Entry along the supply chain: removing growth restrictions on firms in India

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Abstract

I study the spillover effects of removing barriers to growth in one product market on entry and growth of firms in the downstream/customer market. Constrained firms produce low quality goods and, in turn, hamper access to high quality inputs for downstream firms. I exploit the repeal of product reservation in India, whereby hundreds of products stop being reserved for exclusive production by small firms. With an increase in production of high quality goods in the input market, entry in the downstream product market increases. Entrants are not worse on observable characteristics. Productive downstream incumbents grow and less productive ones shrink. My results imply that business dynamism has positive spill-over effects along the supply chain.

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1 Introduction

Many countries employ policies to protect and promote small firms. These programs take various forms including subsidised credit, fiscal incentives, marketing assistance, preferential procurement and exclusive production rights among others. Firms that grow above the threshold lose the benefits offered under these programs. In this way, these policies can pose as barriers to growth for the markets that they aim to promote (Martin et al., 2017) and potentially even spill-over to other linked firms. Firms that are incentivised to remain small may become inefficient and managers may prefer to live "the quiet life" as in Bertrand and Mullainathan (2003) or to "play it safe" as in Gormley and Matsa (2016). These firms, protected by regulation, lack incentives to pay the fixed cost to produce high quality goods. Some of these firms produce goods that are used as intermediate inputs. An inefficient input market, in turn, hampers access to high quality raw materials for firms in the downstream or customer markets.

In this paper, I study the spillover effects of removing barriers to growth in one product market onto entry and growth of firms in markets that use these products as inputs. To do so, I exploit the staggered removal of a policy promoting small firms in certain product markets in India. Starting in 1997, India dismantled its policy of product reservation whereby hundreds of products had been reserved for exclusive production by small firms.[1] Following the reform, there is an increase in the average size of firms (measured in terms of employment and fixed assets) in the de-regulated market. This increase in firm size provides me with a rare exogenous shock to firm growth in some product markets and allows me to examine spill-over effects onto downstream or customer product markets.

Before studying the spillover effects, I start by examining the mechanism for the increase in production in de-regulated markets post reform. Large firms either have a cost advantage in production or produce better quality goods.[2] Economies of

[1] Large firms already producing a product when it was added to the reserved list were allowed to continue operating but their production was capped at existing levels.

[2] It may be noted that quality reflects an improvement in the product and is distinct from mere product variety that may simply reflect heterogeneity in preferences of consumers. Khandelwal (2010) uses imports to the US to infer quality of a product based on the mean valuation that US consumers attach to an imported product. The intuition is simple: conditional on price, imports with higher market share are assigned a higher quality. He finds that there is significant

scale would imply that following de-regulation, downstream firms will have access to cheaper raw materials. Alternatively, under the product quality hypothesis, where small firms produce low quality goods and large firms produce high quality goods, downstream firms would have improved access to high quality inputs post reform. I find evidence in favour of the product quality hypothesis and do not find strong support for economies of scale.

I lay out the mechanism under the product quality hypothesis. I assume that low and high quality goods are imperfect substitutes and firms need to pay a fixed cost to acquire capabilities or machinery in order to produce high quality goods. Prior to de-regulation, there was a cap on production of products on the reserved list by large firms. With segmentation of the market, this cap translates into a cap on the supply of high quality goods. Moreover, small firms (shielded by regulation) with high enough profits will not find it profitable to pay the fixed cost to start producing high quality goods. In this way, small firms either lack the incentives to grow or are explicitly constrained by the regulation and continue producing low quality goods. With de-regulation, we expect an increase in production in the high quality segment of the de-regulated market. Since, low and high quality goods are not perfect substitutes, the improved access to high quality inputs may relieve technological constraints for downstream firms.

To test segmentation of the market based on product quality, I divide the sample into long and short quality ladder industries, i.e., industries with high and low scope for quality differentiation, respectively using Khandelwal (2010)'s classification. An examination of long quality ladder industries (where as per Khandelwal (2010) price is a good proxy for quality) reveals that there is indeed a significant difference between prices (quality) of products produced by small firms and those produced by large ones before de-reservation.

I, then, examine whether post-reform there is an increase in production of high quality goods. After de-reservation, small incumbents shrink (Martin et al., 2017) and with them the production of lower quality goods shrinks. On the other hand, large incumbents and entrants grow. With segmentation based on quality, large

heterogeneity in product market scope for quality differentiation and defines quality ladders as the range of qualities within a product market. I employ this classification for my analysis.

incumbents produce high quality goods. In addition, I show that entrants charge higher prices than small incumbents in long quality ladder industries. This finding is consistent with entrants producing higher quality goods. Put together, there is an increase in production of high quality goods in the de-regulated market post reform. This means improved access to high-quality inputs for firms in the downstream product market.

Having established the economic channel at play in the de-regulated market, I go on to study the effect of the reform on the downstream market. With a more efficient input market following de-regulation, we expect an increase in downstream entry. Moreover, if the channel is improved access to high quality inputs, then we expect downstream markets that use long quality ladder (high range of quality) inputs to benefit most from the reform. In addition to the level of entry, I study whether the new entrants are comparable on observable characteristics. On the one hand, removing barriers to entry may induce worse entrepreneurs or more subsistence entrepreneurs to start firms - we would expect these firms to be smaller and to grow less. On the other hand, it may allow entrepreneurs to experiment and learn about their ability (Manso, 2011) in which case we do not expect to see any difference in quality of new firms created.

Finally, the increase in supply of high quality goods should benefit productive downstream incumbents and enable them to grow. This effect should be stronger in downstream markets that employ long quality ladder inputs. Less productive downstream firms, on the other hand, should shrink.

I empirically test these predictions by employing a difference-in-differences analysis. My empirical strategy relies on the timing of de-regulation. The identifying assumption of my analysis is that the timing of the de-regulation is unrelated to investment opportunities in the downstream market. The consensus in the literature is that the timing of the de-regulation was unrelated to de-regulated industry conditions. I study the impact of the de-regulation in downstream product markets. Arguably, if the timing of the policy was unrelated to industry conditions, it is unlikely to be systematically related to downstream market conditions. Additionally, only about a third of the de-regulated products are used as intermediate inputs in the production of downstream products and even among these there is variation

in the timing of de-regulation. This is reassuring and makes it even more unlikely that the timing of de-regulation is driven by downstream industry characteristics. I provide further evidence by testing whether the timing of de-regulation of products that are used as intermediate inputs is related to downstream industry characteristics using a proportional hazards model.

Next, I document the effect of the reform on downstream entry. I find that allowing firms to grow in one market has positive spill-over effects on entry in downstream markets. The increase in entry is concentrated among downstream markets that use long quality ladder inputs. This is consistent with the mechanism of improved access to high quality raw materials for downstream firms. I find qualitatively similar results for the effect of entry on the larger firms with a minimum of 10 workers. Next, I establish that the new firms created are not worse on observables compared to other firms. The first characteristic is ex-ante size - the value of plant and machinery employed by the firm at start-up. Next, to measure ex-post characteristics, I examine output distribution. There is no statistically significant difference in output for firms created post-reform compared to those in other product markets unaffected by the reform.

Finally, I evaluate how better access to high-quality raw materials impacts growth of downstream incumbents. In particular, following easing of input market frictions, we would expect productive firms to grow and less productive firms to shrink. Using measures such as sales, capex and employment, I indeed find evidence in favour of re-allocation where productive firms expand and less productive ones shrink. Consistent with the mechanism of improved access to high quality raw materials, this re-allocation is stronger in downstream markets that use long quality ladder inputs.

In robustness tests, I rule out alternative explanations for my results such as hold-up problems and uncertainty of access to inputs.

My results point towards small firms in previously regulated markets lacking incentives to produce high quality goods as a result of being protected. The de-regulation of a market increased re-allocation and entry, not only, in the de-regulated market, but also, in the downstream markets. These findings have implications for

the way we think about business dynamism and show that business dynamism in one market can have positive spill-over effects on linked (downstream) markets. The results highlight the importance of understanding the recent decline in dynamism[3] and suggest that the negative consequences associated with declining dynamism may be even larger when considering linked markets. In addition, my findings indicate that policies to protect and promote small firms can have unintended negative consequences. It is, therefore, important to exercise caution when designing and implementing such policies.

My paper relates to three major strands of the literature. First, I contribute to the literature on barriers to entry. The previous literature evaluates the role of specific channels by exploiting within country regulation changes (Kerr and Nanda, 2009; Mullainathan and Schnabl, 2010; Bruhn, 2011; Branstetter et al., 2014; Hombert et al., 2020; Ersahin et al., 2021). I add to the literature by providing evidence of a new channel for entry namely, firm growth and competition in supplier markets. As in Branstetter et al. (2014); Hombert et al. (2020) my paper also studies the characteristics of the newly formed firms to assess the quality of the new entrants.

