cost.

5 Robustness checks

5.1 Alternative quality measures

To validate our product quality effect of dereservation, and the methodology of quality estimation, we conducted multiple robustness checks. We used different variants of our primary quality measure and estimated the impact of dereservation on product quality. Table A4 reports the findings using these quality measures as an outcome variable. Column 1 has the outcome variable is our primary quality measure. In Column 2, we use product quality estimated with an alternative price instrument in the demand estimation. We used the initial coal-based thermal share of a state's installed electricity generation capacity times the coal prices paid by power utilities in a respective year as an instrument for output prices (Abeberese, 2017). The identification strategy relies on the fact that the electricity used by the firms is largely produced and sold by the state‘s power utilities, so any changes in their cost of production (coal prices) affect the market prices of electricity for firms.

In columns 3 and 4, we used the quality estimated with the given value of elasticity of substitution (σ) from Broda et al. (2006) in the demand estimation. In column 3, we used a single value of elasticity of substitution, i.e., the median value of sigma for India. In column 4, we used the industry-specific sigma values. Column 5 represents the results based on quality estimated from a demand equation (5), where we have controlled for firm fixed effects, along with year and product fixed effects (Hu et al., 2021). In other words, we are purging out the firm-specific time-invariant unobserved heterogeneity from the demand. In column 6, we used a quality measured using the Forlani et al. (2023) approach.[18] This measure is based on the variable markups across firms. We can see that, except column 3, all the estimates are statistically significant, indicating that there is a quality up-gradation after dereservation.

5.2 Propensity score matching

To estimate the causal impact of dereservation, we have employed the difference-in-differences (DID) framework. The crucial assumption of the DID is that the control and treatment groups are similar. In other words, there is no selection bias. To address this concern, we performed a propensity score matching analysis and estimated the average effect of treatment on the treated sample. We used the firm-level baseline covariates such as total employees, firm age, gross sales value, gross plant and machinery, capital-labor ratio, etc, to match the treated firms with control firms. Figure A3 in Section A1 of the Appendix shows the balancing property of the matched sample. Indicates that, after matching, there are no statistically significant differences in the mean values of the covariates between the treated and control groups. We used the De Chaisemartin and d'Haultfoeuille (2020) estimator to address a bias in the simple canonical two-way fixed-effects DID setup. Figure A4 in Section A1 of the Appendix represents the DID event study plot from De Chaisemartin and d'Haultfoeuille (2020) estimator. We can see there is no statistically significant difference in product quality between the treated and control groups before the dereservation. However, there is a positive shift after the dereservation. Table A5 reports the average effect of the treatment on product quality

[18]The Forlani et al. (2023) measured quality as a markup-weighted log revenue adjusted for the log quantity demanded.

based on the matched sample.

5.3 Placebo test

We also performed the placebo test in the spirit of Martin et al. (2017). We randomly assigned the dummy treatment to different products from our sample. We repeat this exercise 100 times and estimate the impact of dereservation on quality and other firm-product-level outcomes. Due to random assignment of a placebo treatment, some of the truly dereserved products may also end up in the placebo treatment group. To mitigate the confounding effect, we control for a true dereservation in our regression. Table A6 in Section A2 of the Appendix shows the results from one of 100 placebo regressions. We can see that the placebo dereservation effect is statistically insignificant for all outcomes. Table A7 in Section A2 of the Appendix reports the summary of estimates from 100 iterations of placebo regression. As expected, for all outcomes, around 90 regression runs are insignificant. Figure A5 in Section A2 of the Appendix shows the cumulative distribution function (CDF) of estimates from 100 regression runs for quality and price. As expected, all the placebo estimates fall away and are leftward of the true coefficient indicated by a vertical dotted line. The null placebo effect provides validity to our results on de-reservation.

6 Conclusion

This paper contributes to the literature on size-dependent policies designed to safeguard small and medium-sized firms. We utilized the different timing of product dereservation to examine the effect of the SSI reservation policy of 1967 in India on product quality. We have demonstrated that the reservation policy had an adverse impact on the quality of Indian manufacturing products. The elimination of reservations enables firms to upgrade their product quality. The quality up-gradation is mostly driven by large-sized firms. Large firms further enhanced their capital and skill intensity, thereby enabling the production of superior-quality products relative to the pre-dereservation period. We found that constraint firms below the SSI limit have also upgraded their product quality. We observed that firms operating in a market with a larger scope of differentiation followed quality based competence, whereas firms operating in a market with a smaller scope of differentiation reduced their prices in response to competition. On average, there is a significant decrease in quality-adjusted prices, indicating an improvement in consumer welfare.

Our findings indicate that size-based policies undermine the importance of product quality differentiation, competition, and economies of scale, and that phasing out such policies enables firms to enhance product quality and compete in the market on the basis of quality.

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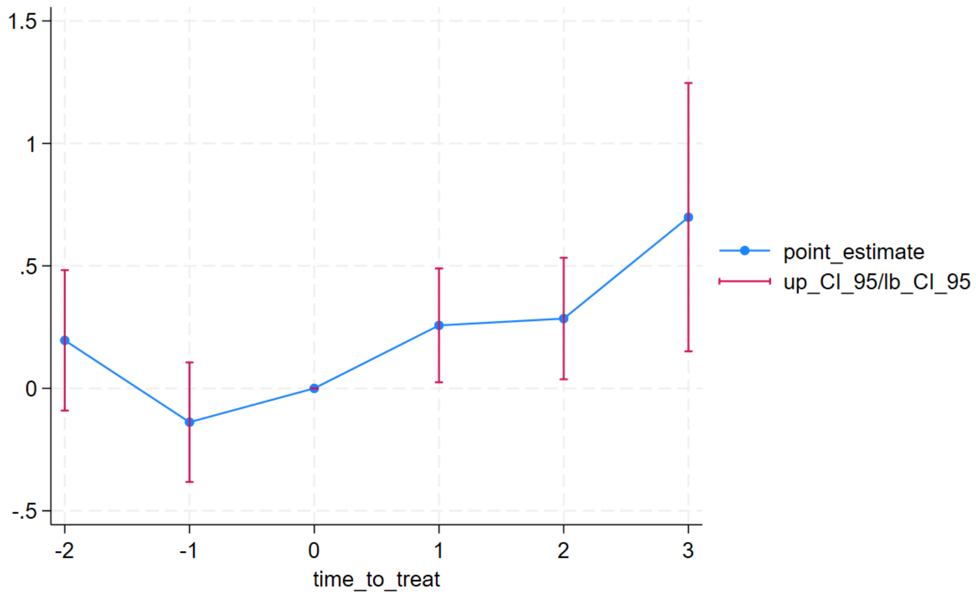

Figure 1: Event Study Plot - "Quality effect" using De Chaisemartin and d'Haultfoeuille (2020) estimator

Table 1: Demand Estimation (Pooled Sample)

	Panel A: OLS Estimation	**Panel B**: IV Estimation	
	(1)	(2)	(3)
	(OLS) Log (Quantity)	(1^{st} Stage) Log (Price)	(2^{nd} Stage) Log (Quantity)
Log (Electricity Price)		0.112***	
		(0.0189)	
Log (Price)	-0.842***		-1.954***
	(0.00245)		(0.248)
Product and Year FE	Yes	Yes	Yes
First stage F Stat	-	35.07	-
R-squared	0.369	-	-
Observations	429,103	411,290	411,290

Note- Standard errors in parenthesis are clustered at the firm-product level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.001$. We have controlled for the log of firm size using total employees as a proxy for size and the firm's own generated electricity share in their total electricity consumption.

