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ABSTRACT

An ongoing debate in employment policy is whether promoting small and medium enterprises creates more employment. Do small enterprises generate more employment growth than larger firms? We use the elimination of small-scale industry (SSI) promotion in India to address this question. For 60 years, SSI promotion in India focused on reserving certain products for manufacture by small and medium establishments. We identify the consequences for employment growth, investment, output, productivity, and wages of dismantling India's SSI reservations. We exploit variation in the timing of de-reservation across products; our identification strategy is also robust to measuring the long-run impact of national SSI policy changes using variation in pre-treatment exposure at the district level, and to conducting placebo tests using products that were never de-reserved. Districts more exposed to de-reservation experienced higher employment and wage growth. The results suggest that promoting employment growth in the Indian case was not achieved via SSI reservation policies.

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1. Introduction

An ongoing debate in employment policy is whether promoting small and medium enterprises creates more employment. Do small enterprises generate more employment growth than larger firms? For the past 60 years, India has attempted to boost employment growth by shielding small manufacturing establishments from competition. Promotion measures have included subsidized credit, technical assistance, excise tax exemptions, preference in government procurement, and subsidies for power and capital. Until recently, the "premier instrument" for protecting small establishments was a policy of reserving a number of products for exclusive production by small-scale industry. Proponents of small establishment promotion have argued that these policies encourage labor-intensive growth, mitigate capital market imperfections, and shift income towards lower wage earners (Hussain, 1997).

Critics of small and medium establishment promotion in India argued that these policies in fact discouraged their growth and slowed the overall expansion of the manufacturing sector. Mohan (2002) documents that following a major expansion of the number of products reserved for small establishments in 1978, manufacturing employment growth slowed down. He argues that small establishments making reserved products have been prevented from growing or upgrading their technology, because they would have had to stop making those products if their investment grew above the allowed limits for small-scale industry (SSI). In a similar vein, Panagariya (2008) argues that the policy of reserving many labor-intensive products for SSIs has limited Indian exports of these products.

In this paper, we address two related questions. First, was the SSI reservation policy an effective tool for job creation? While our ultimate concern is how best to promote employment creation, India's dismantling of this policy – which was specifically targeted at promoting small establishments – allows us to address the linkages between establishment size and job growth. The dismantling of the SSI reservation policy began in 1997 and resulted in the near complete removal of reservations by 2008, allowing us to identify the impact of de-reservation on the growth of employment, output, investment,

and wages. This period was characterized by few other reforms, as most of the trade liberalization and dismantling of the License Raj had been done in previous decades. Second, we can use our data to directly answer the question: do small establishments generate faster employment growth?

We use a newly available panel dataset from India's Annual Survey of Industries (ASI) to explore the linkages between establishment size and employment growth in the Indian context and to use the removal of the SSI reservations policy to cast light on these questions. While these data were previously available as a repeated cross-section, the new dataset provides unique establishment identifiers, allowing us to bypass the tricky business of trying to link establishments through beginning and end of year accounting information. To explore the impact of the SSI reforms, we classify establishments into incumbents (those already producing the reserved product) versus entrants (those that moved into the product space after the product was de-reserved). Due to enormous heterogeneity in which products were reserved within any one industry, we conduct most of the analysis at the establishment level. We also explore the net impact of de-reservation at the district level. The panel dataset does not include district identifiers; however, we have created the first mapping of the panel dataset to district locations by merging these in from the annual cross-sections that we purchased separately.

We find that when products were removed from the reserved list, the average incumbent stagnated, while the average entrant grew. The net impact on employment growth of removing protection for small and medium enterprises is positive. De-reservation increased the growth of larger establishments relative to smaller establishments, and reduced employment growth among smaller, older establishments. De-reservation also encouraged the growth of young entrants and incumbents who were previously constrained by the capital limits.

We directly address the potential endogeneity of the reforms. In 1996, at the height of the SSI policies, more than 1,000 products were reserved for production by small and medium enterprises. By 2008, restrictions on all but 20 products had been eliminated. Since the reform quickly led to the removal

of 98 percent of all products from the reserved list, we are able to avoid the selection associated with a partial reform. We are fortunate that most of India's other major reforms, including delicensing and major trade reform episodes, were completed before the period of our analysis. We address the sequencing of the reforms by documenting that there are no pre-treatment trends indicating higher or lower employment growth before products were de-reserved, and that the products de-reserved during early years were not systematically situated in industries with large establishment size. We then conduct two falsification tests. The first test assigns false de-reservation status to those very few products remaining that were not de-reserved, while the second test assigns false treatment status two years prior to the real de-reservation. In each case the effect of the true de-reservation remains robust, while the false de-reservation shows no effect.

Our second approach to possible endogeneity of the SSI reforms exploits the fact that SSI policies were set nationally but their effects are identified locally depending on prior exposure. At the district level, the elimination of SSI policies was an exogenous shock whose severity was greatest in regions whose pre-existing production structure included a large share of reserved products. We create a concordance that allows us to link our establishment -level panel to Indian districts. We then compare changes in employment, output, investment, and wage outcomes for districts that were more or less exposed to the de-reservation based on their pre-existing product mix. Using product mix prior to the SSI reforms and tracing treatment at the district level based on the prior allocation of SSI reservations is our preferred approach to addressing potential endogeneity concerns. Estimating district-wide impacts also allows us to measure the net impact on employment outcomes across both shrinking (incumbent) establishments and expanding (new entrants into previously restricted products) establishments.

We find that districts that were more exposed to the de-reservation based on their pre-treatment product mix experienced higher employment and wage growth over the period from 2000 to 2007. The results suggest that the average change in the fraction of de-reserved employment (0.095) is associated with a 7% increase in district-level employment.

Our measure of employment is based on the ASI, which covers all establishments with 10 or more workers using power, or 20 or more workers without power; thus our results suggest that de-reservation was associated with increased organized (formal) sector employment. The de-reservation may also have affected informal (unorganized) manufacturing employment.[2] If de-reservation simply pushed some workers into informality, then this would be a negative outcome that our ASI data would miss. To investigate this possibility, we conduct a similar, district-level analysis using unorganized manufacturing surveys from 2000 and 2005. We find no statistically significant association between the fraction of de-reservation and district-level employment in unorganized manufacturing. If anything, the evidence suggests that de-reservation may be associated with workers shifting from the unorganized to the organized sector.

India's policy of reserving products for exclusive manufacture by SSIs is unique, but its concern for promoting small and medium enterprises is shared by many countries. The evidence to date on firm size and employment growth in developing countries is mixed. A number of studies document that small firms grow faster than large firms (Mead and Liedholm, 1998; Gunning and Mengistae, 2001 and Bigsten and Gebreeyesus, 2007; Sleuwaegen and Goedhuys, 2002). In contrast, VanBiesebroeck (2005) shows that after controlling for a number of other characteristics, medium and large firms in nine sub-Saharan African countries grow faster than small firms. Meanwhile, Teal (1998) and Harding, Soderbom and Teal (2004) find little relationship between firm size and growth in Ghana, Kenya and Tanzania.

For India, both Das (1995) and Shanmugam and Bhaduri (2002) document that small firms grow more quickly; however, these analyses are limited to small, specialized subsets of Indian manufacturing and do not shed light on why overall employment growth in labor-intensive industries has been slow. More recently, Garcia-Santana and Pijoan-Mas (2014) calibrate a span-of-control model that accounts for

2 India uses the terms "unorganized" and "informal" to mean slightly different things. Our data cover the unorganized sector, although we use the two terms interchangeably.

the reservation policy, using data from 2001, when most reservations were still in place. They simulate the effects of removing the reservation policy and predict that doing so would increase manufacturing output by nearly 7 percent. To our knowledge, ours is the first paper to empirically test the results of the actual dismantling of the SSI reservations policy at the establishment level, which makes it quite complementary to Garcia-Santana and Pijoan-Mas. Our finding that the average decline in reservations would increase employment by approximately 7 percent at the district-level is remarkably close to the simulation results for output generated by their structural model. However, our primary focus is on generating employment, not output.

While this paper focuses primarily on the linkages between establishment size and employment growth, there is also a related literature on policy distortions, productivity growth, and reallocation of production in developing countries. This includes Aghion, Burgess, Redding, and Zilibotti (2005), Alfaro and Chari (2009, forthcoming), Banerjee (2006), Besley and Burgess (2004), Goldberg, Khandelwal, Pavcnik and Topalova (2010a, 2010b), and Hsieh and Olken (2014). Aghion et al (2005) and Besley and Burgess (2004) are both important early papers on the costs of regulation in India that show how licensing and labor market regulations had significant but heterogeneous costs for both growth and productivity. However, they do not address directly the linkages between promoting small establishments and employment growth. Besley and Burgess (2004) emphasize the movement to informal sector enterprises as a result of regulation, an issue which we address at the end of this paper using the NSS unorganized manufacturing data.

Alfaro and Chari (2009, forthcoming) examine more broadly changes in market structure and firm behavior over a longer time period spanning before and after the 1991 reforms. Alfaro and Chari (2009) find that firms which dominated in the early years continue to dominate in later decades, with the exception of the services sector where there is more significant dynamism. Despite significant entry by new firms, Alfaro and Chari show (using the Prowess data of all publicly listed firms) continued dominance of state-owned enterprises and older manufacturing enterprises. Alfaro and Chari

(forthcoming) examine the impact of the 1991 reforms on the overall size distribution of firms, finding that the reforms led to the entry of many small firms and reinforced the role of larger firms. Our paper is complementary to these, as we focus specifically on the removal of SSI policies, a reform which occurred after the major trade reforms and delicensing of earlier years.

Goldberg, Khandelwal, Pavcnik and Topalova (2010a) are the first authors to use product-level data for India. They explore the determinants of new product introductions as a function of the earlier trade reforms, which were largely completed by the time the SSI liberalization occurred. Goldberg et al find that falling input tariffs account for more than a 30 percent increase in new product introductions during their sample period. Goldberg, Khandelwal, Pavcnik and Topalova (2010b) examine whether the rationalization of product lines is linked to India's trade reforms, and find very weak links between the two. Our paper has a different, but complementary focus: we are interested in how the elimination of product restrictions that favored small establishments—a change which occurred after the major trade reforms—affected employment growth.

The literature on the linkages between firm size and employment growth in developed countries has also evolved, with early researchers finding that small firms grow more quickly and more recent research suggesting that the driver of growth is youth, not size (see, among others, Evans, 1987a, 1987b; Hall, 1987; and Sutton, 1997). More recently, Neumark, Wall, and Zhang (2011) have also found evidence that small businesses create more jobs. However, they find that the negative relationship between establishment size and job creation is sensitive to whether firm size is measured using base period size or average size of the enterprise. In particular, because of the possibility of mean reversion, estimates using average firm size show smaller but still significantly higher job creation rates for smaller firms.

Recent work by Haltiwanger, Jarmin and Miranda (2013) argues that these earlier papers on U.S. firms are flawed due to measurement issues and omitted variable bias. They argue that smaller firms are associated with higher employment growth primarily because of their youth, and they present evidence

showing that the higher employment growth of smaller enterprises disappears once they control for age. Haltiwanger et al. conclude that public policy should promote young enterprises rather than small enterprises. For U.S. data, the evidence suggests both that younger firms grow faster than older firms, and that larger firms grow faster than smaller firms after conditioning on age.

In the last part of the paper, we use the subset of establishments that were never exposed to SSI policies to directly measure the links between establishment size and employment growth. This last part of the paper allows us link our SSI results with the earlier literature focusing directly on which types of establishments grow faster. Measuring establishment size using an average of two periods, we find that large establishments grow more quickly than small establishments, and young establishments grow more quickly than old establishments. Further, we document that larger, younger establishments have higher labor productivity. The elimination of the SSI policies encouraged younger, larger establishments that are more productive and tend to grow quickly, thereby resulting in higher employment growth, productivity increases, and higher wages in India. Taken together, our results point to the failure of using India's small scale policies to promote aggregate employment growth.

Our findings are also consistent with the heterogeneous firms literature (Melitz, 2003). In this context, the de-reservation policy may be seen as lowering the fixed entry cost that establishments must pay in order to join a particular product market. The resulting increase in competition in the product market raises the productivity level required for survival, as average productivity and wages rise. The smallest establishments are forced to exit the product space, and larger establishments increase their market shares. Alternatively, we can view the reservations policy as affecting the optimal behavior of multi-product establishments. Larger establishments that may have found it optimal to produce reserved products may not have been able to do so when the reservations policy was in place, and thus may have switched to a more optimal allocation after the reforms. In addition, by raising competition, de-reservation may have pushed establishments to specialize in products in their "core competencies" (Eckel and Neary, 2010).

Our findings contribute to the literature on establishment growth in two important ways. First, we document, for the first time, the relationships between establishment size, age, and growth among a substantial portion of the manufacturing sector in India. Second, we provide the first systematic examination of whether policies that promote small and medium enterprises through product reservation are an effective tool for employment promotion. Our results suggest that in India, employment growth has been highest for younger and larger enterprises, and that reserving specific products for small and medium enterprises was not an effective approach to maximizing employment or wage growth. The dismantling of small-scale reservations was accompanied by net employment and wage gains for districts that initially had a larger share of previously reserved products.

The remainder of the paper is organized as follows. Section 2 explains the rationale behind SSI reservation in India, describes the trends in reservation and de-reservation, and reviews the data sets used in estimation. Section 3 identifies the impact of SSI reservation policies on employment, investment, output, and wages over the 2000 through 2007 period. Section 4 documents the relationship between size, age and employment growth, and Section 5 concludes.

2. Small-scale Reservation Policies in India

India has historically supported its small scale sector. According to Mohan (2002), one major reason was the government's belief that employment generation is critical in a labor surplus economy. Many believed that SSIs, particularly labor-intensive manufacturing enterprises, would be able to absorb surplus labor. One important pillar of the policy of SSI promotion was the reservation policy, initiated in 1967. Under this policy, which applies exclusively to manufacturing, certain products were reserved for production by SSIs. Initially, only 47 items were reserved (see Figure 1), but by 1996 that number had grown to more than 1,000 products. Mohan points out that the only selection criterion mentioned in official documents was the ability of SSIs to manufacture such items. He also notes – as does an official

report of an expert committee on small enterprises, of which he was a member – that the choice of products was "arbitrary" (Hussain, 1997; Mohan, 2002).

SSIs were originally defined as "industrial undertakings" with up to Rs. 500,000 in fixed assets and fewer than 50 employees.[3] Over time, the employment condition was dropped and the investment ceiling raised, so that by 1999, industrial undertakings with up to Rs. 10 million in plant and machinery (at historical cost) were considered SSIs.[4] Large industrial undertakings that already made the reserved products were allowed to continue manufacturing them, but their output was capped at current levels. Any further expansion or entry required a commitment to export at least 75% of output (Mohan, 2002).

Despite India's liberalization of a variety of industrial and trade policies in 1991, the reservation of products for SSIs remained in force until the late 1990s. However, the Advisory Committee on Reservation recognized growing concerns about SSI policies that followed the 1991 trade liberalization. SSIs had to compete with imported goods, and large undertakings (which had been grandfathered in) might be able to exercise monopoly power in the market for reserved goods as most other producers would be small. Moreover, growing consumer demand for high-quality goods, and ongoing technological progress, made it more difficult to produce many items in small undertakings. The Advisory Committee therefore appointed a special committee to reconsider the list of reserved items in 1995 (Office of Development Commissioner, Ministry of Micro, Small, & Medium Enterprises, Government of India, 2007). Based on recommendations from this committee, most of the 1,000 products were de-reserved starting in 1997 (Figure 1). While there were a few items removed from the list in earlier years, large-scale de-reservation started in 1997 (15 products) and picked up in 2002 (51 products). From 2003 to

3 An "industrial undertaking" may include more than one establishment. As we discuss below, almost all observations in our data include only one establishment, and we conduct our analysis at the establishment level; however, when we consider the capital size threshold we use capital across all reported establishments.

4 The investment ceiling was raised from Rs. 6.5 million to Rs. 30 million in 1997, but was subsequently reduced to Rs. 10 million in 1999. Banerjee and Duflo (2012) use these changes to examine the impact of directed credit on firm performance.

2008, approximately 100 to 250 products were de-reserved each year, with only 20 products remaining reserved at the end of that period.