Second, it relates to the vast literature on product market competition and import competition (Frésard and Valta, 2015; Martin and Otto, 2020; Aslan and Kumar, 2019; Hombert and Matray, 2018; Gutiérrez and Philippon, 2017) among others. My paper is related to Martin and Otto (2020) who examine downstream investment when import tariffs decrease. My setting is similar to theirs in that the main mechanism operates via product market competition. However, in my setting the competition is introduced by the removal of constraints on domestic players rather than international ones. Moreover, my study is in the context of a developing country where upstream/import competition may imply improved access to high quality inputs and not just a decrease in prices of raw materials for downstream firms. Aslan and Kumar (2019) find that upon removal of the requirement to renew trade agreements every year, business entry in the US in the tradable sector declines. My paper also documents spill-over effects of competition onto another sector. I focus on the downstream product markets and contrary to Aslan and Kumar (2019), find an increase in downstream entry.

[3] See Decker et al. (2016) for a review.

Third, it is related to existing work on the de-reservation reform (Martin et al., 2017; Chiplunkar, 2019; Singh, 2017; Boehm et al., 2019; Galle, 2018; Balasundharam, 2019). My findings on the average size of firms are consistent with those of (Martin et al., 2017) who show that while small incumbents shrank, entrants and large incumbents drove growth in employment and investment. Most of the existing work focuses on the de-regulated market with the exception of Boehm et al. (2019) and Balasundharam (2019). Boehm et al. (2019) provide evidence supporting economies of scope among downstream firms. Balasundharam (2019) computes aggregate productivity following the reform taking into account productivity gains from both the deregulated market and the linked markets. She goes on to show that productive firms increase their total output. I add to the literature by studying an important outcome, namely entry in the downstream market. In addition, my paper contributes towards a better understanding of the mechanisms at play, namely, segmentation of the market based on product quality and increase in production of high quality goods. The literature already identifies the reform as pro-competitive in nature (Galle, 2018) with an increase in the number of players and quantity produced and a decrease in prices (Balasundharam, 2019) in previously regulated product markets. My paper is, however, the first to present evidence on segmentation of the market based on product quality.

The rest of the paper is organised as follows. Section 2 describes the reform. Section 3 outlines the data employed in this study and is followed by section 4 that reports the empirical specifications. Section 5 presents the results and finally, section 6 concludes.

2 Background of the reform

India adopted a policy of product reservation in 1967 whereby certain products were reserved for exclusive production by small enterprises. Mohan (2002) notes that this policy was enacted with a view to generate employment in a labour-surplus economy. It was believed that small enterprises make economical use of capital and absorb labour supply whereas large firms are capital intensive and reward only a minority of labour. The policy sought to protect small scale industry from competition by large

firms with a view to generate employment. Furthermore, the widespread perception that import of mass-manufactured products affected millions of handloom textile workers in the nineteenth century also contributed to the concern for protecting small enterprises.

The choice of products to be reserved was arbitrary - government documents state that the only criterion was the ability of small firms to manufacture such items. Though, initially, only 47 products were reserved for production by small firms, over the years, products were added to and removed from the list. By late 1970s most reserved items had been added to the list and as of 1991, there were more than a thousand products on the reserved list. Products spanned many sectors including food, chemicals, base metals, machinery, textiles and wood and paper products. Examples include toothpaste, leather, and PVC compounds.

Following trade liberalisation in 1991, small firms in many reserved sectors were subject to import competition. On the other hand, large domestic players were still not allowed to produce these goods. There was also some concern about existing large players in the reserved markets in a position to exercise monopoly power. A special committee was appointed in 1995 to reconsider the list of reserved items. Based on the recommendations of this committee, the process of de-reservation started in 1997. The process and timing of de-reservation is, however, not very clearly understood as is also noted in earlier papers. The path of a product to de-reservation is often lengthy and circuitous. First, a reserved product is identified as a candidate either by a ministry or by industry players themselves. A series of meetings then follow between the affected parties and government officials. The proposal is then subject to review by a chain of bureaucrats before being signed into law. As a result, the removal of products from the reserved list was staggered across time and industry. I will exploit this variation in timing of deregulation in my empirical analysis. As an example, the deregulation of products in the fabricated metal products sector took place over several years with 0% in 2003, 22% in 2004, 0% in 2005, 42% in 2006, 31% in 2007 and the remaining 5% in 2008.

In the first major round of de-reservation, which took place in 1997, 15 products were removed from the list. De-regulation took off in 2002 when another 51 products were allowed to be produced by larger establishments, and accelerated from 2003

to 2008 with approximately 100-250 products de-reserved each year. The last 20 products were taken off the list in 2015.

Products on the reserved list were only allowed to be produced by small firms. The definition of 'small' firms has evolved over time. An establishment is defined as 'small' based on investment in plant and machinery (at historical cost). The limit has been changing over time as can be seen from Figure 1 largely in order to keep pace with inflation. Establishments above the investment threshold at the time of reservation were allowed to continue production, but their output was capped at current levels. Expansion or entry by large establishments required a commitment to export a majority of the produce. I study the effect of the reform on the downstream market. Some examples of downstream products include detergents, soaps, fertilizers, insecticides and plastic vacuum flasks.

Luckily, most other major reforms were completed before de-reservation. The dismantling of the license raj and major changes relating to foreign investment took place in the early 1990s. Tariffs were largely harmonised across industries by the late 1990s (Nataraj, 2011) and by 1998, 93% of industries were no longer subject to licensing requirements (Martin et al., 2017).

3 Data

3.1 Entrepreneurship data

Data on entrepreneurship are taken from the All India Census of Micro, Small and Medium Enterprises (hereafter MSME census). The fourth round covers the universe of small and medium establishments registered up to 31 March 2007 with their respective state governments or under the Factories Act. Only businesses with a fixed premises and investment in plant and machinery below a threshold of Rs. 10 million are included in the survey.

The dataset contains detailed information on inputs used and products produced including quantities and total value of production for the financial year. These allow me to identify businesses that are directly or indirectly (via input-output linkages)

affected by the deregulation. In addition, the data contain current and historical information about the enterprise such as start date, initial value of plant and machinery installed and location that are well suited to study entry decisions of firms. It must be noted, however, that the data are anonymous and do not allow me to follow establishments from one round of the census to the other or to link establishments to firms.

I drop establishments in the mining, electric utilities, repair/maintenance and services sectors. I require them to have positive and non-missing employment and total output. Only establishments in the manufacturing sector that were formed between 1992 and 2006 are considered for the analysis of downstream entry. Table 1 provides some summary statistics. My sample consists of data on 538 districts. A district has on average 950 total establishments in the data and the average establishment employs 5 persons. There are on average 2.5 new firms formed in each district in any given product market in a year.

My final intensive margin sample consists of 124,708 district $\times$ product $\times$ year observations, of which 29.4% represent downstream entrants. The sample includes either downstream entrants or those unrelated to the regulation change. Establishments producing unrelated products are those that do not produce either deregulated or downstream or upstream products. Further, establishments that produce both downstream and important upstream products (at least 10% exposure) are also excluded.

The third round of the MSME census covers small and medium establishments registered up to 31 March 2001 with their respective state governments. Like the 4th round, the 3rd round also covers businesses with investment in plant and machinery below a threshold of Rs. 10 million. However, unlike the 4th round, it doesn't include establishments registered under the Factories Act. I make adjustments to account for this difference and combine these data with the establishment level data for the test on firm size in the de-regulated market.

3.2 Establishment level data

Establishment level data are from the Annual Survey of Industries (ASI) which is conducted by the Central Statistics Office (CSO). All factories using electricity that employ 10 or more workers and all factories not using electricity that employ 20 or more workers are covered under the survey. The data are anonymous and do not allow either individual firms to be identified or different establishments of the same firm to be linked to each other.[4]

The data are divided into a *census* sample which includes factories that employ 100 or more workers, and a *sample* sample which includes factories that employ less than 100 workers (these are CSO labels). Factories in the *census* sample are surveyed each year whereas a representative sample of factories are surveyed each year in the *sample* sample.

I use ASI data from FY2001-20010. The data come in two versions: one version follows an unbalanced panel structure and allows establishments to be tracked over time whereas the other follows a repeated cross-section and does not allow establishments to be tracked over time. The repeated cross-section version of the data, however, contain granular information about the location of the establishment - district in which it operates - that will be useful for my analysis. I follow Martin et al. (2017) and match the two versions in order to add the information on district of operation of an establishment to the panel version of the data. Similar to Martin et al. (2017), I obtain a high match rate of 94.5%.