Table 2: Industry-specific Price-elasticity Estimates Summary

Panel A

Remark	Statistic
Total Industries	130
Industries with negative price coefficient	130
Estimations with negative & significant price coefficient	130
IV price coefficient (σ)	-1.46 (mean)
Total number of products	5132
Total number of varieties	272,942

Panel B

Variable	Mean	SD	p25	p50	p75	N
Quality	-0.05	5.73	-3.16	0.34	3.40	421,449

Note - The table reports the summary of 4-digit industry-specific price-elasticities estimated using the interaction of predicted log prices from the first stage of the pooled sample with industry-specific dummies.

Table 3: Descriptive Statistics

Item	**Statistic**
No of Observations	233,423
No of Firms	42,868
No of ASICC Products	3,899
No of Treated/Dereserved Products	291 (7.46%)
No of Firm-Products (Varieties)	76,931
No of Treated Firm-Products (Varieties)	8920 (11.6%)
No of Incumbent Firms	12,432 (29%)
No of Entrants Firms	5,193 (12%)
No of Firms Within SSI threshold (Rupees 10 mill.)	29,983 (70%)
No of Firms Over SSI threshold (Rupees 10 mill.)	12,885 (30%)
No of Incumbents Firms Within the SSI threshold (Rupees 10 mill.)	12,178 (40%)
No of Incumbent Firms Over SSI (Rupees 10 mill.)	2,506 (19%)

Note: The table represents the summary statistics from our baseline estimation sample. The incumbents are those firms that were producing dereserved products before dereservation. The entrants refer to the firms that started producing a dereserved product only after it became dereserved. Over and Within SSI refers to the firms above and below the 10 million investment limit in plant and machinery.

Table 4: The Impact of De-reservation on Product Quality

VARIABLES	(1) Quality	(2) Quality	(3) Quality	(4) Quality	(5) Quality
Panel A: OLS					
De-reserved$_{jt}$	0.329*	0.385***	0.280*	0.272*	0.276*
	(0.173)	(0.145)	(0.157)	(0.157)	(0.156)
Observations	233,423	229,574	229,577	229,577	229,577
R-squared	0.839	0.850	0.847	0.845	0.845
Panel B: De Chaisemartin and d'Haultfoeuille (2020)					
De-reserved$_{jt}$	0.148	0.293***	0.285***	0.248***	0.143
	(0.139)	(0.086)	(0.063)	(0.062)	(0.105)
Observations	144,568	50,825	50,825	130,683	130,683
Year FE	Yes	Yes	Yes	Yes	Yes
Firm x Product FE	Yes	Yes	Yes	Yes	Yes
Industry x Year FE	-	Yes	-	-	-
Industry-Time Trend	-	-	Yes	-	-
State x Year FE	-	-	-	Yes	-
State-Time Trend	-	-	-	-	Yes

Note: Standard errors in parentheses are clustered at the product level. *** p<0.01 ** p<0.05 * p<0.1. Panel A presents the average treatment effect on treated (ATT) from using OLS estimation, and Panel B presents the average cumulative (total) effect (Av_tot_eff) from (De Chaisemartin and d'Haultfoeuille, 2020) estimation. The outcome variable is the quality estimated for each firm-product combination using Khandelwal et al. (2013) approach. De-reserved$_{jt}$ takes a value of 1 for the year product dereserved and all subsequent years, and 0 otherwise.

Table 5: The Impact of De-reservation on Product Quality across Firm Size

VARIABLES	(1) Quality	(2) Quality	(3) Quality	(4) Quality	(5) Quality
De-reserved$_{jt}$ $\times$ Q^1	0.255	0.105	0.115	0.119	0.118
	(0.287)	(0.206)	(0.260)	(0.265)	(0.263)
De-reserved$_{jt}$ $\times$ Q^2	0.299	0.297*	0.225	0.208	0.215
	(0.218)	(0.164)	(0.180)	(0.186)	(0.184)
De-reserved$_{jt}$ $\times$ Q^3	0.263	0.427**	0.253	0.254	0.243
	(0.188)	(0.203)	(0.183)	(0.183)	(0.184)
De-reserved$_{jt}$ $\times$ Q^4	0.556*	0.622**	0.573*	0.557*	0.570*
	(0.323)	(0.297)	(0.320)	(0.323)	(0.322)
Observations	233,363	229,518	229,521	229,521	229,521
R-squared	0.855	0.867	0.862	0.863	0.862
Year FE	Yes	Yes	Yes	Yes	Yes
Firm_Product FE	Yes	Yes	Yes	Yes	Yes
Industry x Year FE	-	Yes	-	-	-
Industry_time trend	-	-	Yes	-	-
State x Year FE	-	-	-	Yes	-
State_time trend	-	-	-	-	Yes

Note: Standard errors in parentheses are clustered at the product level. *** p<0.01 ** p<0.05 * p<0.1. The outcome variable is the quality estimated for each firm-product combination using Khandelwal et al. (2013) approach. De-reserved$_{jt}$ takes a value of 1 for the year product dereserved and all subsequent years, and 0 otherwise. **The firm size quartiles (*Q*) are measured using total employees** at base year (i.e., the first year a firm is observed in the e(sample) of the baseline quality regression).

Table 6: The Impact of De-reservation on Product Quality across Firm Size

VARIABLES	(1) Quality	(2) Quality	(3) Quality	(4) Quality	(5) Quality
De-reserved$_{jt}$ $\times$ Q^1	0.186	0.112	0.079	0.072	0.074
	(0.220)	(0.205)	(0.188)	(0.194)	(0.194)
De-reserved$_{jt}$ $\times$ Q^2	0.143	0.015	0.043	0.035	0.043
	(0.233)	(0.154)	(0.213)	(0.218)	(0.214)
De-reserved$_{jt}$ $\times$ Q^3	0.433	0.576***	0.392	0.391	0.396
	(0.272)	(0.221)	(0.241)	(0.247)	(0.245)
De-reserved$_{jt}$ $\times$ Q^4	1.010**	1.010***	1.038***	1.024***	1.032***
	(0.401)	(0.365)	(0.395)	(0.396)	(0.396)
Observations	228,173	224,340	224,343	224,343	224,343
R-squared	0.854	0.866	0.861	0.862	0.861
Year FE	Yes	Yes	Yes	Yes	Yes
Firm_Product FE	Yes	Yes	Yes	Yes	Yes
Industry x Year FE	-	Yes	-	-	-
Industry_time trend	-	-	Yes	-	-
State x Year FE	-	-	-	Yes	-
State_time trend	-	-	-	-	Yes

Note: Standard errors in parentheses are clustered at the product level. *** p<0.01 ** p<0.05 * p<0.1. The outcome variable is the quality estimated for each firm-product combination using Khandelwal et al. (2013) approach. De-reserved$_{jt}$ takes a value of 1 for the year product dereserved and all subsequent years, and 0 otherwise. **The firm size quartiles (Q) are measured using plant and machinery** at base year (i.e., the first year a firm is observed in the e(sample) of the baseline quality regression).