We mapped the list of SSI products to a panel of manufacturing establishments from the Annual Survey of Industries (ASI) from 2000-01 to 2007-08.[5] The ASI provides a representative sample of all registered manufacturing establishments in India, with large establishments covered every year, and smaller establishments covered on a sampling basis. While previously the ASI did not release identifiers that would allow researchers to follow the same unit across years, the Central Statistical Office recently reversed this policy and released a panel going back to 1998. However, due to incomplete product coverage in 1998 and 1999 we are forced to begin our analysis in 2000. We drop 1998 and 1999 because without detailed product coverage we cannot identify which establishments were affected by SSI reservations and which were not.

The basic unit of observation in the ASI is an establishment (called a factory in the ASI data). The ASI allows owners who have more than one establishment in the same state and industry to provide a joint return, but very few (less than 5% of our sample) do so. In discussing the literature on firm size and growth, we occasionally refer to "firms" but our analysis is conducted at the level of the establishment. Establishments report products in the ASI survey using ASI Commodity Classification, or ASICC, codes. We created a concordance between the SSI product codes—which indicate which products were reserved for small and medium enterprises—and the ASICC codes. We describe our procedure in Appendix A.

Table 1 provides further details on the establishments in the ASI. Our dataset contains approximately 30,000 establishments in any given year, 25% of which made at least one reserved product in 2000. Table 1 documents that SSI reservation policies were pervasive at the beginning of the sample period and

5 The ASI uses the accounting year, which runs from 1 April to 31 March. We refer to each accounting year based on the start of the period; for example, the year we call "2000" runs from 1 April 2000 to 31 March 2001. Note that the product de-reservation in 2008 took place at the tail end of the 2007-08 accounting year; therefore we do not count these products as being de-reserved during 2007-08.

affected one out of four establishments in our sample. By 2007, however, only 10% of establishments were making reserved products. Establishments making de-reserved products are, on average, younger than establishments making reserved products. Figure 2 also shows that as of 2007, establishments making de-reserved products were more likely to be younger and larger, compared to establishments making reserved products.

Our other key variables are output, investment (capital), and wages. Throughout the paper, output and capital are defined in real terms, where output is deflated by the wholesale price index (WPI) for the appropriate product category, and capital is deflated by the WPI for plant and machinery. Wages are measured by dividing the total annual wage bill, deflated by the consumer price index, by the number of employees. We also measure labor productivity as real output divided by the number of employees.

3. Removal of Small-scale Reservation Policies

In this section, we use the rapid and complete dismantling of the SSI reservation policy documented in Figure 1 to measure its impact on establishments of different sizes and ages. While we are particularly interested in the impact on employment, we also report consequences for investment, output, wages, and labor productivity. Legally, small-scale reservation policies applied primarily to establishments with a historical cost of plant and machinery below Rs. 10 million during our sample years. Consequently we would expect a heterogeneous response to the removal of reservation policies across establishments depending on whether or not they were constrained by the Rs. 10 million ceiling.

Our level of analysis is either at the establishment or the district level. The reason why we do not present our results at the industry level is that reservation policies were implemented at the sub-industry level. Within any single industry, only a handful of products were typically reserved. At the establishment level we know exactly which products were reserved, so we are able to identify the coverage of the reservation policies much more accurately. In addition, the timing of deservation at the

industry level is problematic because most industries have multiple de-reserved products, many of which have different dates of de-reservation.

Later in the paper we also present the results at the district level, which allows us to aggregate results on the net impact of dereservation across entrants and incumbents in the product space as well as across different industries. The identification strategy at the district level is different than at the establishment level, so we present these two sets of results separately.

3.1 Establishment-Level Effects of De-reservation

For the establishment-level analysis, treatment is defined as the elimination of small-scale reservation on the establishment's first-observed primary reserved or de-reserved product. We start with a difference-in-differences (DID) equation of the following form for establishment *i* in year *t*:

$$y_{it} = \alpha_i + \alpha_t + \beta Deres_{it} + \omega_{it} \qquad (1)$$

The dependent variable y_{it} is alternatively defined as the (log of) employment, output, capital, the average per-employee wage, or labor productivity (output/employee) of establishment *i* at time *t.* $Deres_{it}$ is a dummy variable that is equal to 1 if the establishment's main reserved product has been de-reserved. Where possible, we include all establishments – even those that do not help to identify β because they are not affected by the reservation policy – because these establishments help to identify the secular year trends in establishment performance.

Because we are controlling for both year (α_t) and establishment (α_i) fixed effects, β is identified from a combination of (1) products becoming de-reserved and (2) establishments switching into or out of making (de)reserved products. To distinguish between these channels, we interact the de-reservation dummy with indicators identifying incumbents and entrants into the product market. We create a dummy variable *Incumbent* that equals 1 if a establishment ever made a de-reserved product before it was de-reserved. Similarly, we create a dummy variable *Entrant* that equals 1 if a establishment ever made a de-

reserved product *after* it was de-reserved, but not before. Note that our establishment fixed effects absorb the direct impacts of being an incumbent or entrant, so we include only the interactions with our *Deres* variable:

$$y_{it} = \gamma Deres_{it} * Incumbent_i + \rho Deres_{it} * Entrant_i + \alpha_t + \alpha_t * Incumbent_i + \alpha_i + \varepsilon_{it} \quad (2)$$

In all of our establishment-level regressions, we recognize that incumbents previously engaged in making reserved products may have secular trends that differ from non-incumbents, and therefore we also include an interaction between the year and incumbent dummies.

While we do not control for other confounding policy changes, other major reforms with heterogeneous effects across manufacturing products were limited during this time period. By 1998, 93% of industries were no longer subject to licensing requirements. Major changes in policies vis-à-vis foreign investment occurred in the early 1990s, and then stalled during the period of SSI reform. Nataraj (2011) shows that tariffs were largely harmonized across industries by the late 1990s, so even though there were some reductions during the 2000s the variation in tariff rates across product types had fallen dramatically by the start of the sample period.

Our establishment-level results from estimating equations (1) and (2) are reported in Table 2. The point estimates in panel (a) of Table 2 indicate that when we do not distinguish between incumbents and entrants, de-reservation across the entire sample of establishments had no statistically significant impact on employment or capital. However, removal of small-scale reservation was associated with a significant increase in output, labor productivity, and the average, per-employee wage. The coefficients on output, labor productivity and wage indicate that on average across all establishments, the removal of small-scale

reservation was associated with a 5.2% increase in output, a 2.9% increase in labor productivity, and a 2.1% increase in the average (real) wage. [6]

These averages mask considerable heterogeneity among incumbents and entrants. Panel (b) of Table 2 shows that for entrants into a previously reserved product space, employment, output, capital investment, wages, and labor productivity increased significantly. Employment increased on average by 8%, output by nearly 25%, and capital investment by 10 percent. Average real wages increased by approximately 6.5%. In keeping with the relatively large increase in output relative to employment, labor productivity also increased by over 17%.

For incumbents that previously produced reserved products and remained in the sample, the coefficients on all outcome variables are small in magnitude and, with the exception of the wage results, statistically indistinguishable from zero. The coefficient on wage is marginally significant and suggests that de-reservation is associated with a 1% increase in average wage among incumbents. These findings suggest that with de-reservation, the average incumbent stagnated, while the average entrant grew. In the following section, we examine the extent to which these effects varied by establishment size and age, and thus affected the relationships among size, age, and growth.

3.2 Effects of De-reservation by Establishment Size and Age

In this section we explore whether the impacts of de-reservation differed by establishment size along two dimensions. The first is based on the historical value of fixed assets, which was used as a threshold to determine eligibility for the manufacture of reserved products; the second is employment size.

6 Changes are estimated as [exp(b)-1] for each coefficient b.

Reserved products could typically be produced only by "industrial undertakings" with historical values of plant and machinery below a certain value.[7] However, undertakings with historical capital investment above the threshold could produce reserved products if they committed to exporting a certain share (usually 75%) of production. Moreover, large incumbent undertakings (those that were already producing the product before it was reserved, or small incumbent undertakings that grew above the threshold) could obtain a "Carry On Business" license to continue production. However, these undertakings were constrained to produce no more than they had previously produced.

Table 3 shows how the effect of de-reservation varied for establishments that reported average book values of plant and machinery above versus below the Rs. 10 million threshold prior to de-reservation. In this table, we limit the sample to establishments for which we observe plant and machinery in at least one year prior to de-reservation.[8] In panel (a), we find that de-reservation reduced employment among establishments that were previously below the threshold. However, the reforms increased employment, output, capital, wages, and labor productivity among constrained establishments, defined as those that had exceeded the 10 million Rs. threshold.

In panel (b), we split the results by incumbents versus entrants. As expected, incumbents with pre-de-reservation levels of plant and machinery within the SSI cap reduced employment, output, and capital stock, with a concurrent decline in labor productivity. In contrast, the largest increases in employment and capital are found among new entrants that would have been actively constrained by the SSI cap. The effect on employment is statistically significant as well as economically large; the average

7 An "industrial undertaking" may include more than one establishment. Therefore when measuring plant and machinery for firms that report more than one establishment in our dataset, we use the total value across establishments. In addition, the threshold technically applies to the historical value of plant and machinery; our measure is imperfect in that it reflects the reported, book value of plant and machinery, and is therefore likely to understate historical value.

8 This restriction does not exclude entrants, because we do not require that the establishment be observed *making the reserved product* prior to de-reservation. For example, if an entrant started to make tapioca flour after it was de-reserved in 2004, and we observed that entrant's plant and machinery prior to 2004 (when it was making other products), then we include it.

previously constrained establishment exhibits an increase of nearly 13% in employment after de-reservation. Output and capital also increased by 15% and 11%, respectively. Incumbents that were presumably grandfathered, and constrained by historical output levels, also exhibited increases in employment, output, and capital stock, but to a lesser extent.

We also find a large increase in output among entrants who would have been within the threshold (and thus allowed to enter the product space) even before de-reservation. One likely reason is that the product reservations discouraged even small establishments from entering the product space, since they would have known that they could not grow beyond a certain limit. Another possibility is that there may have been monopolistic conditions created by large, grandfathered incumbents. Once reservations were lifted and de-reserved product markets became more competitive, smaller establishments entered and grew. Unlike larger incumbents and entrants, small entrants increased output by approximately 25% but capital stock only by 10%, with small and insignificant increases in employment. Thus labor productivity and wages among these small entrants also increased substantially.

We would expect that if the SSI threshold were a binding constraint prior to the reforms, the most productive incumbent establishments would have grown until they reached the threshold. Incumbent establishments just below the threshold, and those that reached the threshold and were granted "Carry on Business" licenses should benefit most from de-reservation. Figure 3 shows the effects of de-reservation across size categories for plant and machinery for incumbent establishments, with the largest effects for those near the threshold. The establishments are classified based on their average, pre- de-reservation values of plant and machinery. This figure suggests that incumbents just below the threshold were in fact constrained by the reservation policy, and increased their capital investment after de-reservation. Investment by incumbents above the threshold also increased.

To what extent do these differences by capital investment size hold if we measure size in terms of employment? To examine this issue, we interact the de-reservation variable in Equation 2 with a dummy

for each establishment size and age category. Size is measured as average employment size, as defined in Section 4 below. Figure 4, panel (a) plots the coefficients on de-reservation for each size and age class, and shows that larger establishments grew faster with de-reservation, while smaller establishments shrank. This pattern holds across all age classes.

In panels (b) and (c), we break down the effect for incumbents and entrants. For ease of interpretation, we interact de-reservation with each size category, controlling for age, and vice-versa, rather than showing results for each size and age class independently. Panel (b) shows that among both incumbents and entrants, larger (smaller) establishments grew faster (slower) with de-reservation. The relationship is strong and monotonic, and the standard errors are small. This evidence suggests that the de-reservation encouraged both large incumbents as well as large entrants. Panel (c) shows that de-reservation particularly encouraged growth among young entrants. The results for incumbents confirm the hypothesis that the oldest and smallest establishments shrank the most.

Taken together, these findings suggest that de-reservation increased the tendency of larger, younger establishments to grow relative to smaller, older establishments. The growth in employment was driven both by entrants that moved into the previously reserved product space, as well as by large incumbents that were previously constrained by the reservation ceiling.

3.3 Potential Endogeneity of De-Reservation Policy

One possible concern is that products were strategically chosen for de-reservation, suggesting potential endogeneity of the reforms. Documents from the Ministry of Micro, Small & Medium Enterprises indicate that products were de-reserved based on the recommendations of a special committee. Committee members were asked to consider a variety of factors when determining which products to de-reserve, including the labor intensity of production, the minimum economic scale of

production, the export orientation of small establishments manufacturing those items, and consumer interests.[9]

Our baseline specifications include establishment fixed effects, which control for any time-invariant, establishment-level characteristics that are correlated with de-reservation. However, the committee indicated that some products were selected for de-reservation based on recent changes in product innovation. Therefore, it is possible that the product markets for de-reserved items were changing in a systematically different way than the markets for non-de-reserved items. We might also be concerned that our differential results for entrants and incumbents are driven not by entrants growing due to de-reservation, but because the de-reservation policy simply attracted entrants that were already growing quickly. In this section we perform a number of exercises to investigate whether these issues affect our analysis.

Pre-De-reservation Trends in Outcomes. We plotted average, pre-de-reservation trends in employment and other outcome measures. Results for employment are provided in Appendix B. We find no evidence that pre-de-reservation trends in the outcomes differed systematically by year of de-reservation. Entrant and incumbent levels and growth are also similar prior to de-reservation, although incumbents exhibit a longer right tail of employment and a longer left tail of employment growth.

Optimal Establishment Size. Appendix B also explores the possibility that industries that were particularly constrained by the SSI regulations – because they had higher optimal establishment sizes – were selected for de-reservation earlier. We calculated the average, unconstrained establishment size for

9 The special committee produced a report identifying products for de-reservation. This report indicated a number of reasons for selecting the first set of products recommended for de-reservation, namely: feasibility of producing quality products given the threshold on investment; need for higher investment due to product innovation; safety and hygiene issues associated with certain products; export potential; resource utilization; and the creation of a "monopoly like situation" in certain product markets due to the Carry On Business licenses granted to large establishments (Office of Development Commissioner, Ministry of Micro, Small, & Medium Enterprises, Government of India, 2007).

each industry, using establishments that never produced a reserved product. Our results, shown in Appendix B, do not suggest a systematic relationship between industry size and year of de-reservation. Appendix B also confirms that our baseline results are robust to including industry fixed effects, which should absorb any time-invariant industry characteristics including optimal establishment size.

Placebo Tests. We performed two placebo tests. First, we assigned each product that was never de-reserved a false year of de-reservation, based on the de-reservation years of similar products. For example, we assigned wooden furniture and fixtures, which were never de-reserved, a false de-reservation year of 2007, because wooden storage cupboards and storage shelves were de-reserved in that year. We then included both the true and the false de-reservation in the baseline specifications in Table 4. Panel (a) shows the aggregate results, while panel (b) shows the interaction with incumbents and entrants. We classified all establishments making false de-reserved products as incumbents, since they began making the products before the products were really de-reserved. Therefore in panel (b) we include an interaction with *Incumbent* but not *Entrant*. In both panels, the results of true de-reservation remain robust, while there is no evidence of a false de-reservation effect.

Table 5 shows the results of a second placebo test, in which we assign false de-reservation two years before the true de-reservation. Again, the true de-reservation effects remain robust, while the false de-reservation effects are small in magnitude and are not significant. Panel (b) also helps to confirm that entrants and incumbents did not exhibit pre-existing trends in the outcomes prior to the de-reservation.

Long Differences. Another way to mitigate concerns about the exact timing of de-reservation is to consider long differences. By the end of our sample period, almost all product reservations had been removed. Using long differences consequently addresses selection in timing during the reforms. We regress the change in the dependent variable for a given number of lags (ranging from 1 year to 5 years) on the change in reservation status. We do not include establishment fixed effects in this case. The use of long differences also reduces potential noise in year-to-year changes in establishment characteristics.

Table 6 presents results for employment and wages, and results for the other outcomes are in Appendix B. The effect of de-reservation on all outcomes remains robust, and magnitudes actually increase in size over time.[10] Employment growth, wage growth and other outcomes become stronger.

Product Switching. A related concern is that the positive coefficients on entrants may reflect the fact that establishments moving into these products are a selected sample. Entrants focusing on core competencies may have been expected to grow even in the absence of the de-reservation. To investigate this possibility, we include a dummy variable that equals one when an establishment changes its main product, regardless of whether the product is reserved, is de-reserved, or was never reserved. Appendix B shows that establishments that switch do, in fact, appear to grow, suggesting selection into switching. Nonetheless, the effects of the de-reservation remain robust in magnitude and significance.