I drop establishments that provide mining, repair/maintenance or other services. I consider negative values of assets or output as data inconsistencies and set them to missing. I require all establishments to have non-missing value of establishment age. All observations with missing labour and total output or total assets are dropped. All variables are winsorised at the 1% level.

Both the ASI surveys and MSME census report products using A Standard Industrial Classification of Commodities (ASICC) product codes. I create a concor-

[4]Most establishments in the data are single firm establishments. With a little abuse in terminology, I will use the terms 'establishment' and 'firm' inter-changeably in the paper.

dance between the product codes from the deregulation circulars and ASICC codes based on several government commissioned reports found on government or government affiliated entity websites.

The sample employed for testing the effect of the reform on firm size in the de-regulated market is constructed by combining the two censuses from the entrepreneurship sample with the corresponding two years from the establishment level sample in order to have a full view of all firms. This is done because the entrepreneurship sample only covers small firms and the establishment level sample covers only firms above a threshold.

3.3 Input-output table

I combine the establishment level data from 2006-07 from ASI and the fourth MSME census in order to construct the input-output table. FY2007 is used as a reference year for two reasons: first, the third MSME census doesn't include information on inputs used and hence cannot be used. Moreover, some reserved products are only produced by very small establishments and hence wouldn't be picked up by an input-output table constructed solely using ASI data. Second, the data coverage of inputs used and products produced for the ASI sample is better towards the end of the sample as compared to the very beginning. This makes FY2007 an appropriate choice for constructing the input-output table even though it is at the end of the sample period.

Only single-product establishments are used to construct the input-output table. The rupee value of each input in normalised by the total value of inputs used by the establishment to get a percentage by value. This percentage by value for each input is weighted by the importance of the establishment in producing the product i.e. percentage of production of the product by the establishment to total production of the product in the reference year. This is summed across each input-product pair. Finally, only inputs above a threshold of 1% are considered for identifying the supply chain.

Upstream and downstream products are, then, identified using the input-output

table. Thus, a product is a downstream product if at least one of the inputs used in its production by the average firm in the economy, as measured by the input-output table, is deregulated. Similarly, all inputs used in the production, as per the input-output table, of deregulated products are classified as upstream products.

An establishment is classified as a product market firm if at least one of its products is a reserved product. This procedure identifies only one reserved product for most establishments. In cases where an establishment produces more than one reserved product that is deregulated in different years, the earlier year is considered as the year of dereservation for the establishment. Establishments are classified as downstream firms (upstream firms) based on whether the main product (an arbitrary threshold of at least 30% of revenues coming from a product is used to classify it as a main product) that they produce is a downstream product (upstream product).

4 Empirical strategy

4.1 Empirical strategy

Product reservation in India only allowed small firms to produce certain products thereby forcing firms in these product markets to remain small. De-reservation i.e., removal of this regulation, thus, provides me with an exogenous shock to firm growth and a suitable setting to test my hypothesis. Firms that are incentivised to remain small by way of subsidies may become inefficient and managers may prefer to live "the quiet life" as in Bertrand and Mullainathan (2003) or to "play it safe" as in Gormley and Matsa (2016). This may, in turn, hamper downstream entry and growth of downstream incumbents. I employ a difference-in-differences strategy to study entry in the downstream market. The details of the specification are laid out in section 4.2. A similar specification that compares the new firms created post-reform to those created before the reform is employed to evaluate the quality of the entrants. The identifying assumption is that the timing of the de-regulation in not systematically related to investment opportunities in the downstream market.

The paper goes on to study the effect of the reform on downstream incumbents. As outlined above, firms that are forced to remain small may become inefficient and

in turn constrain the growth of downstream firms. Growth constraints in the form of input market frictions are likely to adversely affect downstream firms with high productivity. Whereas, firms will lower productivity might actually benefit from the slowing down of the process of re-allocation. Since, we expect the effect of the reform (removal of such growth constraints) to differ by productivity, I divide downstream firms into above and below median productivity to test my hypothesis. The baseline regression employs a triple difference-in-differences strategy and is outlined in section 4.3.

4.2 Baseline specifications for downstream entry

The empirical specification for entry is a difference-in-differences strategy of the form:

$$y_{p,d,t} = \beta_1 DownDereg_{p,t} + \delta_p + \delta_t + \delta_d + \varepsilon_{p,d,t} \tag{1}$$

$$y_{p,d,t} = \sum_{n=-5, n!=-1}^{3} \Gamma_n \mathbb{1}(n)_{p,t} + \delta_p + \delta_t + \delta_d + \varepsilon_{p,d,t} \tag{2}$$

where $y_{p,d,t}$ is the outcome variable (a dummy variable for entry or log of number of new firms) for product p in district d with start year t. It is worth noting that I do not need to observe the inputs used for production of each product at this stage as the inputs used by the average firm (as per the input-output table) that produces p are employed for the analysis. $DownDereg_{p,t}$ is a dummy variable that goes from 0 to 1 for downstream products following de-reservation of at least one of their inputs. In the dynamic specification in equation (3), $\mathbb{1}(n)_{p,t}$ is an indicator function that takes the value 1, n years after de-reservation of inputs, and 0 otherwise.

The parameter of interest in equation (1) is β_1. β_1 captures the average effect of de-reservation on firm formation. While equation (1) and (2) present the average effect, equation (3) estimates the dynamic effect of the de-regulation. Γ_n is the parameter of interest in equation (2) and measures the change in downstream firm formation n years after the de-regulation. The identification relies on comparing $y_{p,d,t}$ before and after the de-regulation to a control group of products that are not affected by the change in regulation. A positive β_1 coefficient would imply that de-

regulation leads to an increase in downstream entry relative to entry in unrelated product markets on average.

δ_p, δ_t and δ_d are fixed effects for product, start year and district respectively. District fixed effects control for time-invariant determinants of entrepreneurship at the district level, such as size of the district, access to banking and level of education. Start year fixed effects control for aggregate shocks that may cause more or less firms to be formed in any given year. Product fixed effect account for time-invariant product specific characteristics that may cause entrepreneurs to start more or less firms producing a certain product. In robustness tests, I include state $\times$ product fixed effects and state $\times$ year fixed effects. State $\times$ product fixed effects capture time-invariant product specific regional trends like state specific product procurement policies. State $\times$ year fixed effects control for state specific shocks that might lead to more or less number of firms being created in a given state in a year. The standard errors are clustered at the product level.

4.3 Baseline specification for incumbent downstream firms

The baseline specification for evaluating growth of incumbent downstream firms is as follows:

$$y_{i,t} = \beta_1 DownDereg_{i,t} + \beta_2 DownDereg_{i,t} \times Productivitydummy_i + \delta_i + \delta_t \times Productivitydummy_i + \varepsilon_{i,t} \quad (3)$$

$$y_{i,t} = \sum_{n=-4, n!=-1}^{3} \Gamma_n \mathbb{1}(n)_{i,t} + \delta_i + \delta_t + \varepsilon_{i,t} \quad (4)$$

where $y_{i,t}$ is the outcome variable (for example, log of employment, sales, capex, debt or profits) for firm i that produces product p in year t. The data are collapsed into a single observation per firm-year, retaining the product with the highest revenue share for the purposes of the regression. In this way, the data are organised into a firm $\times$ year level panel while still allowing me to identify the main product produced. $DownDereg_{p,t}$ is a dummy variable that goes from 0 to 1 for downstream products following de-reservation of at least one of their inputs. It is worth noting

that I do not need to observe the inputs used for production of each product at this stage as the inputs used by the average firm that produces p are employed for the analysis. In the dynamic specification in equation (4), $\mathbb{1}(n)_{i,t}$ is an indicator function that takes the value 1, n years after de-reservation of inputs, and 0 otherwise. Furthermore, treatment and exposure to the regulation is invariant at the firm level. In case a firm produces multiple downstream products that are de-reserved in different years, then the year of de-reservation that comes first is assigned to it.

Downstream firms are classified as having below or above median productivity based on productivity in the most recent year before the reform. All other firms are classified as having below or above median productivity based on the first year in which they appear in the data. Accordingly, $Productivitydummy_i$ takes the value 0 for below median productivity and 1 for above median productivity. Productivity is measured as a residual from an OLS regression of log of total output on log of total inputs used including fixed assets, labor and materials with industry-year fixed effects. The parameters of interest of the triple difference-in-differences specification in equation (3) are β_1 and β_2. β_1 measures the change in the outcome variable for below median productivity downstream firms after the de-regulation. $\beta_1 + \beta_2$ measures the change in y for above median productivity downstream firms after de-reservation. δ_i and $\delta_t \times Productivitydummy$ represent firm fixed effects and year fixed effects respectively. Year fixed effects are interacted with a dummy variable for ex-ante productivity. The standard errors are clustered at the product level.