Table 7: The Impact of De-reservation- Over/Within SSI Limit

VARIABLES	(1) Quality	(2) Quality	(3) Quality	(4) Quality	(5) Quality
De-reserved$_{jt}$ $\times$ Over SSI	0.578**	0.642***	0.601**	0.596**	0.596**
	(0.273)	(0.245)	(0.267)	(0.271)	(0.269)
De-reserved$_{jt}$ $\times$ Within SSI	0.236	0.165	0.132	0.125	0.129
	(0.212)	(0.155)	(0.181)	(0.188)	(0.184)
Observations	233,423	229,574	229,577	229,577	229,577
R-squared	0.855	0.867	0.862	0.863	0.862
Year FE	Yes	Yes	Yes	Yes	Yes
Firm_Product FE	Yes	Yes	Yes	Yes	Yes
Industry x Year FE	-	Yes	-	-	-
Industry_time trend	-	-	Yes	-	-
State x Year FE	-	-	-	Yes	-
State_time trend	-	-	-	-	Yes

Note - Standard errors in parentheses are clustered at the firm level. *** p<0.01 ** p<0.05 * p<0.1. The outcome variable is the quality estimated for each firm-product combination using Khandelwal et al. (2013) approach. De-reserved$_{jt}$ takes a value of 1 for the year product dereserved and all subsequent years, and 0 otherwise. Over and Within SSI refers to the firms above and below the 10 million investment in plant and machinery.

Table 8: The Impact of De-reservation- Incumbents v. Entrants

VARIABLES	(1) Quality	(2) Quality	(3) Quality	(4) Quality
De-reserved$_{jt}$ × Incumbent	0.307*	0.316*		
	(0.183)	(0.195)		
De-reserved$_{jt}$ × Entrant	0.169	0.223		
	(0.179)	(0.194)		
De-reserved$_{jt}$ × WithinSSI × Incumbent			0.175	0.110
			(0.191)	(0.202)
De-reserved$_{jt}$ × WithinSSI × Entrant			0.142	0.217
			(0.193)	(0.209)
De-reserved$_{jt}$ × OverSSI × Incumbent			0.664**	0.633**
			(0.264)	(0.285)
De-reserved$_{jt}$ × OverSSI × Entrant			0.421	0.292
			(0.453)	(0.449)
Observations	229,574	229,577	224,032	229,577
R-squared	0.867	0.862	0.867	0.862
Year FE	Yes	Yes	Yes	Yes
Firm x Product FE	Yes	Yes	Yes	Yes
Industry x Year FE	Yes		Yes	
Industry-Time Trend		Yes		Yes

Note - Standard errors in parentheses are clustered at the firm level. *** p<0.01 ** p<0.05 * p<0.1. The outcome variable is the quality estimated for each firm-product combination using Khandelwal et al. (2013) approach. De-reserved$_{jt}$ takes a value of 1 for the year product dereserved and all subsequent years, and 0 otherwise. Over and Within SSI refers to the firms above and below the 10 million investment in plant and machinery. An Incumbent is a dummy for the firms producing a dereserved product before it gets dereserved. Entrant refers to the firms that entered into the dereserved product space after dereservation.

Table 9: The Impact of De-reservation on Quality across Firm-Size

VARIABLES	(1) Quality	(2) Quality	(3) Quality	(4) Quality	(5) Quality
De-reserved$_{jt}$ $\times$ P&M $<$ 0.1	0.150	0.054	0.047	0.051	0.047
	(0.199)	(0.188)	(0.174)	(0.179)	(0.179)
De-reserved$_{jt}$ $\times$ P&M 0.1 to 0.5	0.340	0.144	0.210	0.180	0.200
	(0.366)	(0.251)	(0.325)	(0.328)	(0.326)
De-reserved$_{jt}$ $\times$ P&M 0.5 to 1.5	0.347	0.303	0.219	0.220	0.220
	(0.331)	(0.284)	(0.308)	(0.317)	(0.312)
De-reserved$_{jt}$ $\times$ P&M 1.5 to 5	0.142	0.192	0.099	0.103	0.103
	(0.415)	(0.393)	(0.404)	(0.407)	(0.404)
De-reserved$_{jt}$ $\times$ P&M 5 to 10	0.586	0.713**	0.474	0.465	0.476
	(0.430)	(0.295)	(0.349)	(0.358)	(0.354)
De-reserved$_{jt}$ $\times$ P&M $>$ 10	0.564**	0.651***	0.588**	0.585**	0.586**
	(0.272)	(0.245)	(0.267)	(0.270)	(0.268)
Observations	227,869	224,029	224,032	224,032	224,032
R-squared	0.854	0.866	0.861	0.862	0.861
Year FE	Yes	Yes	Yes	Yes	Yes
Firm x Product FE	Yes	Yes	Yes	Yes	Yes
Industry x Year FE	-	Yes	-	-	
Industry-time trend	-	-	Yes	-	
State x Year FE	-	-	-	Yes	
State-time trend	-	-	-	-	Yes

Note: Standard errors in parentheses are clustered at the product level. *** p<0.01 ** p<0.05 * p<0.1. The outcome variable is the quality estimated for each firm-product combination. De-reserved$_{jt}$ takes a value of 1 for the year product dereserved and all subsequent years, and 0 otherwise. P&M (classified) is measured in INR millions.