3.4 Net Impact of SSI Reservation Policies on District Outcomes

Finally, we examine the effects of the de-reservation policy at the district level using the pre-treatment allocation of reserved and non-reserved products. Our measure of exposure to de-reservation is similar to that used by Topalova (2010) to study the impact of tariff liberalization on Indian districts. It exploits the fact that the de-reservation policy was implemented at a national level and varied across products, but calculates each district's exposure based on beginning-of-period product mix. Therefore, it avoids any changes in a district's product mix that may have been induced by the de-reservation policy. At the same time, it uses geographic variation in exposure to de-reservation, which is less likely to have influenced the special committee's decisions than product-level characteristics. Figure 5, panel (a) shows

10 One limitation of the long-difference results is that as they are skewed towards larger establishments, since these establishments survive for longer periods of time. This concern is not an issue for the district-level analysis below, since we use all observed establishments in any given year, and limit our sample to a balanced panel of districts. In unreported results available from the authors we calculated the mean and median employment levels among establishments in each of the long difference regressions. We find that the average employment size of establishments in the lagged regressions is substantially larger than the average employment size of establishments in the baseline regressions. However, there are only small differences in size as we increase the lag length. Therefore, the observed increase in effects with longer lags is likely due to the increasing effect of the policy over time, rather than a selection effect.

the fraction of employment in each district that was associated with reserved products in 2000. Panel (b) shows the extent to which products were subsequently de-reserved by 2007, weighting each de-reserved product by its labor share in 2000.

For each of the 354 districts in India that have at least 10 establishments reported in the ASI for each year in our sample, we construct a measure of exposure to de-reservation as follows:

$$FrDeres_{dt} = \frac{\sum_p (Employment2000_{dp} XDeres_{pt})}{TotalEmployment2000_d}$$

$FrDeres_{dt}$, the fraction of employment exposed to de-reservation, is calculated as the sum over all products p of employment associated with that product in district d in 2000, multiplied by a dummy variable indicating whether the product was de-reserved, and divided by total district-level employment in 2000. We allocate each establishment's employment to its various products based on output shares.

We estimate the following long-difference DID model at the district level:

$$\Delta y_d = \beta \Delta FrDeres_d + \mu_d \qquad (3)$$

The left hand side variable, Δy_d is alternatively the change in log of employment, output, capital, wages, or labor productivity between 2000 and 2007. The right hand side variable is the change in the fraction of employment exposed to de-reservation between 2000 and 2007, where the fraction is calculated as described above. We calculate these variables at the district level by aggregating the establishment-level variables, inflated by their sampling weights.

Table 7 panel (a) shows the district-level DID results. The point estimates show a positive relationship between de-reservation and employment, output, capital and wages, and a negative relationship between de-reservation and labor productivity, although the results are only statistically significant (at the 5% level) for employment. In the data, the average change in the fraction of de-reserved

employment was 0.095. Thus, the point estimate from panel (a), at 0.719, suggests a 7% increase in district-level employment.

One potential concern is that the de-reservation may have resulted in inter-district migration, thus affecting district-level results. To address this issue, Panel (b) controls for the average change in de-reservation among *neighboring* districts. The coefficient on the effect of own-district de-reservation on employment becomes larger (0.846) and is significant at the 1% level; the coefficient on neighboring-district de-reservation, while not statistically significant, is negative (-0.405). These results are consistent with the migration of workers towards neighboring districts that experienced higher levels of de-reservation.

Panel (c) confirms that the effect of de-reservation on district-level employment is positive and statistically significant when using lags ranging from 1 to 5 years. In keeping with the establishment-level results in Table 6, which showed an increase in the impact of de-reservation over time, the magnitude of the coefficient on employment increases over time. In panel (d) of Table 7 and in Appendix B, we also see that output and wages are positively affected.

These results suggest that the removal of SSI reservations increased formal sector employment, which is captured by the ASI. At the same time, it is possible that the SSI policy reforms affected unorganized, or informal, manufacturing as well. One possibility is that the reforms drove formal sector workers into informal sector jobs, which typically pay lower wages and provide fewer benefits. While panel data do not exist for the unorganized sector, we used two rounds of the National Sample Survey Organisation's Unorganized Manufacturing Enterprises Survey – from 2000 and 2005 – to conduct a district-level analysis. Panel (e) of Table 7 shows the results of regressing the change in unorganized sector employment, output, capital, and labor productivity, at the district level, on the change in the fraction of de-reserved output in the formal sector. We do not include wages as an outcome variable, as many unorganized establishments rely on unpaid household employees.

There is no statistically significant association between the fraction of de-reservation and district-level employment in unorganized manufacturing. If anything, the negative coefficient on unorganized employment in panel (e) and the positive coefficients in panels (a) through (c) suggest that de-reservation may have been associated with a shift away from the unorganized sector towards organized sector employment.

4. Establishment Size and Growth

Our primary focus in this paper is on the relationship between employment growth and establishment size. In Section 3, we used a policy change that eliminated special support for small and medium establishments to identify the implied impact of size on employment growth. Our results suggest that eliminating incentives for small establishments boosted aggregate employment growth. In this section, we adopt a more direct strategy to understanding the relationship between size, age, and growth for Indian manufacturing. We exclude all establishments that were affected by the SSI policies, either as incumbents or as entrants into the reserved product space. We then trace—using approaches adopted previously in the literature for the US—the reduced form relationship between establishment size, age, and employment growth. In addition to providing a robustness check on the previous section, we can also think of this section as casting light on the long run relationship between employment growth and establishment size and age.

4.1 Modeling the Relationship Between Size, Age and Growth

We begin with an establishment growth model based on Evans (1987a), in which the growth of a establishment between time t and time t' is a function of its employment size S, age A, and other characteristics X at time t:

$$g(t') = f(S(t), A(t), X(t)) \qquad (4)$$

We initially define growth between any two consecutive years in which we observe the establishment (t and t') as:

$$g(t') = \frac{S(t') - S(t)}{S(t)[t' - t]}$$

This is an establishment's average annual growth in employment between t and t', as a fraction of its size when we last observed it ("base-year" size) in year t. In keeping with much of the prior analysis of size and growth, we initially limit our analysis to continuing establishments; entry and exit are discussed below.

This approach to measuring the role of size in employment growth has been challenged on several grounds. There is the potential that the commonly observed negative relationship between size and growth is driven, in part, by regression to the mean. Establishments that have experienced an idiosyncratic, negative shock in year t may shed labor and thus be classified in a smaller size category. As they are unlikely to experience a similar shock in year t', they may return to their normal employment levels, thus creating a spurious, negative relationship between size and growth (Haltiwanger et al., 2013).

To address the potential for regression to the mean, we consider alternative measures of both growth and size. Following Haltiwanger et al. (2013), we construct size as the average size between t and t': $S_{avg}(t) = 0.5[S(t) + S(t')]$. We also modify the measure of growth to reflect the updated version of establishment size:

$$g_{avg}(t') = \frac{S(t') - S(t)}{\mathrm{S_{avg}(t)}[t' - t]}$$

This "average size" approach was first proposed by Davis et al. (1996), and has also been implemented by Haltiwanger et al. (2013) and Neumark et al. (2011). These recent papers and earlier

work show that using average size (with and without age controls) significantly affects the relationship between size and growth.

Another challenge in estimating the relationship between size and growth arises because of sample selection. Small establishments tend to have higher failure rates than large establishments. These higher failure rates mean that if only continuing establishments are included in estimates of the size-growth relationship, then the estimated growth rate of small establishments is likely to be biased upwards. Examining only continuing establishments also fails to account for growth due to entry, which may bias the growth rate of small establishments downwards. To overcome these challenges, we replicate Haltiwanger et al.'s measure of growth, which allows for both entry and exit.

We estimate the relationship between growth and size as follows:

$$g_{ij}(t') = \beta_0 + \beta_s s_{ij}(t) + \beta_{s2} s_{ij}(t)^2 + \beta_a a_{ij}(t) + \beta_{a2} a_{ij}(t)^2 + \beta_{sa} s_{ij}(t) a_{ij}(t) + X'_{ij} + \alpha_y + \varepsilon_{ij} \quad (5)$$

where s_{ij} is the log of employment in establishment i and industry j and a_{ij} is the log of establishment age. As controls, we include in the X_{ij} vector of establishment characteristics a dummy variable for multi-establishment firms, urban establishments, and government-owned establishments.[11] We also include year dummies a_y in order to control for secular trends in establishment growth rates. For notational clarity, we distinguish between an accounting year (y) and the time period in which we observe an establishment (t or t').

We also allow for a flexible relationship between size and growth by measuring size and age using dummy variables for various categories (1-4 employees, 5-9, 10-19, 20-49, 50-99, 100-249, 250-499,

11 We define multi-plant firms as those that report more than one establishment in their ASI return. The government ownership dummy is set equal to one if the establishment is either partially or wholly owned by any level of government.

500+ for size; 0 years, 1-2, 3-4, 5-6, 7-8, 9-10, 11-12, 13-15, and 16+ for age). We estimate fully-saturated models using a complete set of interactions between size and age, and we predict growth rates by applying the estimated model while holding size (or age) fixed in a particular category and allowing all other variables to be equal to their observed values. This strategy also guards against a potential challenge noted by Bernard et al. (2014) – that the calculated growth rates of newborn establishments might be biased upwards if they were only open for part of their first year of production, and thus only reported partial year sales. These authors document this bias for export sales; our analysis allows us to separately identify growth rates of establishments that are at least 1 year old, which should eliminate the concern that employment may also be affected by this partial-year bias.

4.2 The Relationship Between Size, Age and Growth

We present our estimates of (5) using both base-year size and average size in Table 8. In panel (a), we rely on base-year size and include only continuing establishments. Column (1) does not control for age, while column (2) adds age as a control and the interaction between size and age. Column (3) includes industry dummies and column (4) weights each observation by its sampling multiplier. The coefficient on size in all four specifications in Table 8 is significant and negative, indicating that employment growth is higher for smaller establishments.

To account for the higher-order and interaction terms, we estimate the actual effect of size and age on growth, evaluated at sample means, as follows:

$$g_s \equiv \frac{\partial g}{\partial s} = \beta_s + 2 * \beta_{s2} s + \beta_{sa} a$$

$$g_a \equiv \frac{\partial g}{\partial a} = \beta_a + 2 * \beta_{a2} a + \beta_{sa} s$$

The median size in our data set is 45 employees, while the median age is 14 years. Evaluated at the median, the net impacts of size and age continue to be negative (g_s = -0.029, g_a = -0.026) when size is defined as the number of employees in the base year. These results are consistent with the work by Evans (1987a), who finds that g_s = -0.0374, g_a = -0.0381 in a sample of U.S. firms.

In panel (b) of Table 8 we switch to using average rather than base-year size, and we include entering and exiting establishments. These two changes substantially alter our results. The coefficient on size, which was negative in panel (a), becomes positive and statistically significant in panel (b), suggesting that larger establishments exhibit higher employment growth. Comparing Columns (1) and (2) shows that the positive relationship between size and growth holds regardless of whether or not we control for age.[12] Our results are similar in column (3) where we include industry dummies and in column (4) where we weight each observation by its sampling multiplier. In all of these specifications, the coefficients on age remain negative and statistically significant, indicating that younger establishments exhibit higher employment growth. Using the estimates from Column (2), the effect of size on growth (g_s) is +0.065 and the effect of age on growth (g_a) is -0.015, when evaluated at median size and age.

Figure 6 confirms these findings while allowing a more flexible relationship between size, age, and growth. When base-year size is used, small establishments (panel (a)) grow faster. But when we use average size, large establishments grow faster. The effect is even stronger when we further allow for entry and exit. In contrast, young establishments grow faster in all cases (panel (b)). Panel (c) of Figure 6 brings together the size and age results by showing projected growth rates for each size and age class, using average size and allowing for entry and exit. The results in panel (c) confirm that growth is driven by young, large establishments.

12 We also estimated Equation (5) while using average size but not accounting for entry or exit. We found that the coefficient on size is positive but smaller than in Panel (b) of Table 8, confirming the hypothesis that failing to account for exit biases the coefficient on size downwards.

Finally, we re-estimate Equation (5) with labor productivity as the dependent variable. If large firms not only grow faster, but also exhibit higher labor productivity growth, then the result also suggests a positive link between establishment size and long run aggregate growth, and would be consistent with the higher wages paid post-reform in the first half of the paper. The results, shown in Table 9, document that larger, younger establishments are more productive than smaller, older establishments. Taken together, the results in Tables 8 and 9 and Figure 6 indicate that establishment growth in India is not fundamentally different than in the United States. Our results are similar to those of Haltiwanger et al. (2013). Once we use average size and allow for entry and exit, we also find that larger, younger establishments exhibit faster employment growth. The SSI reforms encouraged growth among a similar set of faster growing, more productive establishments.

5. Concluding Comments

In this paper, we use the elimination of a policy that promoted small and medium establishments in India to answer the following question: which kinds of establishments create more employment? For the past 60 years, India has promoted small-scale industry (SSI) by reserving production of some goods for smaller establishments. During the sample period, one in four establishments in the Annual Survey of Industries was covered by this policy.13 The stated goal of small-scale reservation was to promote employment growth and income redistribution, but some commentators have argued that the policy constrained growth. We use the elimination of the SSI reservation policy between 1998 and 2007 as an exogenous shock to understand size and employment linkages over time.

India eliminated all but a handful of product restrictions protecting small and medium establishments from competition over a short horizon between 1997 and 2007. This period was characterized by few other reforms, as most of the trade liberalization and dismantling of the License Raj had been done in

13 Since large establishments are over-represented in the sample, and the reservation policy was targeted at small establishments, it is likely that an even greater share of the overall population of formal establishments was covered by the policy.

previous decades. The elimination of small scale reservation over a short horizon allows us to measure the importance of size in employment promotion. We find that districts that were more exposed to the de-reservation policy experienced higher employment growth between 2000 and 2007. The magnitude of the effect is large: between 2000 and 2007 a district facing the average amount of de-reservation would have experienced a 7% increase in overall employment.

To explore the mechanisms through which these changes might have occurred, we examine the effects of the de-reservation policy on incumbents versus entrants. Consistent with the reservation policy's stated goal of protecting employment in small establishments, we find that the de-reservation decreased employment among smaller, older establishments. Also consistent with the claim that reservation was holding back the growth of larger establishments, we find that de-reservation led to the entry and expansion of output, employment, and investment among new entrants to the previously reserved product space. We document increased investment in plant and machinery among those establishments that were previously constrained from expanding their existing stock of fixed assets. These findings could be interpreted through the lens of the heterogeneous firms literature (Melitz, 2003); as de-reservation increases competition in a product market, large establishments increase their market shares at the expense of small establishments.

Our results in the second half of the paper provide an alternative way to trace the relationship between establishment size, age, and employment growth. Using a subset of establishments, which we follow over time and which were not affected by the reforms, we examine long run size and employment linkages. Our results show that Indian establishments have behaved in a similar fashion to U.S. establishments. If size is measured using base-year size, then small establishments grew faster. However, if size is measured using the average measure as defined by Haltiwanger et al. (2013), then larger establishments in India exhibited higher employment growth than smaller establishments. As in the United States, the importance of small-scale is eclipsed by the importance of youth. Younger, larger establishments also exhibit higher labor productivity than older, smaller establishments.

How well did the reservation policy achieve its goals? While small scale reservation may have protected employment in certain small establishments, it did so at the expense of employment elsewhere. With respect to the goal of income enhancement, our results show that eliminating reservation policies for smaller enterprises increased productivity and average wages. However, it is not clear whether this effect is due to entrants paying higher wages to existing workers, or to a shift towards a higher-skilled workforce. Taken together, the results from the first and second parts of this analysis suggest that the removal of small-scale reservations *increased* overall employment by encouraging the growth of younger, larger establishments – those that are most likely to pay higher wages, create more investment, be more productive, and generate growth in employment.