While equation (3) presents the average effect, equation (4) estimates the dynamic effect of the de-regulation. Γ_n is the parameter of interest in equation (4) and measures the change in the outcome variable n years after the de-regulation. Equation (4) represents a difference-in-differences specification that is run separately for firms with below and above median productivity - downstream firms with ex-ante above median productivity are compared to unrelated firms with above median productivity before and after the reform in order to estimate Γ_n for high productivity firms. Γ_n for low productivity firms is estimated in a similar manner. δ_i and δ_t represent firm fixed effects and year fixed effects respectively. The standard errors are clustered at the product level.

5 Results

5.1 Mechanism

I start by examining the mechanism for re-allocation in the deregulated market post reform. Large firms either have a cost advantage in production or produce better quality goods. I find evidence in favour of the latter where large firms produce better quality goods. I will argue that prior to the reform, small firms producing reserved products were catering to the low quality market and the larger firms to the higher quality segment. Then, I will present evidence in line with the view that de-reservation led to an increase in production of higher quality goods.

I start by examining the economies of scale hypothesis. Economies of scale would imply that following de-reservation, downstream firms will have access to cheaper raw materials. Prior to de-reservation, firms were not able to realise economies of scale due to the cap on their output. Employing an OLS specification, I regress log of output on log of inputs (including labor, capital and materials) for firms in the de-reserved market post-reform. Summing up the coefficients on inputs yields a value of less than one. Table A1 presents the results. This evidence is broadly inconsistent with economies of scale.

Next, I examine the production of higher quality goods. I start by presenting evidence on segmentation of the market based on quality. It may be noted that quality reflects an improvement in the product and is distinct from mere product variety that may simply reflect heterogeneity in preferences of consumers. Since, quality is not observable in my dataset, I use data on prices to infer quality. Khandelwal (2010) uses imports to the US to infer quality of a product based on the mean valuation that US consumers attach to an imported product. The intuition is as follows: conditional on price, imports with higher market share are assigned a higher quality. He finds that there is significant heterogeneity in product market scope for quality differentiation and defines quality ladders as the range of qualities within a product market. I use Khandelwal's (2010) measure of quality dispersion aggregated to the 4 digit ISIC (equivalent to NIC 98 at the 4 digit level which is the Indian classification of industries) level to classify industries into long (above median dispersion) and short (below median dispersion) quality ladder industries.

I use the World Integrated Trade Solution (WITS) concordance from HS0 codes to ISIC 3.0 for the aggregation. In addition, Khandelwal (2010) finds that prices are a good proxy for quality in long quality ladder industries i.e., industries with high dispersion in quality. Thus, I conduct my analysis on the sub-sample of long quality ladder industries.

Furthermore, data on average price of a product from ASI is somewhat noisy. I conduct robustness tests using a "clean" sample. I drop observations where price variation within a product in a given year is greater than 20x. This strategy leaves me with about two-thirds of the sample. It is worth noting that the results are qualitatively similar using either sample. The results are robust to using an alternative factor of 100x.

Table 3 presents evidence that is consistent with market segmentation. I observe a significant difference between prices of large firms and those of small firms for reserved product markets before de-reservation. The results are similar when using all reserved products and reserved products used as intermediate inputs. I show the results for reserved products that are used as intermediate inputs since I am interested in studying the effect of the reform on the downstream market. Column 1 of Table 3 reports the result. The coefficient in column 1 implies that large firms on average sold their products at a 35.7% higher price than small ones. This difference is robust to using a clean sample as shown in Column 2. Column 3 reports the results for other product markets that are never reserved. Since price is correlated with product quality in long quality ladder industries, these results imply that large firms produce higher quality goods.

After de-reservation, small incumbents shrink (Martin et al., 2017) and with them the production of lower quality goods shrinks. On the other hand, large incumbents and entrants grow. I have shown evidence in favour of segmentation, implying that large incumbents produce high quality goods. Next, I study whether entrants produce high quality goods. Here, entrants comprise both new entrants and existing firms that start producing deregulated products post reform. In Panel B, I present evidence that there is a price differential in the products produced by entrants and small incumbents with entrants charging higher prices. This difference is statistically significant and economically meaningful. Given that price is a good

proxy for quality in long quality ladder industries, this finding suggests that entrants produce high quality goods. In this way, there is an increase in production of high quality goods post reform.

Additionally, I examine new entrants separately in short and long quality ladder industries using ASI data. Firms need to pay a fixed cost to produce high quality goods and product reservation constrained small firms from growing above a threshold of investment in plant and machinery. Following deregulation, we expect an increase in entry in long quality ladder industries (with a higher scope for quality differentiation) as these were more constrained prior to the reform. Table A2 reports the results. In line with the quality hypothesis, I find that the increase in entry in the de-regulated market post reform is concentrated in long quality ladder product markets.

I interpret my results as an increase in production in the higher quality segment of the market. This implies improved availability of higher quality inputs for firms in the downstream market.

5.2 Firm size in the de-regulated market

I start by estimating the effect of the reform on the average size of firms in a district in the de-regulated market to ascertain that firm size, indeed, responds to the regulation change. Martin et al. (2017) estimate a within-firm effect and show that following de-reservation small incumbents shrink while large incumbents and entrants grow. I, on the other hand, estimate an average effect at the district level.

In order to characterise the distribution after the de-regulation, I compare the mean of measures of size (employment and fixed assets) before and after the reform in a standard difference-in-differences regression. The dependent variable in Table 4 is the mean size in a given product market in a given year of all firms in a district. Size is calculated based on the proportion of revenue from a given product. For example, if a firm produces two products that bring equal revenue, then I assume that half its workers are employed in the production of the first product and the other half in the production of the second. The average number of people

employed and average fixed assets held on the balance sheet are used as dependent variables. Columns 1 and 2 of Table 4 report the results of the regression with firms unaffected by the reform, i.e., after excluding downstream and upstream firms, as a control group. The coefficients in both column 1 and 2 are positive and statistically significant. The point estimate implies an increase in employment of 5.9% and an increase in fixed assets of 6.3% of firms in the de-regulated market following the reform compared to other firms. Columns 3 and 4 restricts the sample to firms producing deregulated products and, thus, employs only firms in the deregulated market so far unaffected by the regulation change as a control group. The coefficients are positive and statistically significant. Put together, I observe an increase in the average size of deregulated firms in a district. My results are in line with those of Martin et al. (2017).

5.3 Downstream entry

In this section I investigate the effect of removal of growth constraints in one product market on to entry in the downstream product markets. I estimate equation (1) and (2). Figure 3 and Table 5 report the results for the dynamics of entry and Table 5 presents the average effect.

The dependent variable is the log of number of new establishments. Column 1 and 2 of Table 5 present results for the full sample. The coefficient is statistically indistinguishable from zero.

As discussed in the previous section, the mechanism operates via improved access to high quality raw materials for downstream firms. In short quality ladder industries, there is low dispersion in quality whereas in long quality ladder industries there is higher dispersion in quality of products. In other words, the range of quality within a product market is higher in long quality ladder industries. In such product markets with a higher range in quality, small firms producing low quality intermediate goods are more likely to constrain downstream firms. A more efficient input market and increase in production of high quality goods should, thus, matter more for downstream markets using long quality ladder inputs. Columns 3 and 4 explore this heterogeneity and show results separately for downstream products that

are produced using short and long quality ladder inputs.

I find an increase in downstream entry following de-regulation for products that are produced using long quality ladder inputs. The coefficient implies that the reform led to an increase in entry of 6.2% in downstream markets that use long quality ladder inputs. Column 4 presents results with state × year fixed effects. The result remains quantitatively and qualitatively similar.

In addition, I show in Table A3 that the results are robust to including state × product fixed effects. State × product fixed effects control for time-invariant product specific regional trends such as state specific product procurement policies. In addition, they also account for local product specific skills of entrepreneurs that may lead entrepreneurs in some regions to start more firms in certain product markets. The results in column 1 are economically significant but statistically noisy. Columns 2 and 4 report results for bins with at least 3 observations in each state × product bin. Upon removing observations with only 2 observations in each state × product bin, the results in column 2 are economically similar and statistically significant. In addition, columns 3 and 4 control for state × year fixed effects.