Table 10: The Impact of De-reservation on Capital Intensity

VARIABLES	(1) Log(K/L)	(2) Log(K/L)	(3) Log(K/L)	(4) Log(K/L)	(5) Log(K/L)
$\text{De-reserved}_{it} \times Q^1$	-0.085***	-0.068*	-0.086***	-0.069**	-0.082**
	(0.032)	(0.038)	(0.031)	(0.033)	(0.032)
$\text{De-reserved}_{it} \times Q^2$	-0.016	-0.008	-0.020	-0.005	-0.005
	(0.031)	(0.032)	(0.031)	(0.031)	(0.031)
$\text{De-reserved}_{it} \times Q^3$	0.068**	0.082***	0.066**	0.076***	0.072***
	(0.027)	(0.029)	(0.027)	(0.027)	(0.027)
$\text{De-reserved}_{it} \times Q^4$	0.038*	0.049**	0.037*	0.045**	0.045**
	(0.020)	(0.022)	(0.020)	(0.020)	(0.020)
Observations	186,605	182,867	182,876	186,605	186,605
R-squared	0.900	0.902	0.900	0.900	0.900
Year FE	Yes	Yes	Yes	Yes	Yes
Firm_Product FE	Yes	Yes	Yes	Yes	Yes
Industry x Year FE	-	Yes	-	-	-
Industry_time trend	-	-	Yes	-	-
State x Year FE	-	-	-	Yes	-
State_time trend	-	-	-	-	Yes

Note- Standard errors in parentheses are clustered at the firm level. *** p<0.01 ** p<0.05 * p<0.1. The K/L represents the capital-labor ratio, defined as the ratio of gross capital (closing) to total employees. De-reserved_{it} takes a value of 1 for the year the firm faced a dereservation and all subsequent years, and 0 otherwise. **The firm size quartiles (Q) are measured using revenue from sales** at the base year (i.e., the first year a firm is observed in the e(sample) of the baseline quality regression).

Table 11: The Impact of De-reservation on Skill Intensity

VARIABLES	(1) Skillintensity	(2) Skillintensity	(3) Skillintensity	(4) Skillintensity	(5) Skillintensity
$\text{De-reserved}_{\text{it}} \times Q^1$	-0.033***	-0.009	-0.033***	-0.024**	-0.034***
	(0.009)	(0.011)	(0.009)	(0.009)	(0.009)
$\text{De-reserved}_{\text{it}} \times Q^2$	0.008	0.007	0.008	0.004	0.003
	(0.007)	(0.008)	(0.007)	(0.007)	(0.007)
$\text{De-reserved}_{\text{it}} \times Q^3$	0.016**	0.015*	0.017**	0.015*	0.015*
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
$\text{De-reserved}_{\text{it}} \times Q^4$	0.008	0.004	0.009	0.007	0.007
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Observations	147,927	147,921	147,926	147,927	147,927
R-squared	0.791	0.794	0.792	0.794	0.792
Year FE	Yes	Yes	Yes	Yes	Yes
Firm_Product FE	Yes	Yes	Yes	Yes	Yes
Industry x Year FE	-	Yes	-	-	-
Industry_time trend	-	-	Yes	-	-
State x Year FE	-	-	-	Yes	-
State_time trend	-	-	-	-	Yes

Note- Standard errors in parentheses are clustered at the firm level. *** p<0.01 ** p<0.05 * p<0.1. The "Skillintensity" is the ratio of regular workers' real wages to the total real wage bill of a firm. $\text{De-reserved}_{\text{it}}$ takes a value of 1 for the year the firm faced a dereservation and all subsequent years, and 0 otherwise. **The firm size quantiles (Q) are measured using revenue from sales** at the base year (i.e., the first year a firm is observed in the e(sample) of the baseline quality regression).

Table 12: Impact of De-reservation of Prices

VARIABLES	(1) Log(Price)	(2) Log(Price)	(3) Log(Price)	(4) Log(Price)	(5) Log(Price)
De-reserved$_{jt}$	0.046	0.077	0.050	0.054	0.054
	(0.111)	(0.096)	(0.112)	(0.117)	(0.114)
Observations	233,423	229,574	229,577	229,577	229,577
R-squared	0.906	0.910	0.905	0.905	0.905
Year FE	Yes	Yes	Yes	Yes	Yes
Firm x Product FE	Yes	Yes	Yes	Yes	Yes
Industry x Year FE	-	Yes	-	-	-
Industry-Time Trend	-	-	Yes	-	-
State x Year FE	-	-	-	Yes	-
State-Time Trend	-	-	-	-	Yes

Note: Standard errors in parentheses are clustered at the product level. *** p<0.01 ** p<0.05 * p<0.1. The outcome variable is the log of output prices. De-reserved$_{jt}$ takes a value of 1 for the year product dereserved and all subsequent years, and 0 otherwise.

Table 13: Impact of De-reservation of quality adjusted Prices

	(1) Price-λadj	(2) Price-λadj	(3) Price-λadj	(4) Price-λadj	(5) Price-λadj
De-reserved$_{jt}$	-0.260**	-0.196**	-0.180*	-0.170*	-0.172*
	(0.124)	(0.091)	(0.097)	(0.096)	(0.096)
Observations	233,423	229,574	229,577	229,577	229,577
R-squared	0.904	0.912	0.910	0.911	0.910
Year FE	Yes	Yes	Yes	Yes	Yes
Firm x Product FE	Yes	Yes	Yes	Yes	Yes
Industry x Year FE	-	Yes	-	-	-
Industry-Time Trend	-	-	Yes	-	-
State x Year FE	-	-	-	Yes	-
State-Time Trend	-	-	-	-	Yes

Note: Standard errors in parentheses are clustered at the product level. *** p<0.01 ** p<0.05 * p<0.1. The outcome variable is a log of quality-adjusted prices [log(price)- log(quality)]. De-reserved$_{jt}$ takes a value of 1 for the year product dereserved and all subsequent years, and 0 otherwise.

Table 14: The Impact of Product De-reservation on Product Quality

VARIABLES	(1) Quality	(2) Quality	(3) Quality	(4) Quality	(5) Quality
$\text{De-reserved}_{jt} \times$ Short Ladder	0.023	-0.114	-0.070	0.005	0.022
	(0.220)	(0.193)	(0.153)	(0.219)	(0.218)
$\text{De-reserved}_{jt} \times$ Long Ladder	0.918**	0.779**	0.802**	0.965**	0.945**
	(0.435)	(0.353)	(0.407)	(0.438)	(0.438)
Observations	91,422	89,605	89,624	91,422	91,422
R-squared	0.836	0.855	0.846	0.838	0.837
Year FE	Yes	Yes	Yes	Yes	Yes
Firm_Product FE	Yes	Yes	Yes	Yes	Yes
Industry x Year FE	-	Yes	-	-	-
Industry_time trend	-	-	Yes	-	-
State x Year FE	-	-	-	Yes	-
State_time trend	-	-	-	-	Yes

Note: Standard errors in parentheses are clustered at the 5-digit industry level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. The outcome variable is the quality estimated for each firm-product combination using the Khandelwal et al. (2013) approach. De-reserved_{jt} takes a value of 1 for the year product dereserved and all subsequent years, and 0 otherwise. Long and short ladder is a dummy for the above and below median quality ladder, where the quality ladder is the distance between the maximum and minimum quality within a 4-digit industry. We have fixed the quality ladder to the base year, i.e., 2000.