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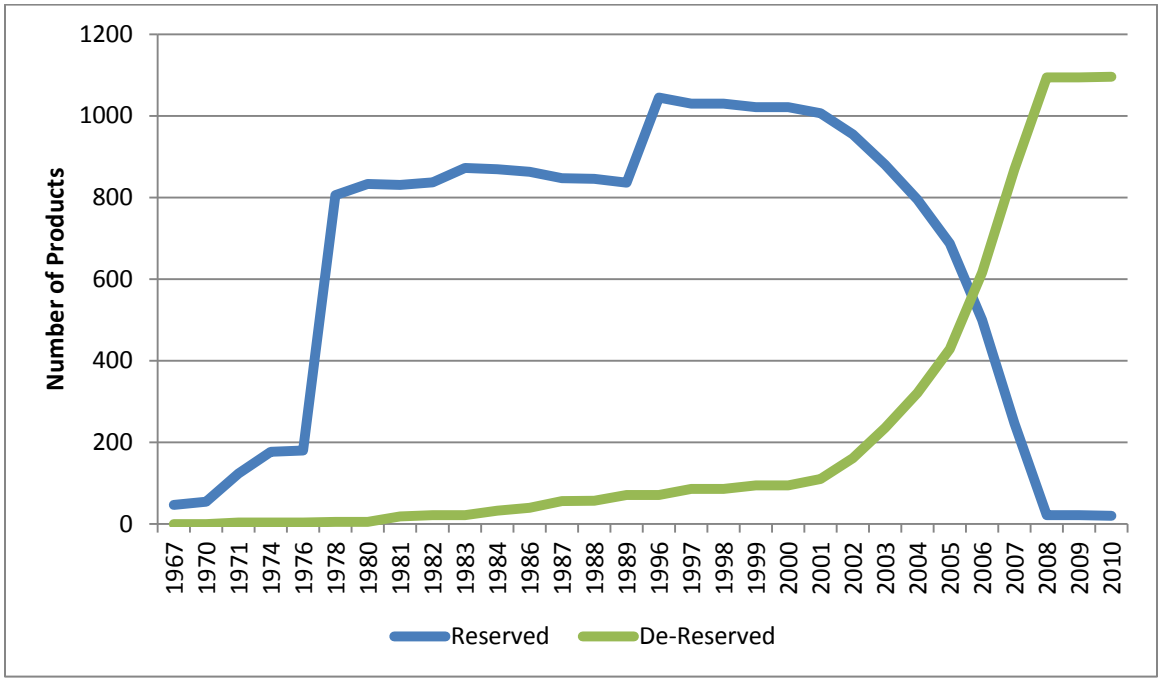
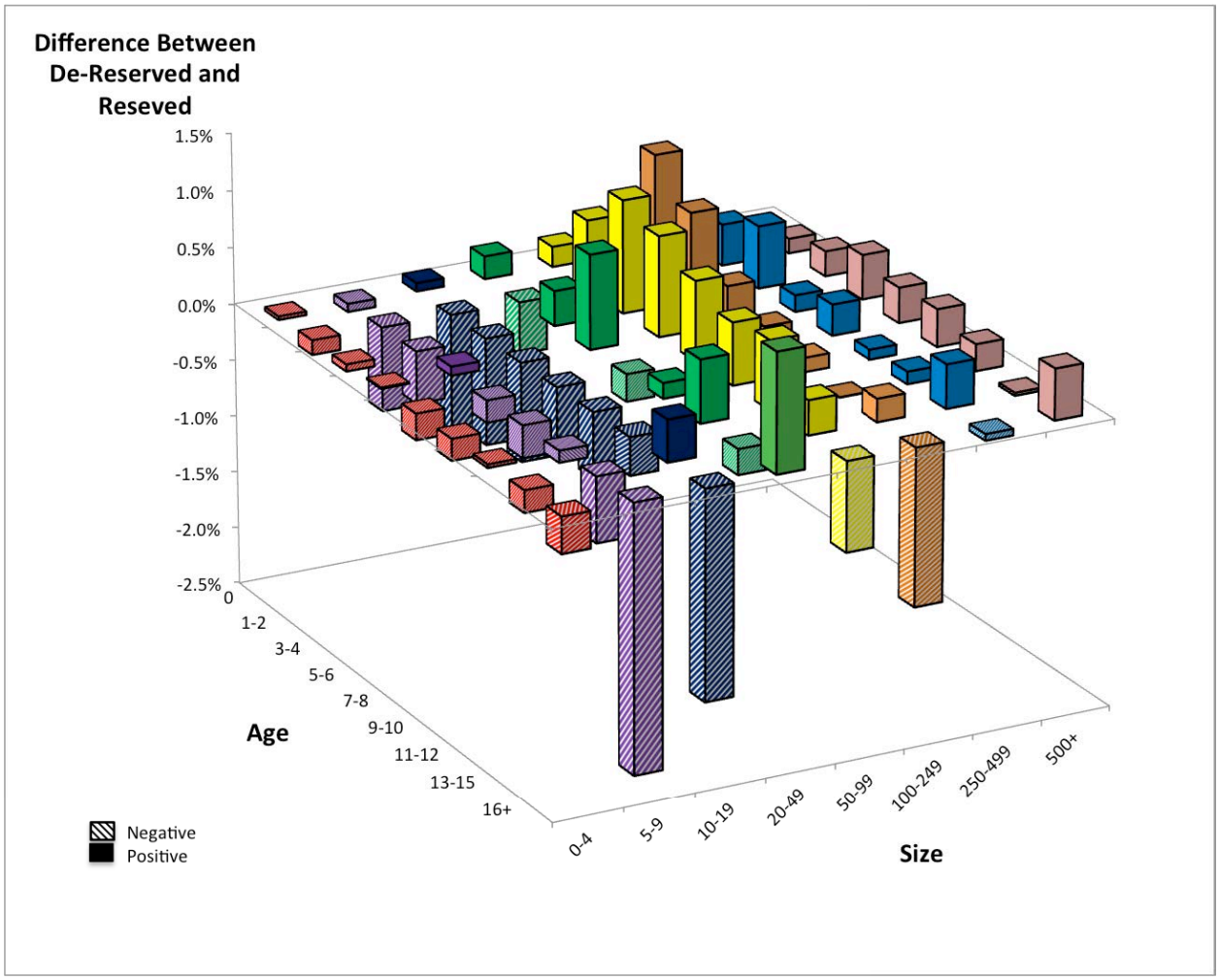
Figure 1: De-Reservation Policy



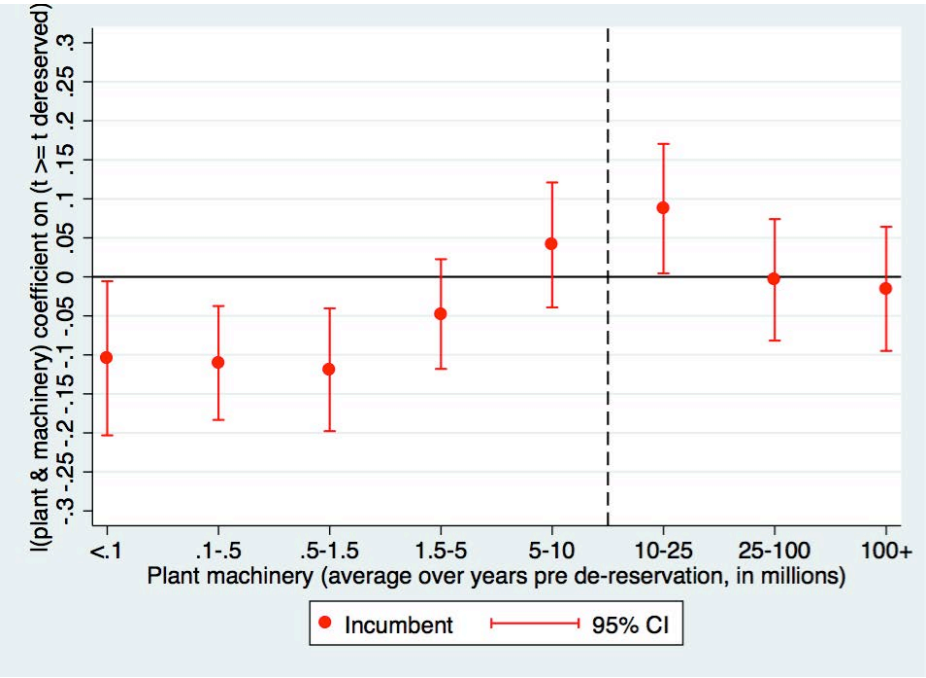
Notes: Data for 1967 through 1989 taken from Table 6.3 in Mohan (2002). Data for 1996 onwards taken from various publications of the Government of India, Ministry of Micro, Small, & Medium Enterprises.

Figure 2: Difference in Size-Age Distribution Among Establishments Making De-Reserved Versus Reserved Products



Notes: Share of establishments making de-reserved products in each size and age class in 2007, minus share of establishments making reserved products in each size and age class in 2007. Positive (negative) values indicate that establishments making de-reserved products are more (less) likely to be in a particular size and age class.

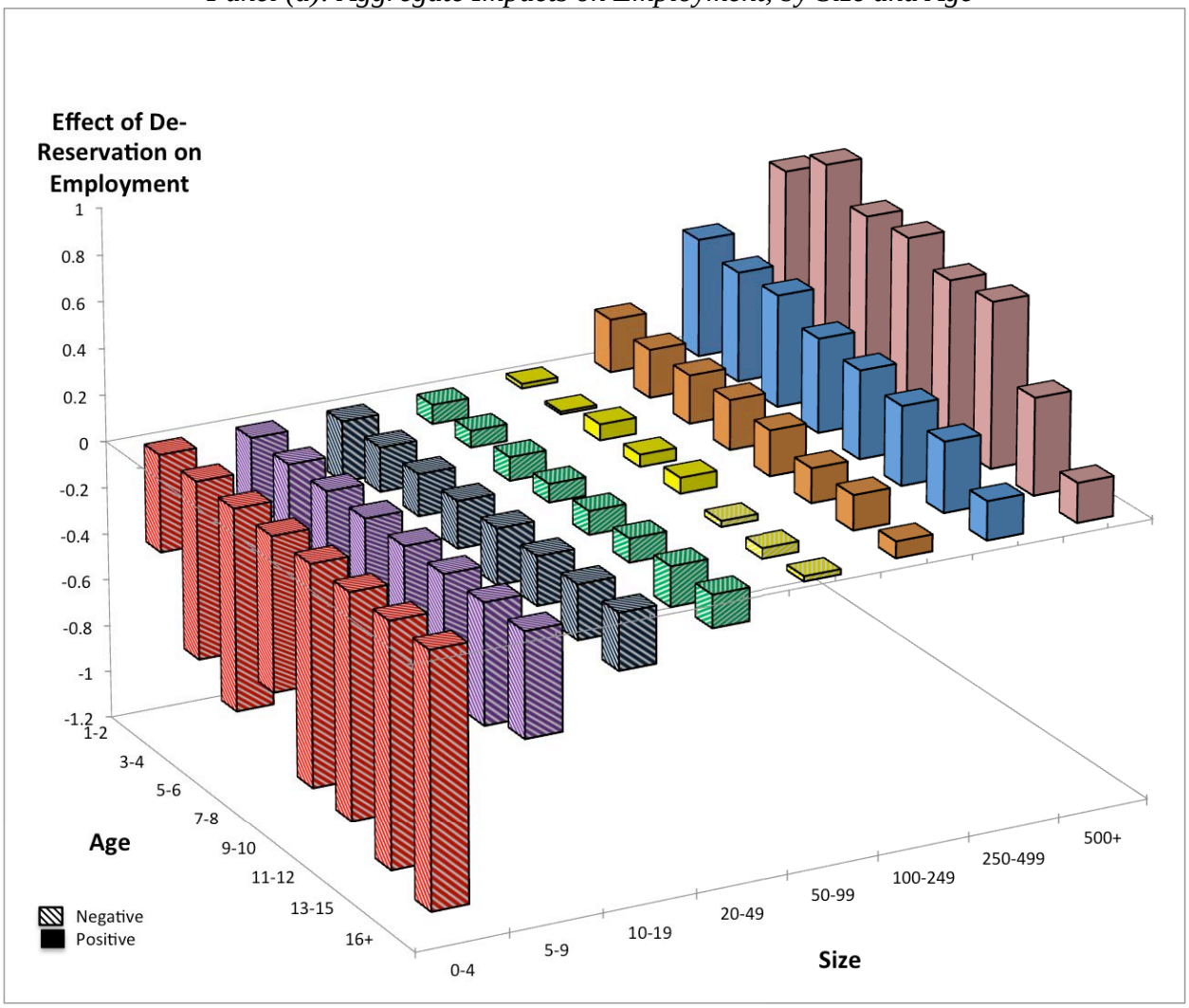
Figure 3: Impact of De-reservation Among Incumbent Establishments Near the Investment Threshold



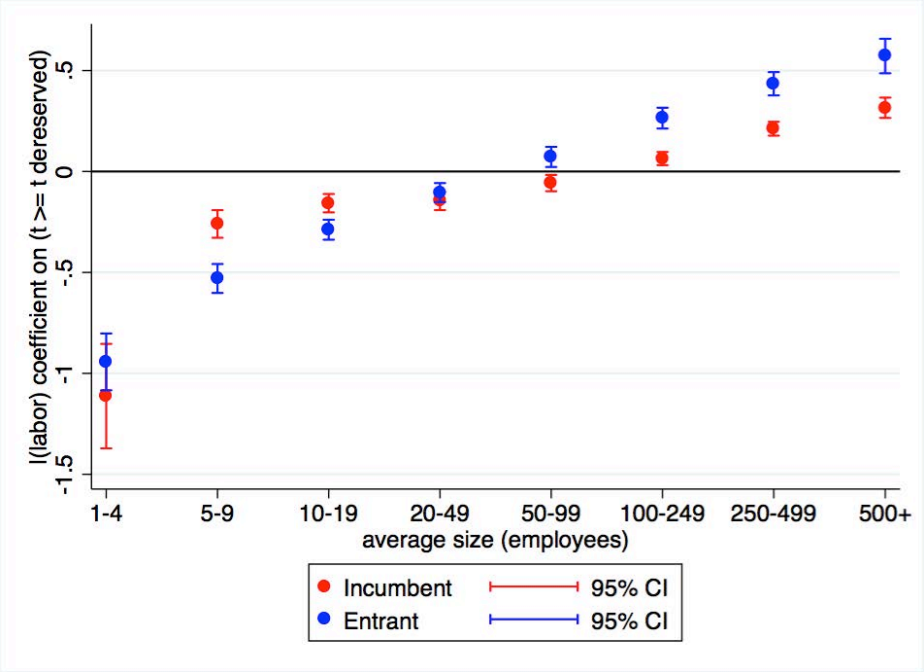
Notes: Coefficients from a regression of log of nominal plant and machinery value on de-reservation, for incumbents to the product space. The value of plant and machinery is calculated at the level of the industrial undertaking. Industrial undertakings with historical investment in plant and machinery up to Rs. 10 million (illustrated by the dashed line) could be considered small-scale industries.