Columns 1 and 2 of Table 5 present results for the dynamics of entry. The coefficients for the years before the reform are all statistically insignificant and show no pre-trends. Column 2 reports the results for downstream markets that use long quality ladder inputs. The coefficients for years 2 and 3 in column 2 are positive and statistically significant. They imply a 10.9%, and 7.0% increase in the number of new establishments formed two and three years after the de-regulation respectively. The coefficient for entry one year after the reform is positive but not statistically significant. In addition, I do not find any effect of the reform on entry in downstream markets that use short quality ladder inputs as can be seen in Column 1.

A positive Γ_n coefficient implies an increase in entry following regulation that no longer constrained firms in the input market from growing. This lends credence to the hypothesis that incentivising firms to remain small by way of subsidies may lead them to become inefficient and, in turn, constrain linked markets.

5.4 Quality of entrants

Having established that the reform led to higher entry, I now examine the quality of the entrants. If it were the lower quality firms (e.g., those started by life-style or subsistence entrepreneurs) that were constrained from entering prior to the de-regulation then I should observe a decrease in the quality of the new entrants. However, if it is difficult to establish ex-ante which firms will be successes and the reform encouraged experimentation by easing certain input market constraints then I should not observe any change in the quality of entrants. As in Hombert et al. (2020), I examine both ex-ante and ex-post measures of firm performance in order to assess the quality of entrants.

First, I provide evidence on an ex-ante measure of firm quality, namely, initial value of plant and machinery which I call startup assets. Table 6, Panel A presents the results for the entrepreneurship dataset. The coefficient is indistinguishable from zero implying that firms created in de-regulated downstream markets post-reform are similar in size to those created before the reform. On ex-ante measures of size, the firm quality distribution doesn't seem to change. This is particularly compelling in light of evidence by Ayyagari et al. (2017) that highlights the importance of initial starting conditions in influencing the growth trajectory of firms in the initial years of a firm's life cycle in India. This evidence of no significant change in firm quality is consistent with the experimentation channel.

Next, I examine ex-post measures of firm quality. Panel B of Table 6 reports the results on growth and probability of distress. The MSME census includes questions on output and value added for 3 years (FY2005-2007) and net worth for 2 years (FY2006-07). I use these data to understand the dynamics of these small firms. Columns (1) and (2) present results on the full sample for output of de-regulated downstream firms compared to downstream incumbents and other unrelated firms. There is no statistically significant observable difference in the outcomes of these firms.

It may be the case that the reform affects not only the composition of firms but also the growth trajectory of firms. And in this way, new firms formed may appear to be of equivalent or better quality because they are now able to grow faster. In

order to address this concern, I examine firms in the year after creation. In the year after creation, the effect of the reform on growth trajectories is likely to be minimal. Columns (3) and (4) present the results. I do not find any statistically significant difference in output. Overall, these results are inconsistent with a deterioration in quality of the new downstream entrants.

Taken together, the results are consistent with post-reform downstream entrants having a similar quality distribution as incumbents. This is evidence in favor of the experimentation hypothesis.

5.5 Incumbent firms in the downstream market

Next, I look at the effect of the reform on growth of downstream incumbents. If indeed the reform improved access to raw materials for downstream firms, then we would expect downstream incumbents to grow following the reform. In particular, it is those firms that were previously most constrained prior to the reform that will benefit most from it. Re-allocation occurs when firms with high productivity expand while those with low productivity shrink and exit. This process of re-allocation may be slowed down by input market frictions (Syverson, 2011). The de-reservation reform eased one such friction by making high quality inputs available at lower prices. A direct prediction of the reform would then be that following an easing of growth constraints on firms in the input market, productive downstream firms expand and less productive ones shrink.

The ASI dataset with establishment level data is best suited to answer this question. It provides information on a number of variables that will allow me to measure productivity and growth. I estimate equation (3) and Table 7 presents the results. Productivity is measured as a residual from an OLS regression of log of total output on log of total inputs used including fixed assets, labor and materials. Firms are classified as high (low) productivity if they have above (below) median productivity in the most recent year before the reform. The productivity of firms unrelated to the reform is measured based on the first time they appear in the dataset. Downstream entrants are excluded in this regression by design since they do not appear in the dataset before the reform.

First, I evaluate the effect of the reform on sales using a triple difference-in-differences specification. I find that high productivity firms increase sales compared to their less productive counterparts following the reform. The coefficient in column (1) of Table 7 can be interpreted as an increase of 21.1% in sales for firms with high productivity compared to less productive firms following the regulation change. This result confirms Balasundharam's (2019) finding that productive downstream firms expand their output following the reform. I, further, study the dynamics of sales growth. Table A3 reports the results of the dynamic specification and Figure 5 provides a graphical representation. I estimate two separate difference-in-differences specifications - one for firms with above median productivity and another for those with below median productivity. Though there are no pre-trends in column (5), there is are pre-trends in column (1). Downstream incumbents with below median productivity shrink following the reform.

The second measure of growth that I use is profits. In line with the hypothesis, profits increase for firms with above median productivity and decrease for those with below median productivity compared to unrelated firms. This can be seen from column (3) of Table 7. The coefficients imply a 33.1% decrease in profits for below median productivity firms compared to unrelated firms and a 61.0% increase for above median productivity firms compared to below median productivity firms after the reform. Looking at the dynamic specification, we can see that there are pre-trends. Absent the reform, low productivity firms were shrinking and high productivity firms were growing in terms of profits. The reform may have had an effect in speeding up the process. The coefficients in the dynamic specification in Table A3 post-reform are statistically significant and economically important. This can be clearly seen from Figure 5. Results using profit margins as a dependent variable are similar and are presented in Figure 5. This provides further evidence that high productivity firms expand and low productivity firms shrink.

Next, I examine whether this process of reallocation occurs by firms employing more labor, investing more or simply employing more raw materials. The coefficient in column (2) of Table 7 implies a 4.0% increase in labour employed by downstream firms with above median productivity compared to less productive downstream firms. Figure 5 also provides evidence of increase in labor employed. Invest-

ment, as shown in column (5), by downstream firms with above median productivity increases by 25.2% compared to firms with below median productivity. The effect is driven primarily by a decline in investment by firms with below median productivity following the reform. Column (8) of Table A3 presents results from the dynamic specification. There are no pre-trends and we can see a statistically significant decline in investment for downstream firms with below median productivity following the reform. I, unfortunately, do not observe research and development spending in my dataset.

As discussed earlier, the mechanism operates via improved access to high quality raw materials for downstream firms. In product markets with a higher range in quality (long quality ladder), small firms producing low quality intermediate goods are more likely to constrain downstream firms. A more efficient input market and increase in production of high quality goods should, thus, matter more for downstream markets using long quality ladder inputs. In line with the hypothesis, the results are stronger for downstream incumbents using long quality ladder inputs. Table A4 and Figure 5 present the results. Overall, my results support the hypothesis that productive downstream firms grow following de-reservation and less productive firms shrink.

5.6 Robustness tests

In this section, I provide evidence against alternate explanations for my results such as hold up and uncertainty of buying from small firms.

5.6.1 Hold up

An alternative explanation for my findings could be a hold-up story. An increase in competition in the input market and a reduction in price of inputs could improve the bargaining position of downstream firms and reduce the ability of the upstream suppliers to hold-up their customers ex-post. This would increase the downstream customers incentives to invest ex-ante. If this were true, we would expect the investment response to be strongest for downstream customers with low bargaining power. I use firm size as a proxy for bargaining power and do not find any evidence in favour of a hold-up story. It is, in fact, the larger firms that increase investment

post-reform. Table 8 reports the result.

5.6.2 Uncertainty of access to inputs

Another explanation for my findings could be uncertainty or risks associated with access to inputs when buying predominantly from small firms. Small firms typically have higher death rates. The risk that these small suppliers might go under or stop operating may constrain downstream markets that source inputs from these firms. Once large firms are allowed to enter and expand post reform, this risk will be mitigated and downstream firms will be able to grow. If this is the case, then we expect older and more established small firms to have lower risk. And, one prediction would be that these older firms should, then, be able to command a higher price compared to their younger counterparts in product markets prior to de-reservation. A regression of log price on firm age (defined either as a continuous variable or as age bins) within the same small size bracket in the same product markets does not reveal a statistically significant difference. Table 9 presents the results.
In addition, I divide the regulated product market prior to the reform based on proportion of old firms to small firms. Product markets with a higher proportion of older more established firms will pose lower risks on the downstream markets. Under an uncertainty of access to inputs story, we expect a lower response for downstream markets that source inputs from input markets with a higher proportion of older, more established firms. I divide product markets based on both the number of old firms to small firms and the proportion of output produced by old firms compared to small firms in the regulated markets prior to the reform. Table 9 reports the results. Column (1) displays the result of reallocation in the downstream market using proportion of old to small firms and column (2) uses proportion of output produced by old to small firms. The results are similar for downstream markets that source inputs from markets with above and below median proportion of old firms. This evidence is inconsistent with an uncertainty or risk story.