Table 15: The Impact of Product Dereservation on Prices

VARIABLES	(1) Log(Price)	(2) Log(Price)	(3) Log(Price)	(4) Log(Price)	(5) Log(Price)
De-reserved$_{jt}$ × Short Ladder	-0.169*	-0.211**	-0.162*	-0.157*	-0.158*
	(0.091)	(0.086)	(0.092)	(0.088)	(0.089)
De-reserved$_{jt}$ × Long Ladder	0.399	0.367*	0.406	0.421	0.415
	(0.256)	(0.208)	(0.256)	(0.259)	(0.258)
Observations	91,423	89,606	89,625	91,423	91,423
R-squared	0.914	0.920	0.913	0.915	0.914
Year FE	Yes	Yes	Yes	Yes	Yes
Firm_Product FE	Yes	Yes	Yes	Yes	Yes
Industry x Year FE	-	Yes	-	-	-
Industry_time trend	-	-	Yes	-	-
State x Year FE	-	-	-	Yes	-
State_time trend	-	-	-	-	Yes

Note: Standard errors in parentheses are clustered at the 5-digit industry level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. The outcome variable is the quality estimated for each firm-product combination using the Khandelwal et al. (2013) approach. De-reserved$_{jt}$ takes a value of 1 for the year product dereserved and all subsequent years, and 0 otherwise. Long and short ladder is a dummy for the above and below median quality ladder, where the quality ladder is the distance between the maximum and minimum quality within a 4-digit industry. We have fixed the quality ladder to the base year, i.e., 2000.

Table 16: Impact of De-reservation on Marginal Cost

VARIABLES	(1) Log(MC)	(2) Log(MC)	(3) Log(MC)	(4) Log(MC)	(5) Log(MC)
De-reserved$_{jt}$	-0.062	0.014	-0.058	-0.047	-0.057
	(0.138)	(0.140)	(0.144)	(0.151)	(0.146)
Observations	80,302	80,289	80,302	80,302	80,302
R-squared	0.918	0.927	0.919	0.919	0.919
Year FE	Yes	Yes	Yes	Yes	Yes
Firm x Product FE	Yes	Yes	Yes	Yes	Yes
Industry x Year FE	-	Yes	-	-	-
Industry-Time Trend	-	-	Yes	-	-
State x Year FE	-	-	-	Yes	-
State-Time Trend	-	-	-	-	Yes

Note: Standard errors in parentheses are clustered at the product level. *** p<0.01 ** p<0.05 * p<0.1. The outcome variable is a log of marginal cost, which is defined as a ratio of price to markup, where markup is estimated using the De Loecker et al. (2016) approach. De-reserved$_{jt}$ takes a value of 1 for the year product dereserved and all subsequent years, and 0 otherwise.

Table 17: The Impact of De-reservation on Input Price

VARIABLES	(1) Log(Input Price)	(2) Log(Input Price)	(3) Log(Input Price)	(4) Log(Input Price)	(5) Log(Input Price)
De-reserved$_{it}$	0.055	-0.007	0.061*	0.052	0.066*
	(0.036)	(0.044)	(0.036)	(0.037)	(0.036)
Observations	387,753	381,879	381,881	381,881	381,881
R-squared	0.877	0.882	0.876	0.877	0.876
Year FE	Yes	Yes	Yes	Yes	Yes
Firm x Input FE	Yes	Yes	Yes	Yes	Yes
Industry x Year FE	-	Yes	-	-	-
Industry-Time Trend	-	-	Yes	-	-
State x Year FE	-	-	-	Yes	-
State-Time Trend	-	-	-	-	Yes

Note: Standard errors in parentheses are clustered at the product level. *** p<0.01 ** p<0.05 * p<0.1. The outcome variable is a log of input prices. De-reserved$_{it}$ takes a value of 1 for the year the firm faced a dereservation and all subsequent years, and 0 otherwise.

Table 18: The Impact of De-reservation on TFPQ

VARIABLES	(1) TFPQ	(2) TFPQ	(3) TFPQ	(4) TFPQ	(5) TFPQ
De-reserved$_{it}$	0.084*	0.060**	0.053**	0.052**	0.051**
	(0.048)	(0.026)	(0.027)	(0.025)	(0.025)
Observations	17,835	17,758	17,831	17,827	17,831
R-squared	0.398	0.400	0.411	0.415	0.411
Year FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Industry x Year FE	-	Yes	-	-	-
Industry-Time Trend	-	-	Yes	-	-
State x Year FE	-	-	-	Yes	-
State-Time Trend	-	-	-	-	Yes

Note: Standard errors in parentheses are clustered at the firm level. *** p<0.01 ** p<0.05 * p<0.1. Panel A estimates use OLS estimation. The outcome variable is the quantity of total factor productivity (TFPQ). The TFPQ is estimated using the De Loecker et al. (2016) approach. De-reserved$_{it}$ takes a value of 1 for the year the firm faced a dereservation and all subsequent years, and 0 otherwise.

Table 19: The Impact of Product De-reservation on Labor Productivity

VARIABLES	(1) Log(LP)	(2) Log(LP)	(3) Log(LP)	(4) Log(LP)	(5) Log(LP)
De-reserved$_{it}$	0.111***	0.188***	0.121***	0.122***	0.111***
	(0.042)	(0.053)	(0.042)	(0.043)	(0.042)
Observations	188,540	184,786	184,795	188,540	188,540
R-squared	0.818	0.825	0.817	0.819	0.818
Year FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Industry x Year FE	-	Yes	-	-	-
Industry-Time Trend	-	-	Yes	-	-
State x Year FE	-	-	-	Yes	-
State-Time Trend	-	-	-	-	Yes

Note: Standard errors in parentheses are clustered at the firm level. *** p<0.01 ** p<0.05 * p<0.1. Labor productivity (LP) refers to the output per employee. De-reserved$_{it}$ takes a value of 1 for the year the firm faced a dereservation and all subsequent years, and 0 otherwise.

Table 20: Impact of De-reservation on Markups

VARIABLES	(1) Log(Markup)	(2) Log(Markup)	(3) Log(Markup)	(4) Log(Markup)	(5) Log(Markup)
De-reserved$_{jt}$	0.039	0.013	0.043	0.037*	0.043
	(0.028)	(0.012)	(0.027)	(0.021)	(0.027)
Observations	80,302	80,289	80,302	80,302	80,302
R-squared	0.737	0.751	0.739	0.741	0.739
Year FE	Yes	Yes	Yes	Yes	Yes
Firm x Product FE	Yes	Yes	Yes	Yes	Yes
Industry x Year FE	-	Yes	-	-	-
Industry-Time Trend	-	-	Yes	-	-
State x Year FE	-	-	-	Yes	-
State-Time Trend	-	-	-	-	Yes

Note: Standard errors in parentheses are clustered at the product level. *** $p<0.01$ ** $p<0.05$ * $p<0.1$. The markups are estimated using De Loecker et al. (2016) approach. De-reserved$_{jt}$ takes a value of 1 for the year product dereserved and all subsequent years, and 0 otherwise.