Figure 4: Impact of De-reservation on Employment – By Employment Size and Age

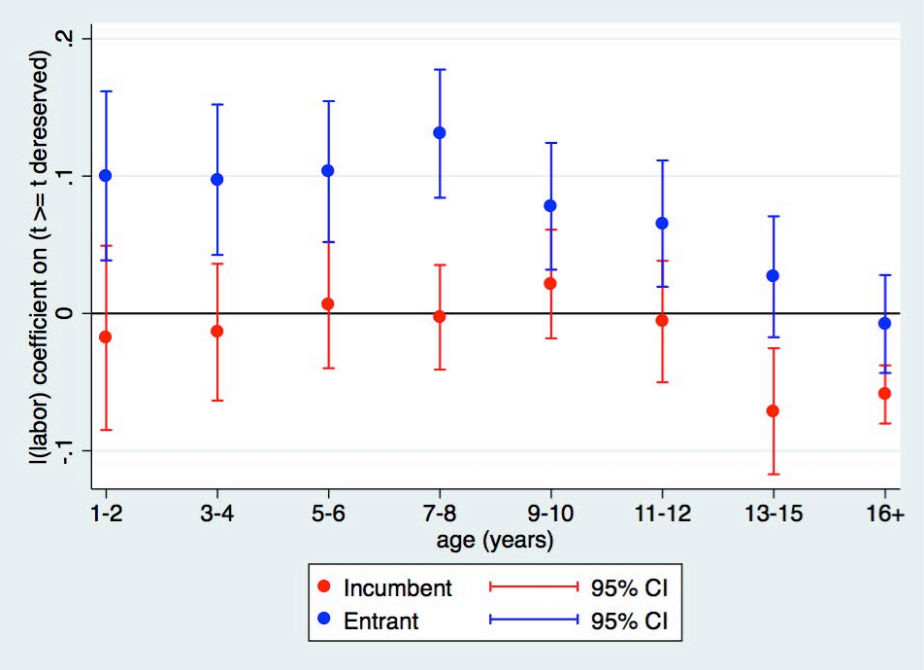
Panel (a): Aggregate Impacts on Employment, by Size and Age



Panel (b): By Average Size (Controlling for Age), Incumbents versus Entrants



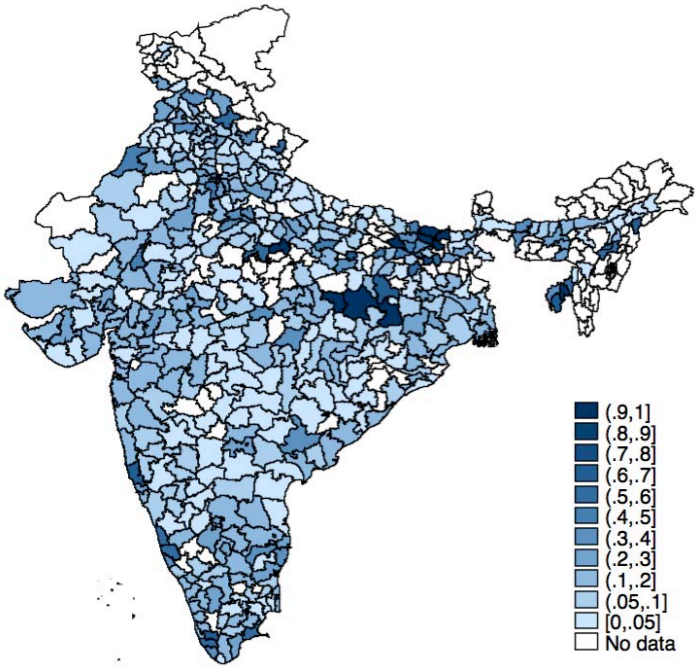
Panel (c): By Age (Controlling for Size), Incumbents versus Entrants



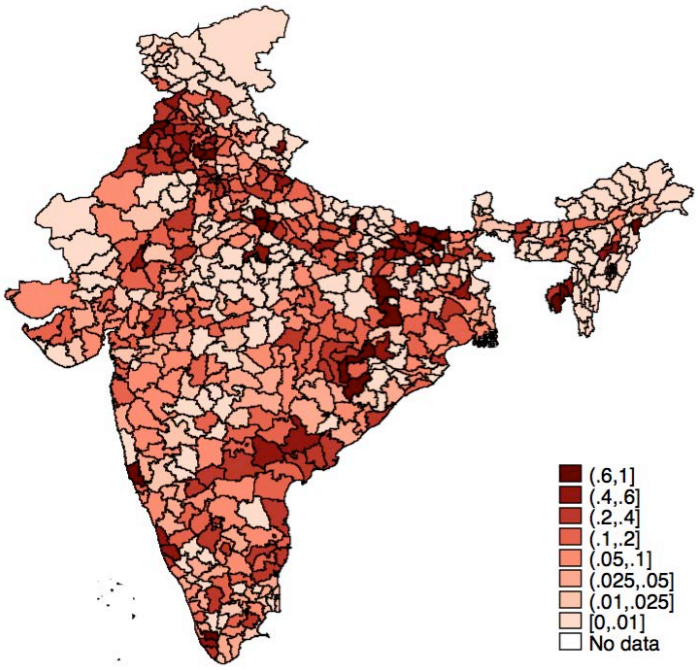
Notes: Panel (a) shows the coefficients from a regression of log of employment on de-reservation, interacted with a dummy variable for each size and age class. Panel (b) shows the coefficients from a regression of the log of employment on de-reservation, interacted with dummy variables for size and for whether the establishment is an incumbent or an entrant into the product space, controlling for age. Panel (c) shows the coefficients from a similar regression, using age rather than size interactions.

Figure 5: Product Reservation and De-reservation by District

Panel (a): Fraction of Employment in 2000 Associated with Products Ever Reserved



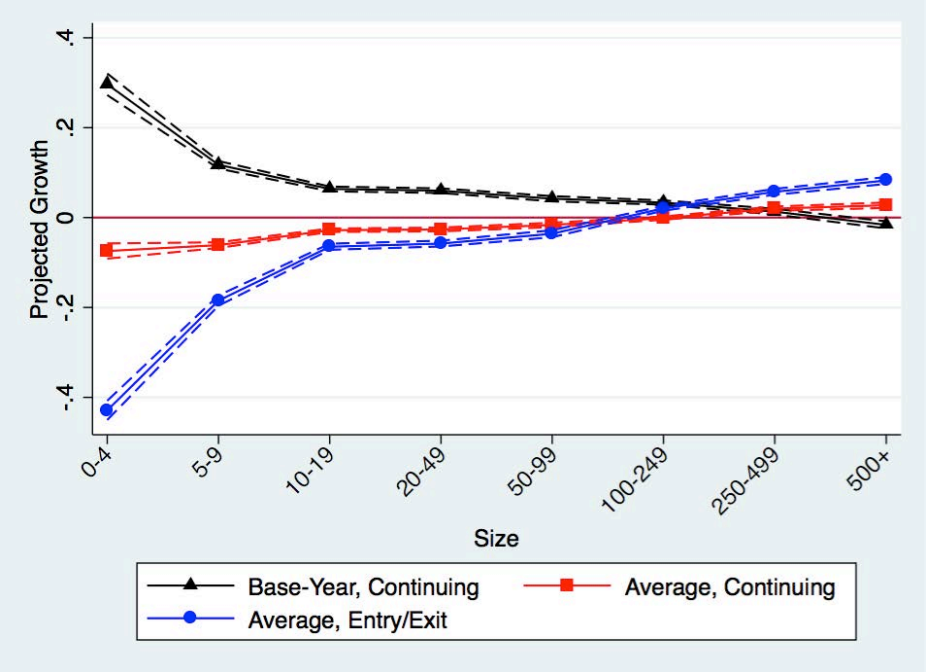
Panel (b): Fraction of Employment in 2000 Associated with Products De-reserved 1997-2007



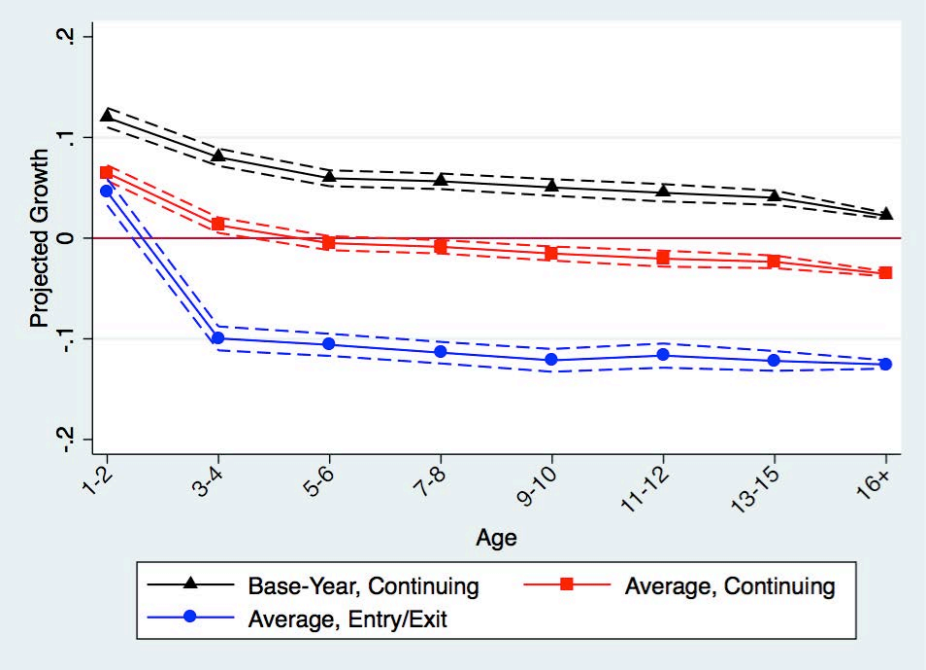
Notes: Panel (a) shows the fraction of employment in 2000 that was associated with producing a product that was ever reserved, by district. Panel (b) shows the fraction of employment in 2000 that was associated with producing a product that was eventually de-reserved, by district.

Figure 6: Establishment Size, Age, and Growth

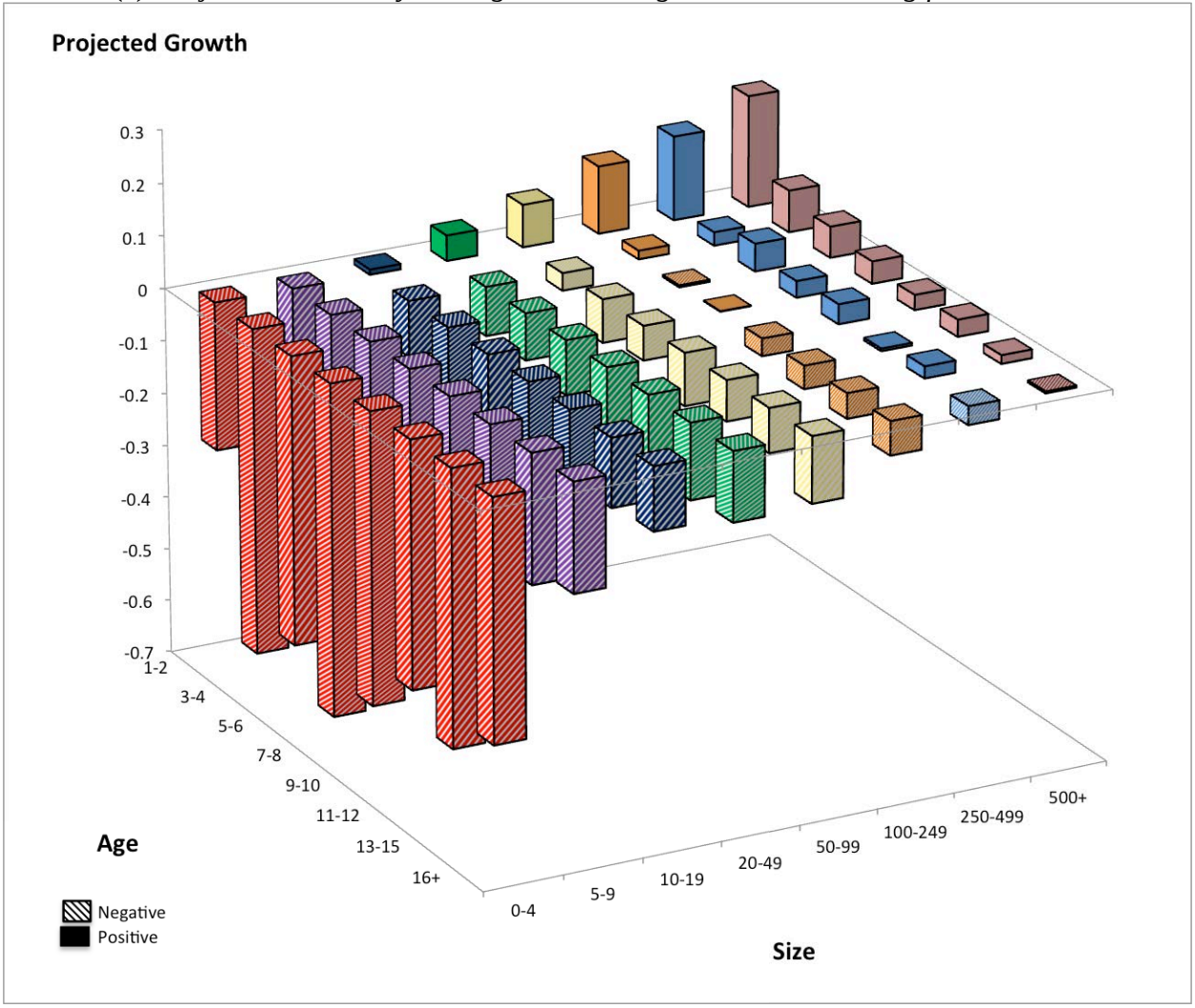
Panel (a): Projected Growth by Size, Controlling for Age



Panel (b): Projected Growth by Age, Controlling for Size



(c) Projected Growth by Average Size and Age Class, Controlling for Exit



Notes: Panels (a) and (b) show projected establishment employment growth rates by size (controlling for age) and age (controlling for size), respectively. "Base-Year, Continuing" and "Average, Continuing" indicate that only continuing establishments are included, with size and age are measured as defined in the text. "Average, Entry/Exit" indicates that average size and age are used, and entry and exit are addressed following Haltiwanger et al. (2013). Panel (c) shows projected establishment employment growth rates for each size and age class, using average size and age and controlling for exit.

Table 1: Summary Statistics for ASI Manufacturing Establishments by Participation in Reserved Product Market

	Manufacturing Reserved Product				Manufacturing De-reserved Product				Not manufacturing Ever-reserved products			
year	Labor (000s)	Age (mean)	Establishments		Labor (000s)	Age (mean)	Establishments		Labor (000s)	Age (mean)	Establishments	
2000	1,112	16.5	7,444	25%	70	17.2	1,305	4%	3,364	19.2	21,501	71%
2001	1,045	16.9	7,481	23%	232	13.9	2,332	7%	3,291	19.0	22,382	70%
2002	1,092	16.9	7,761	24%	268	14.7	2,711	8%	3,295	19.5	21,797	68%
2003	1,043	16.8	9,621	22%	465	15.7	4,019	9%	3,538	18.6	29,788	69%
2004	872	17.2	7,728	21%	539	15.8	4,375	12%	3,395	18.8	25,374	68%
2005	786	17.1	7,461	18%	734	15.6	5,516	14%	3,663	17.8	27,832	68%
2006	653	16.2	6,749	17%	854	15.2	5,971	15%	3,899	17.2	27,365	68%
2007	395	17.4	3,168	9%	1,049	15.6	7,309	21%	4,123	17.4	24,591	70%

Notes: Summary statistics for all establishments are authors' calculations based on ASI data. No sampling multipliers applied. Labor is total for each group-year, in thousands. Age represents mean value for each group-year.

Table 2: Impact of De-reservation on Establishment-Level Outcomes

Panel (a): Aggregate Results

	log(Labor)	log(Output)	log(Capital)	log(Wage)	log(Q/L)
t ≥ year de-reserved	0.008	0.051	0.015	0.021	0.029
	(0.009)	(0.013)***	(0.011)	(0.005)***	(0.011)***
Year FE	Yes	Yes	Yes	Yes	Yes
Year FE X Incumbent	Yes	Yes	Yes	Yes	Yes
Establishment FE	Yes	Yes	Yes	Yes	Yes
R^2	0.01	0.01	0.00	0.03	0.01
N	291,581	287,486	289,004	289,366	287,198

Panel (b): Incumbents versus Entrants

	log(Labor)	log(Output)	log(Capital)	log(Wage)	log(Q/L)
Incumbent X	-0.011	0.005	-0.007	0.010	-0.008
t ≥ year de-reserved	(0.010)	(0.014)	(0.012)	(0.006)*	(0.012)
Entrant X	0.078	0.221	0.098	0.064	0.164
t ≥ year de-reserved	(0.018)***	(0.032)***	(0.025)***	(0.013)***	(0.027)**
Year FE	Yes	Yes	Yes	Yes	Yes
Year FE X Incumbent	Yes	Yes	Yes	Yes	Yes
Establishment FE	Yes	Yes	Yes	Yes	Yes
R^2	0.01	0.01	0.00	0.03	0.01
N	291,581	287,486	289,004	289,366	287,198

Notes: Dependent variables are shown in column headings. "t ≥ year deserved" is a dummy variable that takes the value of 1 when the product is removed from the list of reserved products. "Incumbent" indicates that the establishment previously made the product when it had reserved status. "Entrant" indicates that the establishment only made the product after it had been de-reserved. "Q/L" indicates labor productivity (real output divided by number of employees). Errors are clustered at the establishment level. *, ** and *** represent significant at the 10%, 5% and 1% levels respectively.