6 Conclusion

In this paper, I study the implications of a reform whereby hundreds of products stop being reserved for exclusive production by small firms. The reform led to increased entry in the downstream market. The new firms created were not of worse quality (on observables) relative to firms created before the reform. These results suggest that firms that are forced to remain small by way of regulation tend to become inefficient and this inefficiency can creep into related markets along the supply chain. Put differently, business dynamism in one market has positive spill-over effects on linked downstream markets.

In my setting, the mechanism operates via segmentation of the reserved product market by quality (with small firms producing low quality goods) and an increase in competition in the high quality segment of the market following de-regulation. This implies improved availability of high quality products at a lower price in the downstream market. In addition to increased entry, I also document higher growth among downstream incumbents post-reform. Productive downstream firms grow while less productive ones shrink following easing of input market constraints. Interestingly, this growth is driven by re-allocation of existing resources and assets, thereby widening the productivity gap between high and low productivity firms. Less productive firms, however, respond by borrowing more in order to continue operating. This zombie lending (owing to frictions in the banking market) slows down the process of re-allocation. Overall, the results are in line with easing of growth constraints in one market leading to more dynamism in downstream markets. In light of these results, it becomes even more important to understand the reasons for declining business dynamism observed in the recent years.

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Table 1: Summary statistics: MSME census

This table presents the summary statistics on the number of new firms founded each year and the average values of fixed assets at start-up in millions of 2010 rupees and employment as of 31 March 2007.

Founding year	Number of establishments	Employment in 2007	Assets at start-up
1991	30,848	6.90	2.26
1992	37,782	6.65	1.92
1993	32,409	7.29	2.13
1994	34,322	7.23	1.98
1995	43,922	6.85	1.83
1996	41,652	7.47	1.77
1997	42,236	7.08	1.79
1998	45,047	7.00	1.54
1999	38,030	6.94	1.40
2000	53,124	7.13	1.28
2001	45,532	6.28	1.07
2002	45,418	7.20	1.23
2003	46,393	6.59	0.98
2004	47,630	6.46	1.00
2005	45,910	6.76	0.95
2006	37,941	6.39	1.04

	N	Mean	Median	Std dev	p10	p90
Full sample						
No of entrants	115,810	1.989	1.008	2.650	1.000	4.000
log(new estab)	115,810	0.368	0.008	0.644	0.000	1.386
Downstream firms	115,810	0.537	1.000	0.499	0.000	1.000
Down dereg.	115,810	0.088	0.000	0.283	0.000	0.000
Downstream entrants						
No of entrants	62,137	2.108	1.011	2.787	1.000	4.004
log(new estab)	62,137	0.409	0.011	0.671	0.000	1.387
Down dereg.	62,137	0.163	0.000	0.370	0.000	1.000

Table 2: Summary statistics: ASI data

Year	No of establishments	Employment	Fixed assets(Rs mn)
2001	6,973	167.70	186.35
2002	10,881	138.02	127.10
2003	12,982	125.86	115.96
2004	17,756	101.74	90.75
2005	15,517	110.93	96.62
2006	16,495	110.43	93.78
2007	16,950	113.10	100.02

	N	Mean	Median	Std dev	p10	p90
Full sample						
Downstream firms	97,554	0.259	0.000	0.438	0.000	1.000
Treated × Post	97,554	0.093	0.000	0.291	0.000	0.000
Sales(Rs mn)	97,550	329.779	26.961	1,394.673	1.967	572.311
Fixed assets(Rs mn)	96,279	108.058	4.498	566.956	0.280	139.762
Profit(Rs mn)	97,554	69.234	2.543	357.759	-0.140	97.299
Capex(Rs mn)	96,290	19.707	0.355	113.919	0.000	20.399
Employment	97,532	118.615	32.000	291.483	8.000	253.000
Bank debt(Rs mn)	81,759	97.497	7.351	450.593	0.489	137.430
Debt/assets	81,185	0.497	0.388	0.540	0.052	0.930
Capex/assets	95,581	0.076	0.013	0.182	0.000	0.190
Downstream firms						
Treated × Post	25,293	0.359	0.000	0.480	0.000	1.000
Sales(Rs mn)	25,293	470.012	52.962	1,552.059	3.664	990.292
Fixed assets(Rs mn)	25,209	151.951	10.601	598.732	0.681	279.879
Profit(Rs mn)	25,293	110.107	5.585	436.015	-0.124	211.344
Capex(Rs mn)	25,212	30.188	1.162	135.114	0.000	46.052
Employment	25,289	140.623	41.000	279.108	9.000	354.000
Bank debt(Rs mn)	22,479	131.257	11.347	498.619	0.718	233.681
Debt/assets	22,374	0.477	0.376	0.525	0.043	0.890
Capex/assets	25,055	0.090	0.025	0.191	0.000	0.222

Table 3: Segmentation of product market by quality

This table reports the results on segmentation of the market into low and high quality based on size. Dereg is a dummy variable that switches from 0 to 1 when any product produced by the firm is deregulated. Size is defined based on a threshold for investment in plant and machinery, with firms below Rs. 10 million classified as small, firms from Rs. 10-50 million classified as medium and those above Rs. 50 million classified as large. In Panel B, columns (1) and (2) report results for long quality ladder industries i.e. those industries where there exists a high dispersion in quality of products. This definition is taken from Khandelwal (2010). Columns (3) and (4) report results for short quality ladder industries i.e. those industries where there exists only a low dispersion in quality of products. Standard errors are clustered at the firm level.

Panel A. Price differential before the reform			
	(1)	(2)	(3)
	log(Price)	log(Price)	log(Price)
Medium	0.147**	0.139***	0.144***
	(2.251)	(2.713)	(8.836)
Large	0.357**	0.161*	0.197***
	(2.181)	(1.932)	(7.923)
Product FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Sample	Regulated	Regulated	Not regulated
Years	Pre	Pre	All
"*Clean*" prices	No	Yes	Yes
Observations	7135	5681	109327
R^2	0.855	0.897	0.797

Panel B. Entrants produce high quality goods		
	(1)	(2)
	log(Price)	log(Price)
Entrant	0.301*	0.222*
	(1.959)	(1.829)
Product FE	Yes	Yes
Year FE	Yes	Yes
Sample	Regulated	Regulated
Years	Post	Post
"*Clean*" prices	No	Yes
Observations	1385	1027
R^2	0.634	0.827

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Average size of firms following the deregulation

The table reports the effect of de-regulation on the average size of firms at the district level. Dereg is a dummy variable that switches from 0 to 1 when a product is deregulated. The dependent variable in columns (1) and (3) is the log of the average number of persons employed by firms operating in a given product market. The dependent variable in columns (2) and (4) is the log of the average fixed assets employed by firms operating in a given product market. Columns (1) and (2) present results with unrelated manufacturing firms as a control group whereas columns (3) and (4) employ only firms in the deregulated market so far unaffected by the regulation change as a control group. Standard errors are clustered at the product level.

	(1) log(avg emp)	(2) log(avg FA)	(3) log(avg emp)	(4) log(avg FA)
Dereg	0.059**	0.063*	0.062**	0.118***
	(2.406)	(1.940)	(2.315)	(3.265)
Product × State FE	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	170298	170215	51697	51687
R^2	0.526	0.598	0.494	0.590

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Downstream entry

The table reports the effect of de-regulation on downstream entry. The dependent variable in panel A is the log of number of new establishments. Columns (3) and (4) report results for downstream markets that use short and long quality ladder inputs. Short QL is a dummy variable that takes the value 1 for downstream markets that use short quality ladder (below median quality dispersion) de-regulated inputs. Long QL is a dummy variable that takes the value 1 for downstream markets that use long quality ladder (above median quality dispersion) de-regulated inputs. Standard errors are clustered at the product level. The regression equation is:
$y_{p,d,t} = \beta_1 DownDereg_{p,t} + \delta_p + \delta_t + \delta_d + \varepsilon_{p,d,t}$

Panel A. Average effect				
	(1)	(2)	(3)	(4)
	log(#entrants)	log(#entrants)	log(#entrants)	log(#entrants)
DownDereg	0.016	0.012		
	(0.711)	(0.674)		
DownDereg × Short QL inputs			-0.017	-0.017
			(-0.951)	(-1.007)
DownDereg × Long QL inputs			0.062**	0.055**
			(1.983)	(2.257)
District FE	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes
State × Year FE	No	Yes	No	Yes
Year FE	Yes	No	Yes	No
Observations	115282	115267	113605	113590
R^2	0.217	0.224	0.217	0.224

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Downstream entry contd.