Appendix

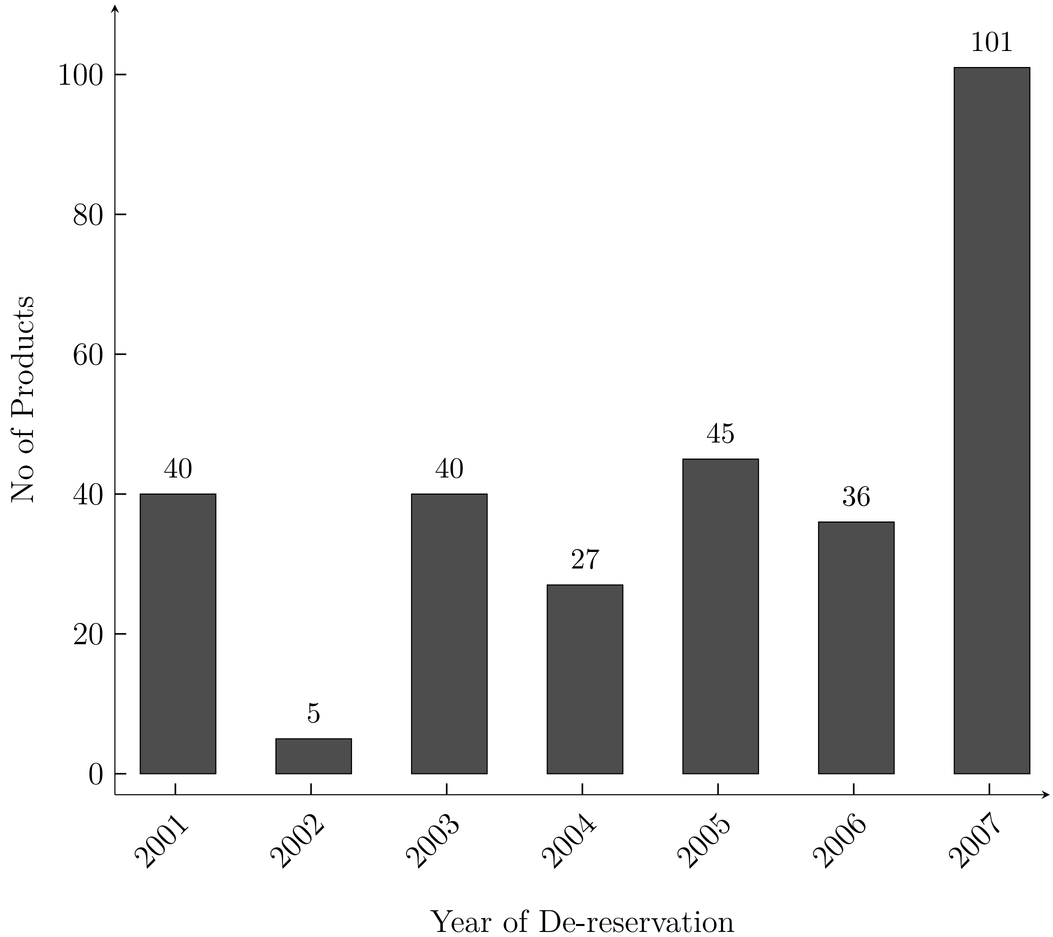

Figure A2: Number of 5-digit ASICC Products Dereserved over the Years

Table A1: Evolution of Investment limit of SSI Industries

Year	Investment Limits	Additional Condition
1950	Up to Rs. 0.5 million in fixed assets	Less than 50/100 persons with or without power
1960	Up to Rs. 0.5 million in fixed assets	No condition
1966	Up to Rs. 0.75 million in plant and machinery	No condition
1975	Up to Rs. 1 million in plant and machinery	No condition
1980	Up to Rs. 2 million in plant and machinery	No condition
1985	Up to Rs. 3.5 million in plant and machinery	No condition
1991	Up to Rs. 6 million in plant and machinery	No condition
1997	Up to Rs. 30 million in plant and machinery	No condition
1999	Up to Rs. 10 million in plant and machinery	No condition

Source: Mohan (2002)

Table A2: Number of Products Reserved and Dereserved Over Years

Year	Number Products Reserved At Beginning of Year	Number Products De-Reserved During the Year	Number of Products Still Reserved at End of Year
1997	1045	15	1030
1998	1030	0	1030
1999	1030	9	1021
2000	1021	0	1021
2001	1021	15	1006
2002	1006	51	955
2003	955	75	880
2004	880	85	795
2005	795	108	687
2006	687	187	500
2007	500	253	247
2008	247	225	22
2009	22	0	22
2010	22	2	20
2015	20	20	0

Source: Martin et al. (2017)

Table A3: The Impact of De-reservation on Product Quality across Firm Size

VARIABLES	(1) Quality	(2) Quality	(3) Quality	(4) Quality	(5) Quality
De-reserved$_{jt}$ $\times$ Q^1	0.255	0.105	0.115	0.119	0.118
	(0.287)	(0.206)	(0.260)	(0.265)	(0.263)
De-reserved$_{jt}$ $\times$ Q^2	0.299	0.297*	0.225	0.208	0.215
	(0.218)	(0.164)	(0.180)	(0.186)	(0.184)
De-reserved$_{jt}$ $\times$ Q^3	0.263	0.427**	0.253	0.254	0.243
	(0.188)	(0.203)	(0.183)	(0.183)	(0.184)
De-reserved$_{jt}$ $\times$ Q^4	0.556*	0.622**	0.573*	0.557*	0.570*
	(0.323)	(0.297)	(0.320)	(0.323)	(0.322)
Observations	233,363	229,518	229,521	229,521	229,521
R-squared	0.855	0.867	0.862	0.863	0.862
Year FE	Yes	Yes	Yes	Yes	Yes
Firm_Product FE	Yes	Yes	Yes	Yes	Yes
Industry x Year FE	-	Yes	-	-	-
Industry_time trend	-	-	Yes	-	-
State x Year FE	-	-	-	Yes	-
State_time trend	-	-	-	-	Yes

Note: Standard errors in parentheses are clustered at the product level. *** p<0.01 ** p<0.05 * p<0.1. The outcome variable is the quality estimated for each firm-product combination. De-reserved$_{jt}$ takes a value of 1 for the year product dereserved and all subsequent years, and 0 otherwise. **The firm size quartiles (Q) are measured using labor productivity** at base year (i.e., the first year a firm is observed in the e(sample) of the baseline quality regression).

Table A4: Alternative quality measures: Robustness check

	(1) Quality $\sigma = \sigma_k$	(2) Quality $\sigma = \sigma_k$	(3) Quality $\sigma = 3.7$	(4) Quality $\sigma = \sigma_k$	(5) Quality $\sigma = \sigma_k$	(6) Quality $\sigma = \sigma_{ijt}$ Forlani et al. 2023
		Khandelwal et al. (2013)				
De-reserved$_{\mathrm{jt}}$	0.385***	0.362***	0.156	0.534***	0.272*	4.996**
	(0.145)	(0.010)	(0.103)	(0.175)	(0.150)	(2.405)
Observations	2,29,574	2,29,577	2,29,577	2,26,487	2,29,577	80,302
R-squared	0.850	0.847	0.712	0.918	0.628	0.667
Details	Original	Alternate IV	σ from Broda et. 2006		Year, Firm, Product FE	Variable markups
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm x Product FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Time Trend	Yes	Yes	Yes	Yes	Yes	Yes

Note- Standard errors in parentheses are clustered at the product level. *** p<0.01 ** p<0.05 * p<0.1.