Table 3: Impact of De-reservation on Establishment-Level Outcomes – By Value of Plant and Machinery

Panel (a): Aggregate impact

	log(Labor)	log(Output)	log(Capital)	log(Wage)	log(Q/L)
Within SSI cap in 2000 X	-0.040	0.002	-0.013	0.010	0.019
t ≥ year de-reserved	(0.010)***	(0.016)	(0.013)	(0.006)	(0.013)
Over SSI cap in 2000 X	0.071	0.104	0.058	0.035	0.033
t ≥ year de-reserved	(0.014)***	(0.020)***	(0.017)***	(0.008)**	(0.016)*
Year FE	Yes	Yes	Yes	Yes	Yes
Year FE X Incumbent	Yes	Yes	Yes	Yes	Yes
Establishment FE	Yes	Yes	Yes	Yes	Yes
R^2	0.02	0.03	0.00	0.05	0.02
N	260,297	256,669	261,674	258,482	256,404

Panel (b): Incumbents versus Entrants

	log(Labor)	log(Output)	log(Capital)	log(Wage)	log(Q/L)
Incumbent X Within SSI cap X	-0.057	-0.052	-0.038	-0.007	-0.028
t ≥ year de-reserved	(0.012)***	(0.017)***	(0.015)***	(0.007)	(0.014)**
Entrant X Within SSI cap X	0.023	0.225	0.091	0.079	0.216
t ≥ year de-reserved	(0.022)	(0.042)***	(0.032)***	(0.017)***	(0.037)***
Incumbent X Over SSI cap X	0.057	0.083	0.041	0.033	0.019
t ≥ year de-reserved	(0.016)***	(0.023)***	(0.019)**	(0.009)***	(0.018)
Entrant X Over SSI cap X	0.120	0.142	0.108	0.031	0.048
t ≥ year de-reserved	(0.028)***	(0.043)***	(0.037)***	(0.018)*	(0.033)
Year FE	Yes	Yes	Yes	Yes	Yes
Year FE X Incumbent	Yes	Yes	Yes	Yes	Yes
Establishment FE	Yes	Yes	Yes	Yes	Yes
R^2	0.02	0.03	0.00	0.05	0.02
N	260,297	256,669	261,674	258,482	256,404

Notes: Dependent variables are shown in column headings. "Within/over SSI cap" refers to whether an establishment's average estimated value of plant and machinery in years pre- de-reservation exceeded 10 million rupees. "Incumbent" indicates that the establishment previously made the product when it had reserved status. "Entrant" indicates that the establishment only made the product after it had been de-reserved. The label "t ≥ year deserved" is a dummy variable that takes the value of 1 when the product is removed from the list of reserved products. "Q/L" indicates labor productivity (real output divided by number of employees). Errors are clustered at the establishment level. *, ** and *** represent significant at the 10%, 5% and 1% levels respectively.

Table 4: Placebo Test, Never De-Reserved

Panel (a): Aggregate Results

	log(Labor)	log(Output)	log(Capital)	log(Wage)	log(Q/L)
t ≥ year de-reserved	0.005	0.050	0.010	0.021	0.033
	(0.009)	(0.013)***	(0.011)	(0.005)***	(0.011)***
t ≥ false year de-reserved	-0.011	-0.005	-0.024	0.001	0.019
	(0.011)	(0.017)	(0.017)	(0.007)	(0.014)
Year FE	Yes	Yes	Yes	Yes	Yes
Year FE X Incumbent	Yes	Yes	Yes	Yes	Yes
Establishment FE	Yes	Yes	Yes	Yes	Yes
R^2	0.01	0.01	0.00	0.03	0.01
N	291,581	287,486	289,004	289,366	287,198

Panel (b): Incumbents versus Entrants

	log(Labor)	log(Output)	log(Capital)	log(Wage)	log(Q/L)
Incumbent X	-0.017	-0.002	-0.016	0.008	-0.007
t ≥ year de-reserved	(0.010)*	(0.014)	(0.012)	(0.006)	(0.012)
Entrant X	0.078	0.221	0.098	0.064	0.164
t ≥ year de-reserved	(0.018)***	(0.032)***	(0.025)***	(0.013)***	(0.027)***
Incumbent X	-0.019	-0.024	-0.033	-0.004	0.005
t ≥ false year de-reserved	(0.011)*	(0.017)	(0.017)**	(0.007)	(0.014)
Year FE	Yes	Yes	Yes	Yes	Yes
Year FE X Incumbent	Yes	Yes	Yes	Yes	Yes
Establishment FE	Yes	Yes	Yes	Yes	Yes
R^2	0.01	0.01	0.00	0.03	0.01
N	291,581	287,486	289,004	289,366	287,198

Notes: Dependent variables are shown in column headings. "t ≥ year deserved" is a dummy variable that takes the value of 1 when the product is removed from the list of reserved products. "t ≥ false year deserved" is a dummy variable that takes the value of 1 after the false year of de-reservation assigned to a product that was never de-reserved. "Incumbent" indicates that the establishment previously made the product when it had reserved status. "Entrant" indicates that the establishment only made the product after it had been de-reserved. "Q/L" indicates labor productivity (real output divided by number of employees). Errors are clustered at the establishment level. *, ** and *** represent significant at the 10%, 5% and 1% levels respectively.

Table 5: Placebo Test, Prior to De-Reservation

Panel (a): Aggregate Results

	log(Labor)	log(Output)	log(Capital)	log(Wage)	log(Q/L)
t ≥ year de-reserved	0.009	0.051	0.017	0.021	0.028
	(0.009)	(0.014)***	(0.011)	(0.005)***	(0.011)**
t ≥ 2 years before deres	0.014	-0.002	0.023	-0.006	-0.012
	(0.020)	(0.038)	(0.026)	(0.015)	(0.034)
Year FE	Yes	Yes	Yes	Yes	Yes
Year FE X Incumbent	Yes	Yes	Yes	Yes	Yes
Establishment FE	Yes	Yes	Yes	Yes	Yes
R^2	0.01	0.01	0.00	0.03	0.01
N	291,581	287,486	289,004	289,366	287,198

Panel (b): Incumbents versus Entrants

	log(Labor)	log(Output)	log(Capital)	log(Wage)	log(Q/L)
Incumbent X	-0.010	0.005	-0.006	0.009	-0.009
t ≥ year de-reserved	(0.010)	(0.015)	(0.013)	(0.006)	(0.012)
Entrant X	0.080	0.229	0.103	0.067	0.171
t ≥ year de-reserved	(0.018)***	(0.033)***	(0.026)***	(0.014)***	(0.028)***
Incumbent X	0.019	-0.007	0.022	-0.011	-0.021
t ≥ 2 years before deres	(0.023)	(0.045)	(0.031)	(0.017)	(0.040)
Entrant X	0.017	0.074	0.053	0.030	0.067
t ≥ 2 years before deres	(0.035)	(0.065)	(0.050)	(0.032)	(0.060)
Year FE	Yes	Yes	Yes	Yes	Yes
Year FE X Incumbent	Yes	Yes	Yes	Yes	Yes
Establishment FE	Yes	Yes	Yes	Yes	Yes
R^2	0.01	0.01	0.00	0.03	0.01
N	291,581	287,486	289,004	289,366	287,198

Notes: Dependent variables are shown in column headings. "t ≥ year deserved" is a dummy variable that takes the value of 1 when the product is removed from the list of reserved products. "t ≥ 2 years before deres" is a dummy variable that takes the value of 1 starting 2 years before a product is removed from the list of reserved products. "Incumbent" indicates that the establishment previously made the product when it had reserved status. "Entrant" indicates that the establishment only made the product after it had been de-reserved. "Q/L" indicates labor productivity (real output divided by number of employees). Errors are clustered at the establishment level. *, ** and *** represent significant at the 10%, 5% and 1% levels respectively.

Table 6: Impact of De-reservation on Establishment-Level Outcomes – Long Differences

Panel (a): Labor, Aggregate Impact

	1 lag	2 lags	3 lags	4 lags	5 lags
t ≥ year de-reserved	0.009	0.002	0.028	0.013	0.026
	(0.007)	(0.009)	(0.010)***	(0.012)	(0.014)*
R^2	0.00	0.00	0.00	0.00	0.00
N	122,175	95,516	72,529	50,996	33,871

Panel (b): Labor, Incumbents versus Entrants

	1 lag	2 lags	3 lags	4 lags	5 lags
Incumbent X	0.006	-0.007	0.022	0.005	0.014
t ≥ year de-reserved	(0.008)	(0.010)	(0.011)**	(0.013)	(0.016)
Entrant X	0.026	0.052	0.061	0.059	0.097
t ≥ year de-reserved	(0.018)	(0.019)***	(0.023)***	(0.026)**	(0.031)***
R^2	0.00	0.00	0.00	0.00	0.00
N	122,175	95,516	72,529	50,996	33,871

Panel (c): Wage, Aggregate Impact

	1 lag	2 lags	3 lags	4 lags	5 lags
t ≥ year de-reserved	-0.000	0.012	0.022	0.036	0.047
	(0.005)	(0.005)**	(0.006)***	(0.007)***	(0.008)***
R^2	0.00	0.00	0.00	0.00	0.00
N	121,892	95,203	72,255	50,798	33,738

Panel (d): Wage, Incumbents versus Entrants

	1 lag	2 lags	3 lags	4 lags	5 lags
Incumbent X	-0.006	0.004	0.016	0.029	0.040
t ≥ year de-reserved	(0.005)	(0.006)	(0.006)**	(0.008)***	(0.008)***
Entrant X	0.043	0.058	0.056	0.074	0.086
t ≥ year de-reserved	(0.015)***	(0.014)***	(0.017)***	(0.020)***	(0.022)***
R^2	0.00	0.00	0.00	0.00	0.00
N	121,892	95,203	72,255	50,798	33,738

Notes: The dependent variable is the difference between labor (Panels (a) and (b)) or wage (Panels (c) and (d)) in year t and year t-k where k is 1-5 (Columns (1)-(5), respectively). The right hand side variables are also differenced by the appropriate lag k. "Q/L" indicates labor productivity (real output divided by number of employees). Errors are clustered at the establishment level. *, ** and *** represent significant at the 10%, 5% and 1% levels respectively.

Table 7: Impact of De-reservation on District-Level Outcomes

Panel (a): Long Differences, 2000 to 2007

	Δ log(Labor)	Δ log(Output)	Δ log(Capital)	Δ log(Wage)	Δ log(Q/L)
Δ Fraction de-reserved	0.719	0.436	0.020	0.155	-0.283
	(0.281)**	(0.354)	(0.461)	(0.135)	(0.293)
R^2	0.04	0.01	0.00	0.01	0.01
N	354	354	354	354	354

Panel (b): Long Differences, 2000 to 2007, controlling for changes in neighboring districts

	Δ log(Labor)	Δ log(Output)	Δ log(Capital)	Δ log(Wage)	Δ log(Q/L)
Δ Fraction de-reserved	0.846	0.630	0.387	0.161	-0.215
	(0.301)***	(0.401)	(0.441)	(0.153)	(0.329)
Δ Fraction de-reserved	-0.405	-0.621	-1.178	-0.020	-0.216
of neighboring districts	(0.441)	(0.583)	(0.676)*	(0.189)	(0.363)
R^2	0.05	0.02	0.02	0.01	0.01
N	354	354	354	354	354

Panel (c): Labor, Variable Lags

	1 lag	2 lags	3 lags	4 lags	5 lags
Δ Fraction de-reserved	-0.015	0.006	0.224	0.378	0.570
	(0.123)	(0.124)	(0.119)*	(0.173)**	(0.255)**
R^2	0.00	0.00	0.00	0.01	0.01
N	2,478	2,124	1,770	1,416	1,062

Panel (d): Wage, Variable Lags

	1 lag	2 lags	3 lags	4 lags	5 lags
Δ Fraction de-reserved	0.181	0.097	0.035	0.146	0.172
	(0.048)***	(0.060)	(0.081)	(0.085)*	(0.127)
R^2	0.00	0.00	0.00	0.00	0.00
N	2,478	2,124	1,770	1,416	1,062

Panel (e): Long Differences, 2000 to 2005, Unorganized Manufacturing

	Δ log(Labor)	Δ log(Output)	Δ log(Capital)	Δ log(Q/L)
Δ Fraction Formal Sector Manufacturing De-reserved	-0.561	0.032	-0.069	0.593
	(0.475)	(0.992)	(0.708)	(0.767)
R^2	0.01	0.00	0.00	0.00
N	399	399	399	399

Notes: Panel (a) shows long-difference regressions of changes in dependent variables (shown in column headings) from 2000-2007 on change in fraction of district employment 2000 that was subsequently associated with product de-reservation. Panel (b) adds a control for the mean change in exposure to de-reservation among neighboring districts. Panels (c) and (d) show regressions of changes in labor and wage, respectively, at lagged intervals from 1-5 years. Regressions use all districts that, after applying weights, have at least 10 establishments in each ASI year. Panel (e) shows long-difference regressions that are analogous to Panel (a) but use unorganized sector employment from 2000-2005 (and Δ Fraction for only 2000 to 2005 on RHS). "Q/L" indicates labor productivity (real output divided by number of employees). Errors are clustered at the district level. *, ** and *** represent significant at the 10%, 5% and 1% levels respectively.

Table 8: Relationship Between Establishment Size, Age and Growth (Dependent Variable is Establishment Employment Growth)

Panel (a) Base-Year Size and Age

	(1) Baseline	(2) Baseline	(3) Industry FE	(4) Multipliers
log(Base-Year Size)	-0.072***	-0.084***	-0.092***	-0.14***
	(0.0042)	(0.0045)	(0.0046)	(0.0077)
log(Base-Year Size) Sq.	0.0053***	0.0068***	0.0074***	0.014***
	(0.00045)	(0.00046)	(0.00047)	(0.00090)
log(Base-Year Age)		-0.056***	-0.055***	-0.054***
		(0.0045)	(0.0046)	(0.0069)
log(Base-Year Age) Sq.		0.0048***	0.0045***	0.0036***
		(0.00085)	(0.00088)	(0.0012)
log(Base-Year Size) x log(Base-Year Age)		0.0011	0.0013	0.0011
		(0.00080)	(0.00081)	(0.0013)
Multiplant	-0.027***	-0.012**	-0.012**	-0.0041
	(0.0050)	(0.0050)	(0.0050)	(0.0052)
Urban	-0.029***	-0.015***	-0.017***	-0.015***
	(0.0022)	(0.0022)	(0.0024)	(0.0033)
Govt Ownership	-0.032***	-0.022***	-0.022***	-0.026***
	(0.0037)	(0.0035)	(0.0037)	(0.0066)
Observations	120153	116788	116788	116788
R^2	0.022	0.028	0.031	0.033

Panel (b) Average Size and Age, Correcting for Entry and Exit

	(1) Baseline	(2) Baseline	(3) Industry FE	(4) Multipliers
log(Average Size)	0.18***	0.20***	0.20***	0.23***
	(0.0055)	(0.0060)	(0.0060)	(0.0095)
log(Average Size) Sq.	-0.017***	-0.014***	-0.014***	-0.016***
	(0.00062)	(0.00059)	(0.00059)	(0.00094)
log(Average Age)		-0.12***	-0.12***	-0.096***
		(0.0069)	(0.0070)	(0.013)
log(Average Age) Sq.		0.026***	0.026***	0.026***
		(0.0011)	(0.0011)	(0.0019)
log(Average Size) x log(Average Age)		-0.0090***	-0.0096***	-0.015***
		(0.0012)	(0.0012)	(0.0021)
Multiplant	-0.039***	0.0042	0.015**	-0.015**
	(0.0063)	(0.0061)	(0.0061)	(0.0063)
Urban	-0.018***	0.019***	0.023***	0.034***
	(0.0035)	(0.0030)	(0.0033)	(0.0050)
Govt Ownership	-0.098***	-0.076***	-0.082***	-0.092***
	(0.0071)	(0.0064)	(0.0066)	(0.0093)
Observations	141972	138837	138837	138828
R^2	0.024	0.050	0.057	0.061

Notes: Dependent variable is establishment growth. Panel (a) shows results for base-year size and age and includes continuing establishments only, while Panel (b) shows results for average size and age, and corrects for entry and exit. "Industry FE" indicates that industry dummies are included, and "Multipliers" indicates that sampling weights are applied. Multiplant, Urban and Govt Ownership are dummy variables equal to 1, respectively, if more than one establishment was reported, if the establishment was in an urban location, or if it was wholly or partially government-owned. Errors are clustered at the establishment level. *, ** and *** represent significant at the 10%, 5% and 1% levels respectively.