The table reports the effect of de-regulation on downstream entry. The dependent variable in columns (1) and (2) is the log of number of new establishments. Column (1) reports the results for downstream markets using short quality ladder inputs and column (2) shows the results for downstream markets using long quality ladder inputs. Standard errors are clustered at the product level. The regression equation is:
$y_{p,d,t} = \sum_{n=-5,n!=-1}^{3} \Gamma_n \mathbb{1}(n)_{p,t} + \delta_p + \delta_t + \delta_d + \varepsilon_{p,d,t}$

Panel B. Dynamic effect		
	(1)	(2)
	Short QL inputs	Long QL inputs
-5	-0.003	0.010
	(-0.130)	(0.252)
-4	0.022	-0.012
	(0.920)	(-0.386)
-3	0.009	-0.024
	(0.369)	(-0.737)
-2	0.003	-0.011
	(0.189)	(-0.608)
0	0.009	0.026
	(0.336)	(1.134)
1	-0.007	0.050
	(-0.381)	(1.566)
2	-0.029	0.109***
	(-1.254)	(3.911)
3	-0.011	0.070**
	(-0.392)	(2.463)
District FE	Yes	Yes
Product FE	Yes	Yes
Year FE	Yes	Yes
Observations	86410	82092
R^2	0.214	0.223

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Quality of downstream entrants

The table reports the effect of de-regulation on quality of downstream entrants. The dependent variable in panel A is the log of initial value of plant and machinery. DownDereg is a dummy variable that takes the value 1 for firms in downstream markets started after the reform, 0 otherwise. Standard errors are clustered at the product level. The regression equation is: $y_{i,p,d,t} = \beta_1 DownDereg_{i,t} + \delta_{s,p} + \delta_t + \delta_d + \varepsilon_{p,d,t}$

Panel A. Ex-ante measure		
	(1)	(2)
	log(startup assets)	log(startup assets)
DownDereg	-0.005	
	(-0.156)	
DownDereg × Short QL inputs		0.006
		(0.205)
DownDereg × Long QL inputs		-0.010
		(-0.210)
District FE	Yes	Yes
State × Product FE	Yes	Yes
Start year FE	Yes	Yes
Observations	693520	693520
R^2	0.654	0.654

Panel B. Ex-post measures				
	Full sample		Within 1yr of entry	
	(1)	(2)	(3)	(4)
	log(output)	log(output)	log(output)	log(output)
DownDereg	-0.019		0.016	
	(-0.900)		(0.321)	
DownDereg × Short QL inputs		-0.015		0.125
		(-0.391)		(1.266)
DownDereg × Long QL inputs		-0.020		-0.002
		(-0.756)		(-0.039)
District × Firm age FE	Yes	Yes	Yes	Yes
State × Product × Firm age FE	Yes	Yes	Yes	Yes
Year of entry × Firm age FE	Yes	Yes	Yes	Yes
Observations	906839	906839	92024	92024
R^2	0.610	0.610	0.582	0.582

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7: Downstream incumbent firms - productive firms grow

The table reports the effect of the de-regulation on downstream incumbents by ex-ante productivity. The dependent variable is the log of sales, labour employed, profits, investment, and bank debt and profit margins. Downstream firms are classified as having low or high productivity based on below or above median productivity in the most recent year before the reform. DownDereg is a dummy variable that takes the value 1 for downstream firms after the reform, 0 otherwise. Standard errors are clustered at the product level. The regression equation is: $y_{i,p,t} = \beta_1 DownDereg_{p,t} + \beta_2 DownDereg_{p,t} \times Productivitydummy_i + \delta_i + \delta_t + \varepsilon_{i,p,t}$

	(1) log(sales)	(2) log(labour)	(3) log(profit)	(4) Profit margin	(5) log(capex)	(6) log(debt)
DownDereg	-0.084***	-0.021*	-0.331***	-0.099***	-0.199**	0.007
	(-4.850)	(-1.768)	(-13.172)	(-8.103)	(-2.198)	(0.351)
DownDereg × High productivity	0.212***	0.040**	0.610***	0.190***	0.252**	0.004
	(9.213)	(2.420)	(17.218)	(11.739)	(2.365)	(0.152)
log(assets)	0.465***	0.213***	0.368***	-0.009*	0.306***	0.460***
	(37.854)	(25.317)	(33.886)	(-1.670)	(6.734)	(33.671)
Establishment FE	Yes	Yes	Yes	Yes	Yes	Yes
Year × Productivity bin FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	123225	90604	106493	123223	122952	120063
R^2	0.953	0.958	0.915	0.648	0.736	0.926

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 8: Robustness - hold up

The table reports a robustness test for the effect of the de-regulation on investment by downstream incumbents. The sample is restricted to firms with above median ex-ante productivity. The dependent variable is the log of investment. Downstream firms are classified as having low or high productivity based on below or above median productivity in the most recent year before the reform. DownDereg is a dummy variable that takes the value 1 for downstream firms after the reform, 0 otherwise. Large is a time-invariant size dummy that takes the value 1 for firms with fixed assets above a threshold of Rs. 50million and 0 otherwise. It is defined based on the first time the firm appears in the sample. Standard errors are clustered at the product level. The regression equation is: $y_{i,p,t} = \beta_1 DownDereg_{p,t} + \beta_2 DownDereg_{p,t} \times Large_i + \delta_i + \delta_t + \varepsilon_{i,p,t}$

	(1)
	log(capex)
DownDereg	0.035
	(0.304)
DownDereg × Large	0.348**
	(2.280)
log(assets)	0.427***
	(6.814)
Establishment FE	Yes
Year × Size bin FE	Yes
Observations	60796
R^2	0.771

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9: Robustness - old firms as suppliers

This table reports the association between firm age and log of prices for small firms in the regulated market prior to the reform. Small firms are categorised into age bins: upto 5 years, between 5 and 10 years old; and older than 10 years. Size is defined based on a threshold for investment in plant and machinery, with firms below Rs. 10 million classified as small, firms from Rs. 10-50 million classified as medium and those above Rs. 50 million classified as large.

	(1)	(2)	(3)
	log(Price)	log(Price)	log(Price)
$5 < Age < 10$	0.016	0.015	
	(0.223)	(0.191)	
Old firms(> 10)	0.069	0.063	
	(1.019)	(0.885)	
Firm age			-0.001
			(-1.075)
log(assets)		0.018	0.021
		(1.154)	(1.356)
Product FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Sample	Regulated	Regulated	Regulated
Years	Pre	Pre	Pre
"*Clean*" prices	Yes	Yes	Yes
Observations	6427	6399	6399
R^2	0.876	0.876	0.876

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9: Robustness - old firms as suppliers contd..

The table reports the differential effect of age of suppliers in the input market post reform on downstream incumbents by ex-ante productivity. The dependent variable is the log of sales. Downstream firms are classified as having low or high productivity based on below or above median productivity in the most recent year before the reform. DownDereg is a dummy variable that takes the value 1 for downstream firms after the reform, 0 otherwise. Old suppliers are firms with age above 10 years. De-regulated markets in column 1 are classified into above median proportion of old firms as suppliers. Alternatively, in column 2, de-regulated markets are classified as older suppliers if above median proportion of output is produced by old suppliers. Standard errors are clustered at the product level.