A1 Propensity Score Matching

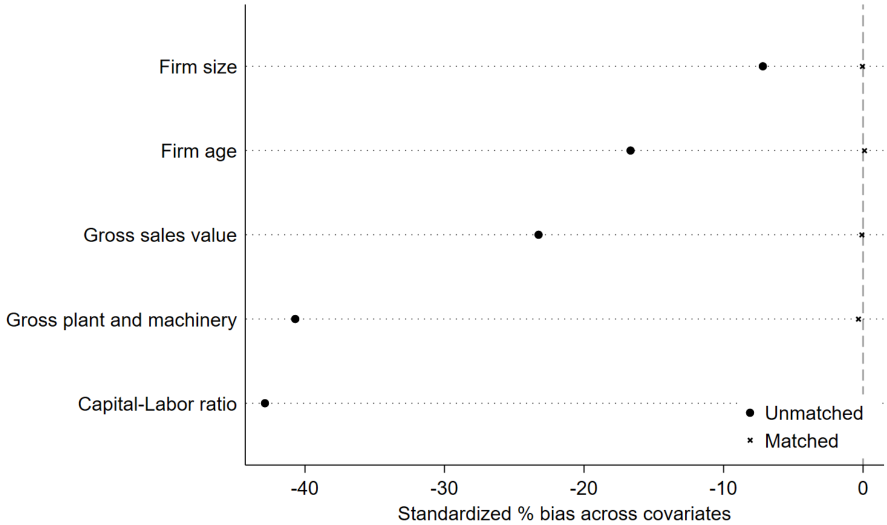

Figure A3: Balancing Property

Note: The figure shows the difference between the mean value of covariates (bias) of treated and control groups. We used the Mahalanobis distance matching based on the propensity score. All variables are measured at the base year and all variables, except firm age, are in log form.

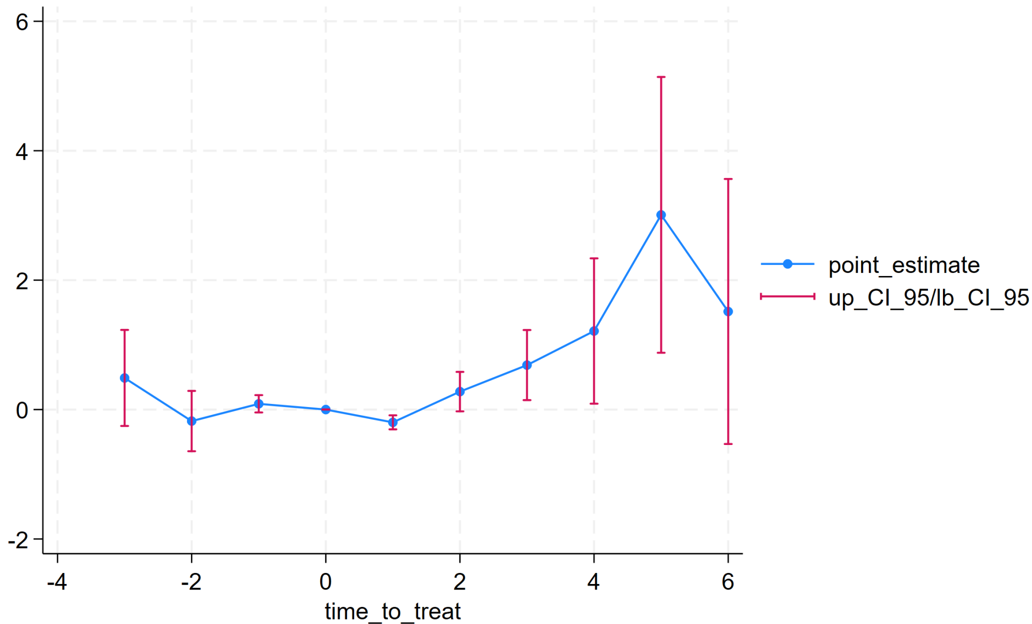

Figure A4: Impact of De-reservation on Quality (Event study plot)

Note: The event study plot is based on the De Chaisemartin and d'Haultfoeuille (2020) specification in Table A6.

Table A5: Impact of dereservation on Quality using matched sample

	Quality
Panel A: OLS	
De-reserved$_{jt}$	0.073
	(0.157)
Observations	48,856
Panel B: De Chaisemartin and d'Haultfoeuille (2020)	
De-reserved$_{jt}$	0.282*
	(0.151)
Observations	8137
Year FE	Yes
Firm_Product FE	Yes
Industry_time trend	Yes

Note: Standard errors in parentheses are clustered at the product level. *** p<0.01 ** p<0.05 * p<0.1. Panel A estimates use OLS estimation, and Panel B estimates use (De Chaisemartin and d'Haultfoeuille, 2020) estimation. The outcome variable is the quality estimated for each firm-product combination using Khandelwal et al. (2013) approach. De-reserved$_{jt}$ takes a value of 1 for the year product dereserved and all subsequent years, and 0 otherwise.

A2 Placebo Test

Table A6: Placebo Test of the Impact of Product De-reservation

VARIABLES	(1) Quality	(2) Price	(3) Markup	(4) MC
De-reserved$_{jt}$	0.289*	0.133	0.061*	0.070
	(0.151)	(0.098)	(0.035)	(0.129)
De-reserved$_{jt}$ (placebo)	-0.258	-0.003	-0.043	-0.125
	(0.177)	(0.112)	(0.030)	(0.149)
Observations	229,577	229,578	91,386	91,386
R-squared	0.864	0.907	0.744	0.913
Year FE	Yes	Yes	Yes	Yes
Firm x Product FE	Yes	Yes	Yes	Yes
Industry-Time Trend	Yes	Yes	Yes	Yes

Note: Standard errors in parentheses are clustered at the product level. *** p<0.01 ** p<0.05 * p<0.1. All outcome variables are in log form. De-reserved$_{jt}$ takes a value of 1 for the year product dereserved and all subsequent years, and 0 otherwise. "De-reserved$_{jt}$ (placebo)" identify the impact of randomly assigned dereservation (placebo) across the available set of products.