Table 9: Relationship Between Establishment Size, Age and Productivity (Dependent Variable is Establishment Labor Productivity Growth)

	(1) Baseline	(2) Baseline	(3) Industry FE	(4) Multipliers
log(Average Size)	0.69***	0.55***	0.52***	0.79***
	(0.032)	(0.035)	(0.028)	(0.032)
log(Average Size) Sq.	-0.057***	-0.046***	-0.038***	-0.069***
	(0.0040)	(0.0042)	(0.0031)	(0.0036)
log(Average Age)		-0.17***	-0.20***	-0.089***
		(0.025)	(0.023)	(0.029)
log(Average Age) Sq.		-0.049***	-0.019***	-0.047***
		(0.0041)	(0.0040)	(0.0046)
log(Average Size) x log(Average Age)		0.032***	0.026***	0.015***
		(0.0052)	(0.0046)	(0.0056)
Multiplant	1.09***	1.18***	1.20***	1.14***
	(0.037)	(0.037)	(0.034)	(0.037)
Urban	0.0045	0.091***	0.019	0.17***
	(0.017)	(0.017)	(0.016)	(0.017)
Govt Ownership	-0.41***	-0.30***	-0.55***	-0.26***
	(0.054)	(0.052)	(0.044)	(0.052)
Observations	118,765	118,765	118,765	118,765
R^2	0.100	0.130	0.290	0.130

Notes: Dependent variable is log of labor productivity (total output divided by number of employees). "Industry FE" indicates that industry dummies are included, and "Multipliers" indicates that sampling weights are applied. Average size and age are used, as defined in the text, and only continuing establishments are included. Multiplant, Urban and Govt Ownership are dummy variables equal to 1, respectively, if more than one establishment was reported, if the establishment was in an urban location, or if it was wholly or partially government-owned. Errors are clustered at the establishment level. *, ** and *** represent significant at the 10%, 5% and 1% levels respectively.

Appendix A: Data Cleaning Details (FOR ONLINE APPENDIX)

Annual Survey of Industries Data

We use an establishment-level panel from the Annual Survey of Industries (ASI) covering 2000 to 2007. The ASI sampling frame covers all registered (formal) manufacturing firms. Large firms are considered part of the "Census" sector, and are surveyed every year. Smaller firms are considered part of the "Sample" sector, and are sampled every few years. The survey provides sampling weights that allow the construction of representative samples at the state-by-industry level.

We excluded services and mining establishments from our analysis, as the growth patterns in these sectors may be different from those in manufacturing. We also note that the growth measures based on "average" size are, by definition, bounded by -2 and +2. However, the growth measure based on "base-year" size is bounded below by -1, but is not bounded above. About 1% of our establishments exhibited growth rates of more than 200% (more than +2 using the "base-year" size measure), and examination of these observations suggested that many of them may have been data entry mistakes. We therefore removed any establishments that had growth rates based on "base-year" size that were among the top 1% of growth rates. We also examined the size-growth relationships including these establishments. As we would expect, we find a much larger, negative relationship between "base-year" size and growth when including these outliers, but there is little change in the results based on "average" size.

District Codes

This analysis uses the ASI panel identifiers supplied by Ministry of Statistics and Programme Implementation. The panel dataset does not include district identifiers; we merge these in from the annual cross-sections that we purchased separately.

Matching Establishment-Level Data with Product Reservation Status

During the years we study (2000-2007), product codes in the ASI were classified under the ASI Commodity Classification (ASICC). During this period, there were 4,805 ASICC product codes in manufacturing that respondents could choose from when answering the survey. Although respondents could in theory list up to 10 output products on their form, over 90% of respondents listed 4 or fewer products. For most years of the panel, 50-60% of respondents listed only one product.

We created a concordance between the ASICC product codes and the list of reserved and de-reserved products. Because some of the ASICC codes are very broad, we matched products reserved to each establishment based on both ASICC and 5-digit industry. In some cases, the match between ASICC codes and SSI codes was so exact that we were able to create the match based solely on the product descriptions. In other cases, we used the lengthy descriptions associated with the industry codes to help resolve many questionable concordances. We assumed that a product was matched to an ASICC code if it was at least a partial match.

The following tables show a subset of illustrative industries with ASICC codes and reserved products matched to those codes.

Table A.1 Sample of Exact Product Matches, Including Partial Matches

SSI product	SSI product description	ASI product	ASI product description
202501	Pickles & chutneys	13532	Chutneys
20530101	Biscuits	13401	Biscuit, cookies
271001	Sawn timber	51105 51107	Timber/wooden planks, sawn/resawn Sawn timber posts / squares
292001	Leather garments	44202	Garments, leather
30350101	Polyethylene films with thickness less than 0.10 mm except co-extruded film cross linked polymer films and high density molecular films	42405	Film, polythene
315102	Cashew shell oil	12114	Cashewnut shell liquid
31922030	Sodium nitrate-lab.	31331	Sodium nitrate
340101	Steel almirah	71501	Almirah, steel
340403	Cocks and valves--water pipe fittings	71362	Sanitary fittings, iron/steel
353134	Rice and dal mill machinery	76235	Rice mill machinery
36420101	Radio/car radio-low cost up to Rs. 250 each	78237	Radio

Table A.2 Sample of Industry-Product Matches

SSI product	SSI product description	Industry	Industry description	ASI product	ASI product description
204200	Rice milling	15312	Rice milling	12311 12312 12315 12317 15312	Rice, par-boiled Rice raw excl. basmati Rice, basmati Rice, broken Bran, rice
224302	Synthetic syrups	15542	Manufacture of synthetic flavored concentrates and syrups	13971 13977	Essence/flavour used in food products Concentrates/emulsion used in food products
260101 260102 260103 260104 260106 260199	Cotton cloth knitted Cotton vests knitted Cotton socks knitted Cotton undergarments knitted Cotton shawls knitted Other cotton knitted wears	17301	Manufacture of knitted and crocheted cotton textile products	63323 63348 63437	Knitted fabrics, cloth, cotton Hosiery knitted cloth, cotton Garments, knitted- cotton
290201	Sole leather	19112	Tanning and finishing of sole leather	43302 43304 43301	Leather, semi-tanned Leather, semi-processed Leather, tanned
27210301	Wooden crates	20231	Manufacture of wooden boxes, barrels etc. (except plywood)	51102	Wooden crates
281904	Corrugated fiber board containers	21023	Manufacture of corrugated fibre board containers	57104	Boxes, corrugated sheet
312203xx 312207xx 312210xx 312211xx	Basic dyes Azo dyes (direct) Acid dyes Reactive dyes Fast colour bases	24114	Manufacture of dyes	35115 35126 35152 35166 35199	Chrome, dye Dye, intermediates, others Dye, synthetic, others Direct dye excl. congo red Dyeing/tanning materials, n.e.c (+ 13 color-specific)
34359901 350102 350104 350105 350106 350108 35080101 343507 343510 343511	Other agricultural implements Winnowers--up to 5 h.p. motive power Seed cleaners--up to 5 h.p. motive power Grain Driers--up to 5 h.p. motive power Sheel Huskers--up to 5 h.p. motive power Cotton Deliniting machine--up to 5 h.p. motive power Harvester grader, baler & other earth moving blades used in agricultural machines Plough shears/iron ploughs Insecticide dusters--manual Insecticide sprayers--manual	29219	Manufacture of other machinery and equipment for use in agriculture, horticulture or forestry, bee-keeping and fodder preparation n.e.c.	76189	Agricultural & forestry machinery/parts, n.e.c
3768xx	(39 bicycle component products: tube valves, fork handles, pedal assemblies, chains, etc.)	35923	Manufacture of parts and accessories for bicycles, cycle - rickshaws and invalid carriages	82489 82414	Cycles-others and parts, n.e.c Parts for motor cycle/moped/ cycle, n.e.c.

Appendix B: Additional Robustness Tests (FOR ONLINE APPENDIX)

This appendix shows results from several robustness tests discussed in the main text.

Pre-De-Reservation Trends

First, we explore pre-de-reservation trends in key outcome variables. Results for employment are presented here; results for other outcome variables are similar. Panel (a) of Figure B.1 shows box plots of pre-de-reservation growth in employment for establishments making reserved products, by year of de-reservation. As a comparison, it also shows box plots of growth in employment for establishments making products that were never de-reserved, and other establishments (those that never made a reserved or de-reserved product). Sampling multipliers are used to generate a representative sample at the product level. This figure shows that there is little evidence that the timing of de-reservation is correlated with pre-de-reservation changes in employment at the product level.

Panel (b) performs a similar exercise at the establishment level. Here, we do not apply sampling weights, but rather show establishments for which we observe at least two pre-de-reservation years.[14] As with the product level results, there is no evidence of a difference in pre-de-reservation trends in growth.

We might also be concerned that our differential results for entrants and incumbents are driven not by entrants growing due to de-reservation, but because the de-reservation policy simply attracted entrants that were already growing quickly. To investigate this possibility, panels (c) and (d) show box-plots of pre-de-reservation levels and trends in establishment-level employment, for entrants and incumbents. Employment levels are similar among incumbents and entrants, although incumbents exhibit a longer right tail. In contrast, incumbents exhibit a longer *left* tail of slow-growing (or shrinking) establishments, relative to entrants, as shown in panel (d). Nonetheless, these figures suggest that entrants

14 Note that in this case, we are able to include establishments making product de-reserved in 2001, as we can observe those establishments in 1998 and 1999, although we do not have a complete list of the products they made in those years.

and incumbents are fairly similar in terms of pre-de-reservation size and growth patterns. We find similar pre-treatment patterns for output, capital, and wage, both by year of de-reservation, and for entrants versus incumbents.

Industry Characteristics

It may also be the case that industries that were the most constrained – those with the largest optimal establishment sizes – were those selected for de-reservation at an earlier date. In that case, we may not have observed a differential trend in pre-de-reservation employment growth, if the constrained establishments were growing slowly due to constraints, while the still-reserved establishments were growing slowly simply because they were aiming for smaller establishment size.

We examine this possibility in two ways. First, we investigate whether there is any evidence that industries with larger optimal establishment sizes were de-reserved earlier. To do so, we calculate the average *unconstrained* size in each industry as average employment among establishments that never make a reserved or de-reserved product. We then assign each establishment making a reserved product, the average unconstrained size in its industry. Figure B.2, panels (a) and (b) show the distribution of average unconstrained industry size (in levels and logs) associated with establishments making reserved products, by year of de-reservation. There is no apparent trend in average industry size by year of de-reservation.

Another way to control for industry-specific optimal size is to include industry fixed effects in our regressions. Our baseline regressions include establishment fixed effects, but as establishments may switch industries, we can also include industry fixed effects. Table B.1 shows that the results are robust to doing so.

Long Differences

Table 6 in the main manuscript presents the long-difference results for employment and output. Table B.2 shows the long-difference results for output, capital, and labor productivity. As with employment and wages, the effects of the de-reservation on these additional variables increase over time.

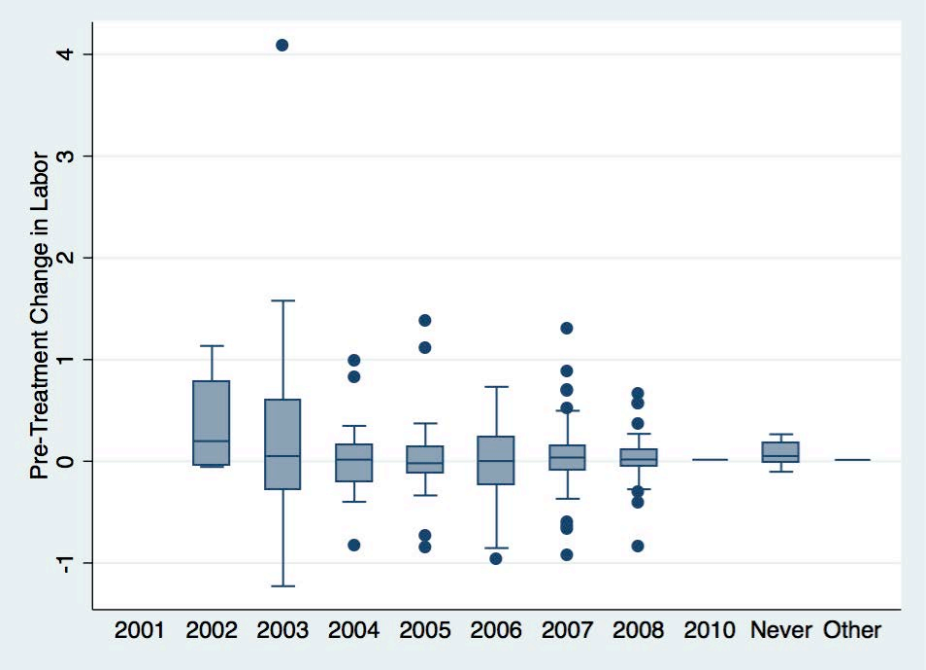
Similarly, like Table 7 in the main manuscript, Table B.3 shows the long-difference results at the district level for output, capital, and labor productivity. The coefficient on output becomes statistically significant at the fifth lag, but otherwise there is little evidence that de-reservation is associated with these outcomes in a statistically significant manner.

Product Switching

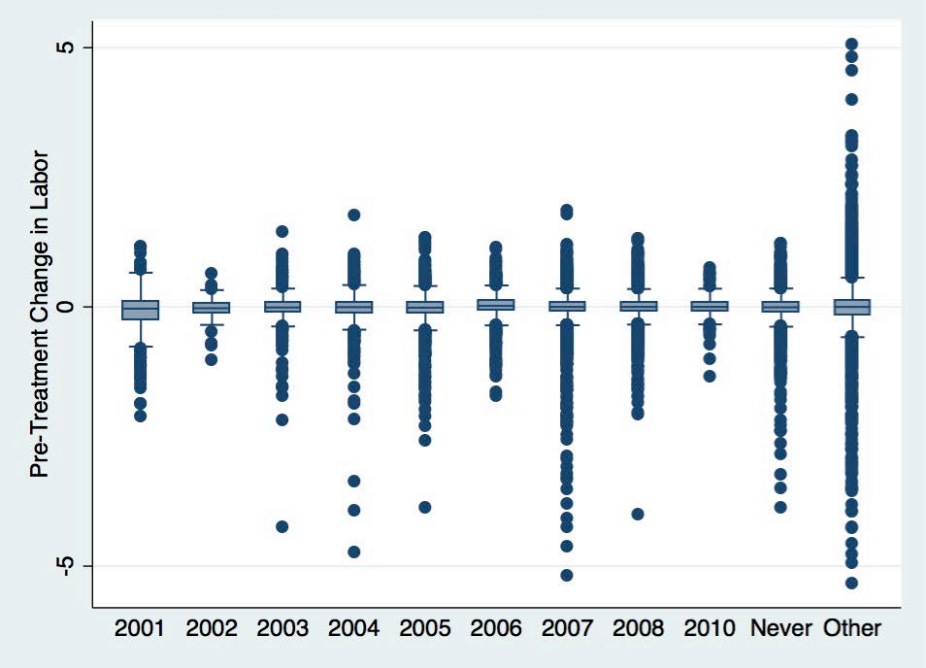
Table B.4 shows the results of the baseline regressions where we also control for product switching. We create a dummy variable that equals one when an establishment changes the main product it makes, regardless of whether the product is reserved, is de-reserved, or was never reserved. The results show that establishments that switch products do appear to grow subsequently, suggesting that there is likely a selection effect. However, the results for entrants remain similar in sign and magnitude to the original results, indicating that product switching is not driving the results for the SSI de-reservation.