Variables	Insignificant	+ Significant	- Significant
Quality	92	5	3
Price	93	3	4
Markup	92	7	1
Mc	93	3	4

Table A7: The above table reports the number of significant and insignificant estimates at 5 percent significance level, based on 100 iterations of placebo regressions

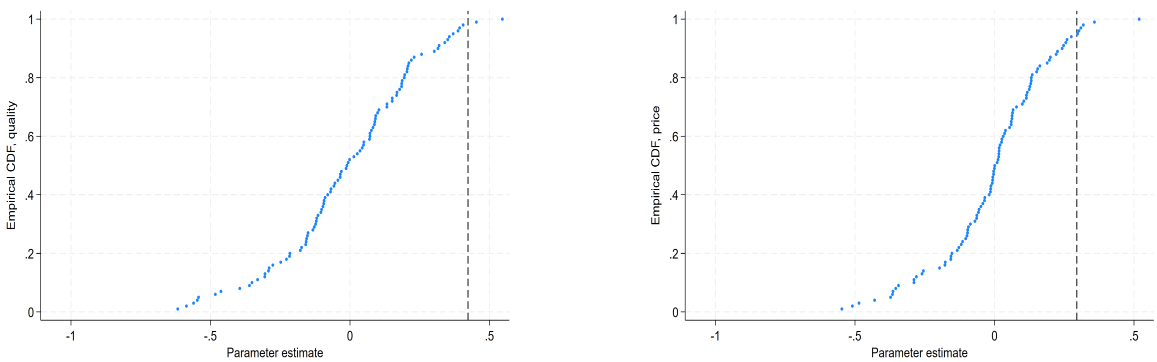

Figure A5: The cumulative distribution function (CDF) of 100 iterations of placebo. The vertical dotted line represents the true estimate of de-reservation

A3 Markups and Marginal Cost Estimation

We follow De Loecker et al. (2016) to estimate the marginal cost and product level markups. For multi-product firms, we do not know the product-specific input expenditure share. De Loecker et al. (2016) proposed an approach to use the single-product firm's production and input demand functions to get the product-specific input allocation. The key assumption is that the production technology is specific to each product, allowing for the estimation of the production function at the product level without relying on unobserved input allocation for multi-product firms. The firm i's production function for product j at time t is below expression:

$$Q_{ijt} = F_{it}(V_{ijt}, K_{ijt})\Omega_{it}$$

Where Q is the output quantity, V represents a vector of variable inputs (freely adjustable), and the vector of fixed inputs is given by K. Ω_{it} is the firm's productivity. By solving the cost-minimization problem of the firm and rearranging the first-order condition for variable input i.e., the material used for the production of product j., we get the following expression for markups (μ_{ijt}. Markups are defined as a ratio between the output elasticity of materials and the proportion of material expenditure in total revenue.

$$\mu_{ijt} = \frac{P_{ijt}}{MC_{ijt}} = \left(\frac{\delta Q_{ijt}(.)}{\delta M_{ijt}} \cdot \frac{M_{ijt}}{Q_{ijt}}\right) \Big/ \left(\frac{P^M_{ijt} \cdot P_{ijt}}{M_{ijt} \cdot Q_{ijt}}\right)$$

Where P_{ijt} and P^M_{ijt} denote the price of output and variable input (material, M_{ijt}) price respectively. $\delta Q_{ijt}(.)$ is the product function of firm i producing product j at time t. MC_{ijt} is the marginal cost of production. The left-hand side of the above expression is the output elasticity of the material input. The right-hand side represents the share of material expenditure allocated to product j relative to the sales revenue of product j.

Once we estimate the markups, we can calculate the marginal cost of production as a ratio of prices to markups.

$$MC_{ijt} = \frac{P_{ijt}}{\mu_{ijt}}$$

We estimate the markups separately for each two-digit NIC industry. Table 1 reports the mean and median markups for each 2-digit NIC industry. The overall median markup is 1.41, and the overall mean is 2.43. There is considerable variation in the mean and median of markups across industries.

The correlation between markups and marginal cost against the quality is shown in Fig 1. Both the markups and marginal cost are increasing in quality of products. We have demeaned both the variables at the product and year level to make them comparable across firms across products. The correlation coefficient between quality and markup is 0.11, while the correlation coefficient between quality and marginal cost is 0.13. The association between marginal cost and quality aligns with the notion that high-quality products require superior inputs, which are generally expensive. Increasing markups with quality indicates that the quality of the product enables firms to accrue markups by charging higher prices.

Table A8: Industry-wise Markups

		Markups				Markups	
Nic code	Industry description	Median	Mean	Nic code	Industry description	Median	Mean
15	Food products	1.03	1.85	26	Non-metallic mineral products	1.98	2.64
16	Tobacco products	2.71	3.13	27	Basic Metals	1.16	1.96
17	Textiles	1.42	2.05	28	Fabricated metal products	1.23	1.69
18	Apparel	1.58	2.02	29	Machinery & Equipments	1.66	3.30
19	Leather products	1.51	2.11	30	Accounting machinery	1.05	1.87
20	Wood products	1.30	2.10	31	Electrical machinery	1.38	2.56
21	Paper Products	1.31	1.91	32	Communication equipments	1.62	2.94
22	Publishing & Printing	1.38	2.26	33	Medical equipments	1.57	2.97
23	Chemicals	1.26	2.21	34	Automobiles	1.68	2.98
24	Petrolium products	1.37	2.56	35	Other transport equipments	1.61	2.90
25	Rubber & Plastic	1.50	2.19	36	Furniture	1.38	2.38
				-	**Average**	1.41	2.34

The table reports the mean and median of markups by the two-digit industry for the years 2000-2007. We have trimmed the observations (markups) below and above the 3rd and 97th percentiles of the distribution in each industry.

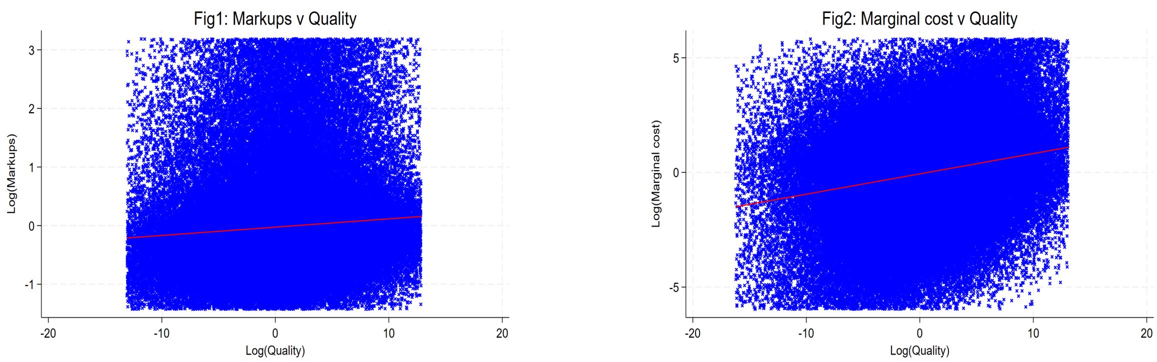

Figure A6: Note: All the variables are demeaned by product and year-fixed effects. Outliers are trimmed below the 1st and 99th percentile for each demeaned variable