Figure B.1: Pre-De-Reservation Trends in Employment by Year of De-Reservation

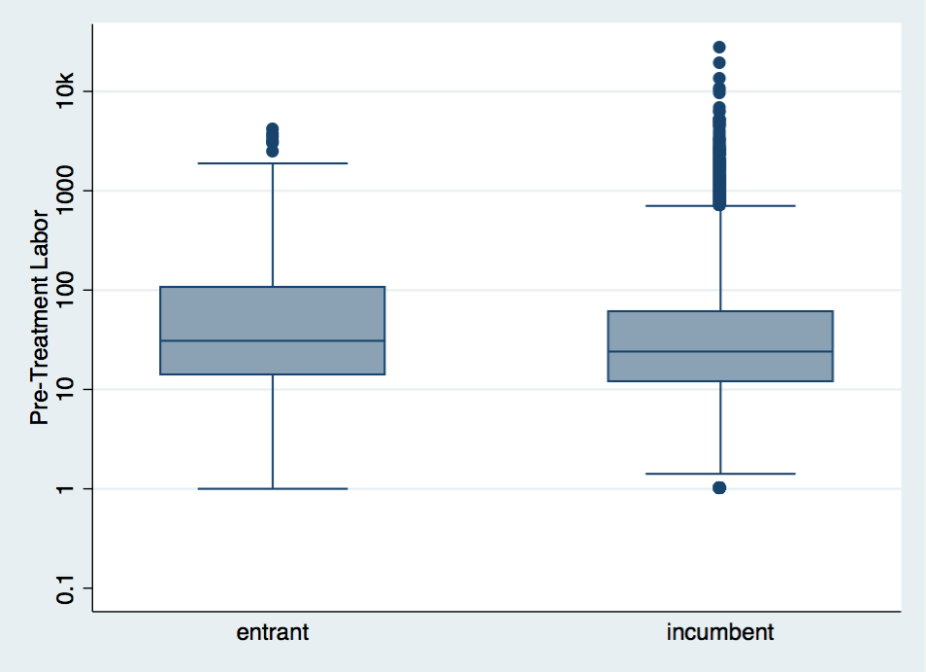
Panel (a): Labor Growth Rates at the Product Level, by Year of De-Reservation



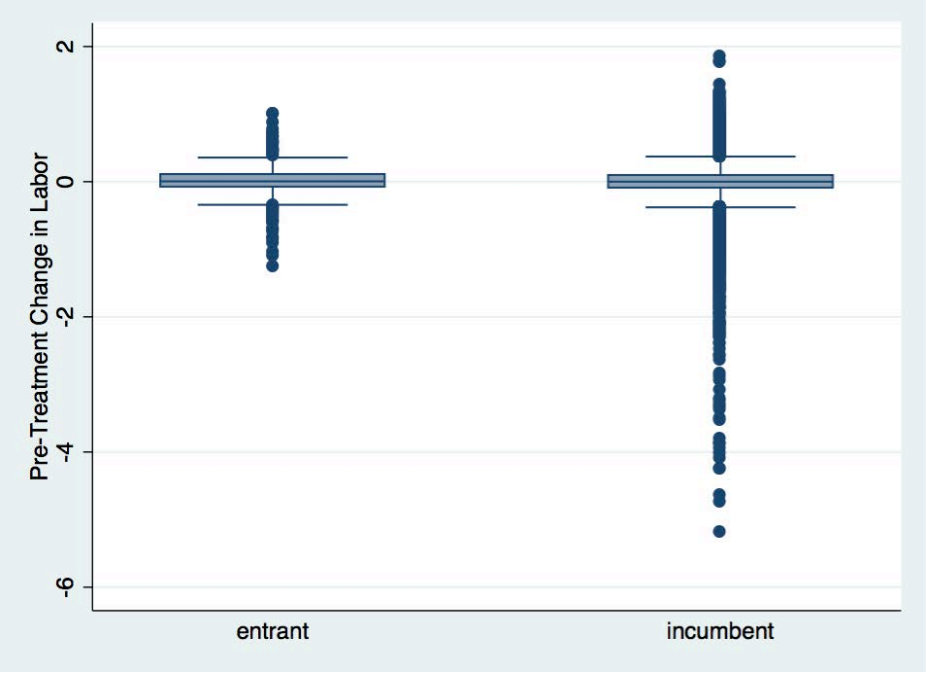
Panel (b): Labor Growth Rates at the Establishment Level, by Year of De-Reservation



Panel (c): Levels by Entrants vs. Incumbents



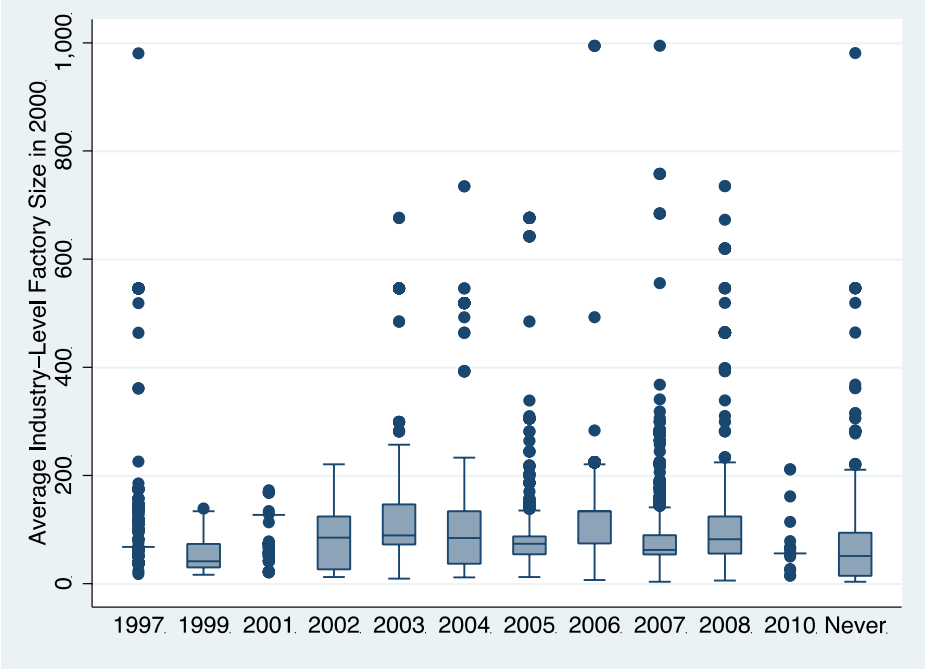
Panel (d): Growth Rates by Entrants vs. Incumbents



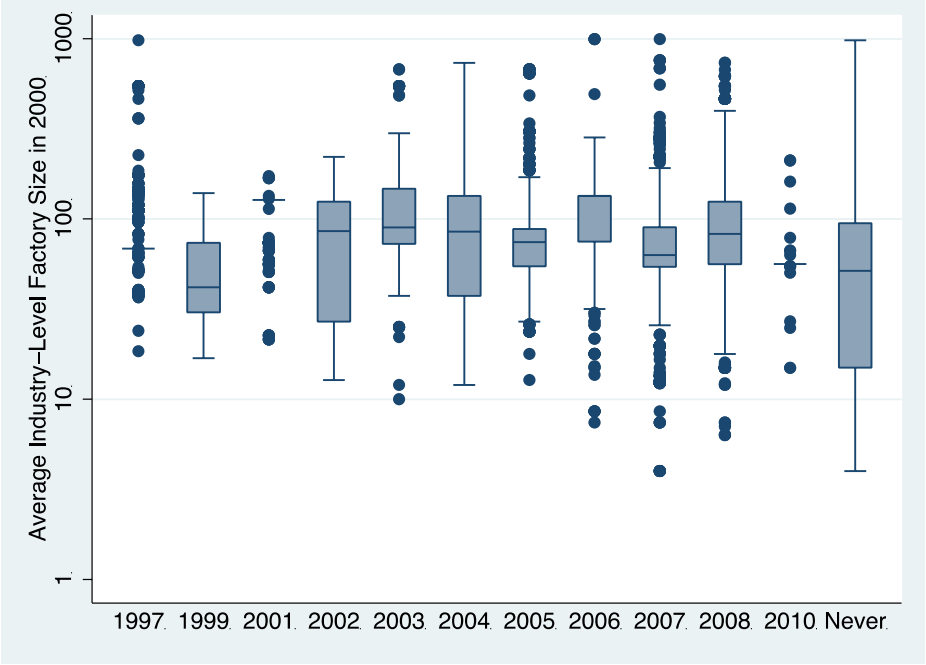
Notes: Panels (a) and (b) show pre-de-reservation growth rates in employment at the product and establishment levels, respectively, by year of de-reservation. Panels (c) and (d) show average pre-de-reservation levels and growth rates, respectively, for entrants versus incumbents. In all plots, the box shows the 25th and 75th percentiles, and the upper and lower horizontal bars indicate adjacent values.

Figure B.2: Unconstrained Industry Size by Year of De-Reservation

Panel (a): Unconstrained Industry Employment Size, by Year of De-Reservation



Panel (b): Unconstrained Industry Employment Size (in logs), by Year of De-Reservation



Notes: Panels (a) and (b) show average, unconstrained industry employment, by year of de-reservation. Unconstrained industry employment is calculated based on the average size of establishments that never made a reserved or de-reserved product. In both plots, the box shows the 25th and 75th percentiles, and the upper and lower horizontal bars indicate the adjacent values.

Table B.1: Impact of De-reservation on Establishment-Level Outcomes, With Industry Fixed Effects

Panel (a): Aggregate Results

	log(Labor)	log(Output)	log(Capital)	log(Wage)	log(Q/L)
t >= year dereserved	0.009	0.050	0.016	0.021	0.026
	(0.009)	(0.013)***	(0.011)	(0.005)***	(0.011)**
Year FE	Yes	Yes	Yes	Yes	Yes
Year FE X Incumbent	Yes	Yes	Yes	Yes	Yes
Establishment FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
R^2	0.01	0.02	0.01	0.03	0.02
N	291,581	287,486	289,004	289,366	287,198

Panel (b): Incumbents versus Entrants

	log(Labor)	log(Output)	log(Capital)	log(Wage)	log(Q/L)
Incumbent X	-0.010	0.004	-0.007	0.009	-0.010
t ≥ year de-reserved	(0.010)	(0.014)	(0.013)	(0.006)*	(0.012)
Entrant X	0.079	0.219	0.101	0.063	0.160
t ≥ year de-reserved	(0.018)***	(0.032)***	(0.025)***	(0.013)***	(0.027)***
Year FE	Yes	Yes	Yes	Yes	Yes
Year FE X Incumbent	Yes	Yes	Yes	Yes	Yes
Establishment FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
R^2	0.01	0.02	0.01	0.03	0.02
N	291,581	287,486	289,004	289,366	287,198

Notes: Dependent variables are shown in column headings. "t ≥ year deserved" is a dummy variable that takes the value of 1 when the product is removed from the list of reserved products. "Incumbent" indicates that the establishment previously made the product when it had reserved status. "Entrant" indicates that the establishment only made the product after it had been de-reserved. Errors are clustered at the establishment level. *, ** and *** represent significant at the 10%, 5% and 1% levels respectively.

Table B.2: Impact of De-reservation on Establishment-Level Outcomes – Long Differences, Additional Results

Panel (a): Output, Aggregate Impact

	1 lag	2 lags	3 lags	4 lags	5 lags
t ≥ year de-reserved	0.026	0.056	0.074	0.062	0.083
	(0.010)***	(0.012)***	(0.014)***	(0.018)***	(0.023)***
R^2	0.00	0.00	0.00	0.00	0.00
N	121,171	94,593	71,816	50,491	33,540

Panel (b): Output, Incumbents versus Entrants

	1 lag	2 lags	3 lags	4 lags	5 lags
Incumbent X	0.013	0.032	0.049	0.026	0.046
t ≥ year de-reserved	(0.010)	(0.013)**	(0.015)***	(0.019)	(0.024)*
Entrant X	0.116	0.195	0.210	0.257	0.287
t ≥ year de-reserved	(0.032)***	(0.031)***	(0.040)***	(0.051)***	(0.061)***
R^2	0.00	0.00	0.00	0.00	0.00
N	121,171	94,593	71,816	50,491	33,540

Panel (c): Capital, Aggregate Impact

	1 lag	2 lags	3 lags	4 lags	5 lags
t ≥ year de-reserved	-0.011	0.006	0.018	0.054	0.060
	(0.008)	(0.010)	(0.012)	(0.015)***	(0.018)***
R^2	0.00	0.00	0.00	0.00	0.00
N	122,949	95,887	72,747	51,177	33,982

Panel (d): Capital, Incumbents versus Entrants

	1 lag	2 lags	3 lags	4 lags	5 lags
Incumbent X	-0.017	-0.004	0.008	0.042	0.046
t ≥ year de-reserved	(0.009)*	(0.012)	(0.013)	(0.016)***	(0.019)**
Entrant X	0.032	0.063	0.077	0.115	0.134
t ≥ year de-reserved	(0.026)	(0.023)***	(0.034)**	(0.038)***	(0.047)***
R^2	0.00	0.00	0.00	0.00	0.00
N	122,949	95,887	72,747	51,177	33,982

Panel (e): Labor Productivity, Aggregate Impact

	1 lag	2 lags	3 lags	4 lags	5 lags
t ≥ year de-reserved	0.005	0.036	0.035	0.044	0.052
	(0.009)	(0.011)***	(0.012)***	(0.015)***	(0.018)***
R^2	0.00	0.00	0.00	0.00	0.00
N	120,977	94,428	71,675	50,396	33,470

Panel (f): Labor Productivity, Incumbents versus Entrants

	1 lag	2 lags	3 lags	4 lags	5 lags
Incumbent X	-0.008	0.016	0.013	0.012	0.023
t ≥ year de-reserved	(0.009)	(0.011)	(0.012)	(0.015)	(0.019)
Entrant X	0.099	0.152	0.159	0.214	0.212
t ≥ year de-reserved	(0.032)***	(0.030)***	(0.035)***	(0.042)***	(0.049)***
R^2	0.00	0.00	0.00	0.00	0.00
N	120,977	94,428	71,675	50,396	33,470

Notes: The dependent variable is the difference between output (Panels (a) and (b)), capital (Panels (c) and (d), or labor productivity (Panels (e) and (f)) in year t and year t-k where k is 1-5 (Columns (1)-(5), respectively). The right hand side variables are also differenced by the appropriate lag k. Errors are clustered at the establishment level. *, ** and *** represent significant at the 10%, 5% and 1% levels respectively.

Table B.3: Impact of De-reservation on District-Level Outcomes: Long Differences, Additional Results

Panel (a): Output, Variable Lags

	1 lag	2 lags	3 lags	4 lags	5 lags
Δ Fraction de-reserved	0.023	0.092	0.062	0.373	0.539
	(0.140)	(0.174)	(0.168)	(0.229)	(0.269)**
R^2	0.00	0.00	0.00	0.00	0.01
N	2,478	2,124	1,770	1,416	1,062

Panel (b): Capital, Variable Lags

	1 lag	2 lags	3 lags	4 lags	5 lags
Δ Fraction de-reserved	0.045	0.057	-0.035	0.185	0.399
	(0.156)	(0.169)	(0.239)	(0.286)	(0.335)
R^2	0.00	0.00	0.00	0.00	0.00
N	2,478	2,124	1,770	1,416	1,062

Panel (c): Labor Productivity, Variable Lags

	1 lag	2 lags	3 lags	4 lags	5 lags
Δ Fraction de-reserved	0.038	0.085	-0.163	-0.004	-0.032
	(0.097)	(0.116)	(0.139)	(0.130)	(0.180)
R^2	0.00	0.00	0.00	0.00	0.00
N	2,478	2,124	1,770	1,416	1,062

Notes: Regressions of changes in output, capital, and labor productivity, respectively, at lagged intervals from 1-5 years. Regressions use all districts that, after applying weights, have at least 10 establishments in each ASI year. Errors are clustered at the district level. *, ** and *** represent significant at the 10%, 5% and 1% levels respectively.

Table B.4: Impact of De-reservation on Establishment-Level Outcomes, Controlling for Product Switching

Panel (a): Aggregate Results

	log(Labor)	log(Output)	log(Capital)	log(Wage)	log(Q/L)
t ≥ year de-reserved	0.006	0.048	0.014	0.020	0.027
	(0.009)	(0.013)***	(0.011)	(0.005)***	(0.011)**
Switch	0.054	0.085	0.028	0.018	0.042
	(0.003)***	(0.005)***	(0.004)***	(0.002)***	(0.004)***
Year FE	Yes	Yes	Yes	Yes	Yes
Year FE X Incumbent	Yes	Yes	Yes	Yes	Yes
Establishment FE	Yes	Yes	Yes	Yes	Yes
R^2	0.01	0.01	0.00	0.03	0.01
N	291,581	287,486	289,004	289,366	287,198

Panel (b): Incumbents versus Entrants

	log(Labor)	log(Output)	log(Capital)	log(Wage)	log(Q/L)
Incumbent X	-0.011	0.005	-0.007	0.010	-0.008
t ≥ year de-reserved	(0.010)	(0.014)	(0.012)	(0.006)*	(0.012)
Entrant X	0.068	0.206	0.093	0.061	0.156
t ≥ year de-reserved	(0.018)***	(0.032)***	(0.025)***	(0.013)***	(0.027)***
Switch	0.053	0.084	0.028	0.018	0.041
	(0.003)***	(0.005)***	(0.004)***	(0.002)***	(0.004)***
Year FE	Yes	Yes	Yes	Yes	Yes
Year FE X Incumbent	Yes	Yes	Yes	Yes	Yes
Establishment FE	Yes	Yes	Yes	Yes	Yes
R^2	0.01	0.01	0.00	0.03	0.01
N	291,581	287,486	289,004	289,366	287,198

Notes: Dependent variables are shown in column headings. "t ≥ year deserved" is a dummy variable that takes the value of 1 when the product is removed from the list of reserved products. "Incumbent" indicates that the establishment previously made the product when it had reserved status. "Entrant" indicates that the establishment only made the product after it had been de-reserved. "Switch" is a dummy that takes a value of 1 when a establishment changes the main product it makes. "Q/L" indicates labor productivity (real output divided by number of employees). Errors are clustered at the establishment level. *, ** and *** represent significant at the 10%, 5% and 1% levels respectively.