	(1)	(2)
	log(sales)	log(sales)
DownDereg × Younger suppliers	-0.097***	
	(-3.864)	
DownDereg × Older suppliers	-0.090**	
	(-2.374)	
DownDereg × High productivity × Younger suppliers	0.226***	
	(6.312)	
DownDereg × High productivity × Older suppliers	0.225***	
	(5.965)	
DownDereg × Younger suppliers		-0.104***
		(-3.360)
DownDereg × Older suppliers		-0.085***
		(-2.889)
DownDereg × High productivity × Younger suppliers		0.197***
		(4.866)
DownDereg × High productivity × Older suppliers		0.249***
		(7.485)
log(assets)	0.456***	0.456***
	(34.385)	(34.374)
Establishment FE	Yes	Yes
Year × Productivity bin FE	Yes	Yes
Observations	107986	107986
R^2	0.953	0.953

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Figure 1: Evolution of definition of small firms

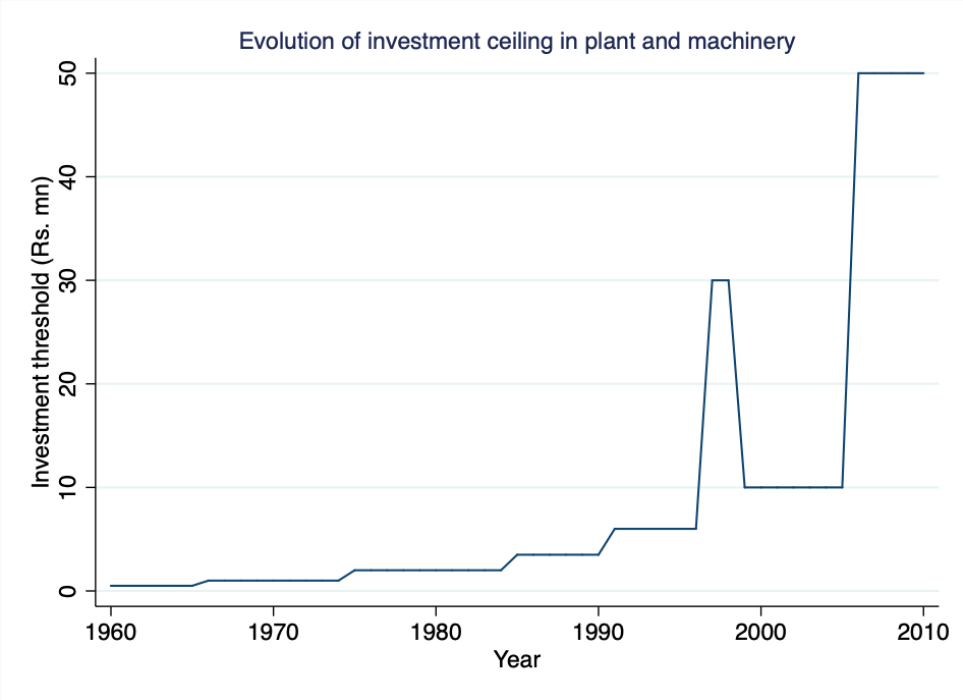


Figure 2: Number of downstream products affected by the deregulation by year

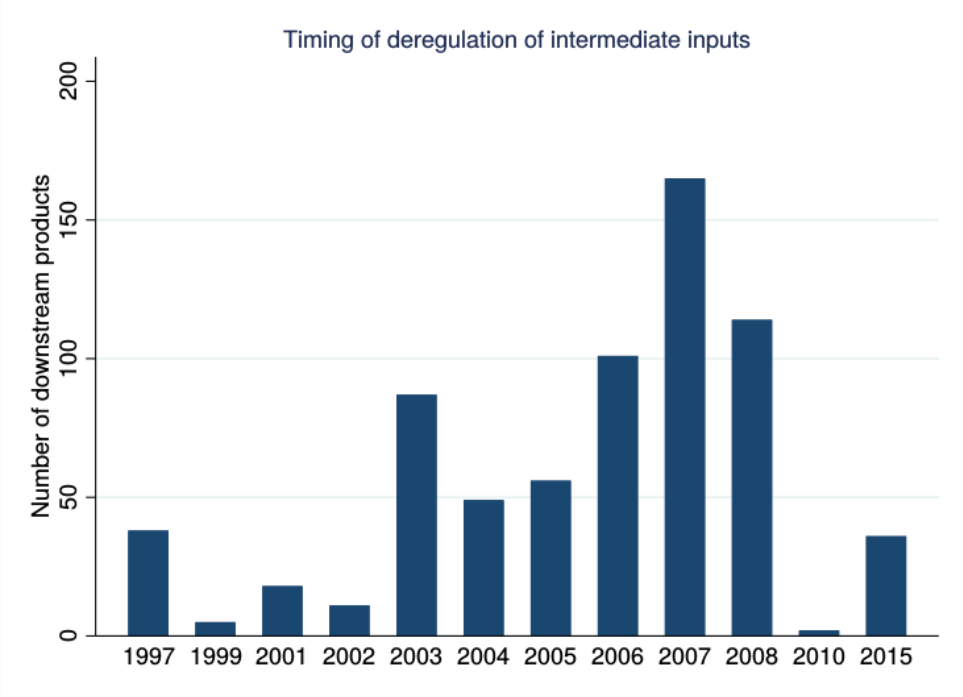
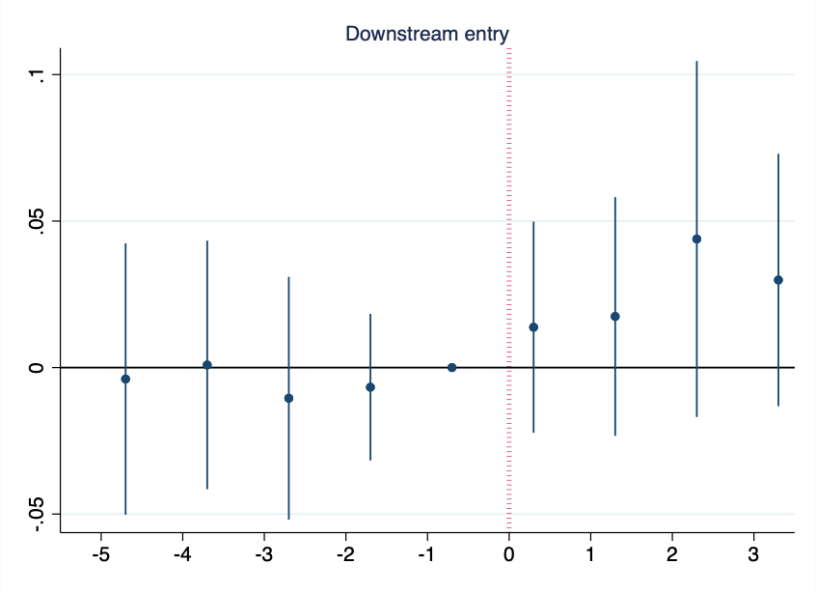


Figure 3: Downstream entry dynamics

The figure presents the effect of the de-regulation on downstream entry. The dependent variable is the log of the number of new establishments. Standard errors are clustered at the product level. The regression equation is: $y_{p,d,t} = \sum_{n=-5,n!=-1}^{3} \Gamma_n \mathbb{1}(n)_{p,t} + \delta_{s,p} + \delta_t + \delta_d + \varepsilon_{p,d,t}$

(a) Panel A.



(b) Panel B.

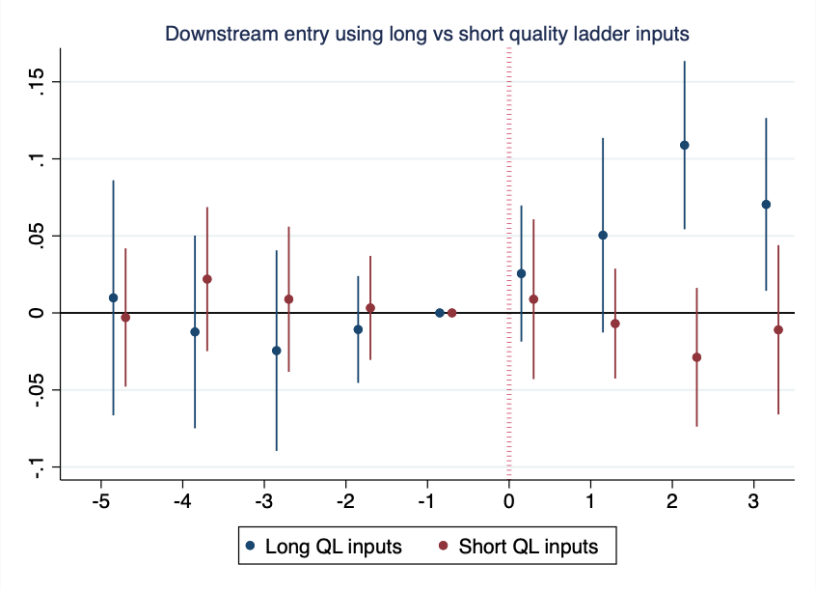


Figure 4: Post-reform dynamics of downstream incumbents by productivity

The figure reports the effect of the dynamics of the de-regulation on downstream incumbents by ex-ante productivity. Downstream firms are classified as having low or high productivity based on below or above median productivity in the most recent year before the reform. Standard errors are clustered at the product level. The regression equation is: $y_{i,t} = \sum_{n=-4,n!=-1}^{3} \Gamma_n \mathbb{1}(n)_{i,t} + \delta_i + \delta_t + \varepsilon_{i,t}$

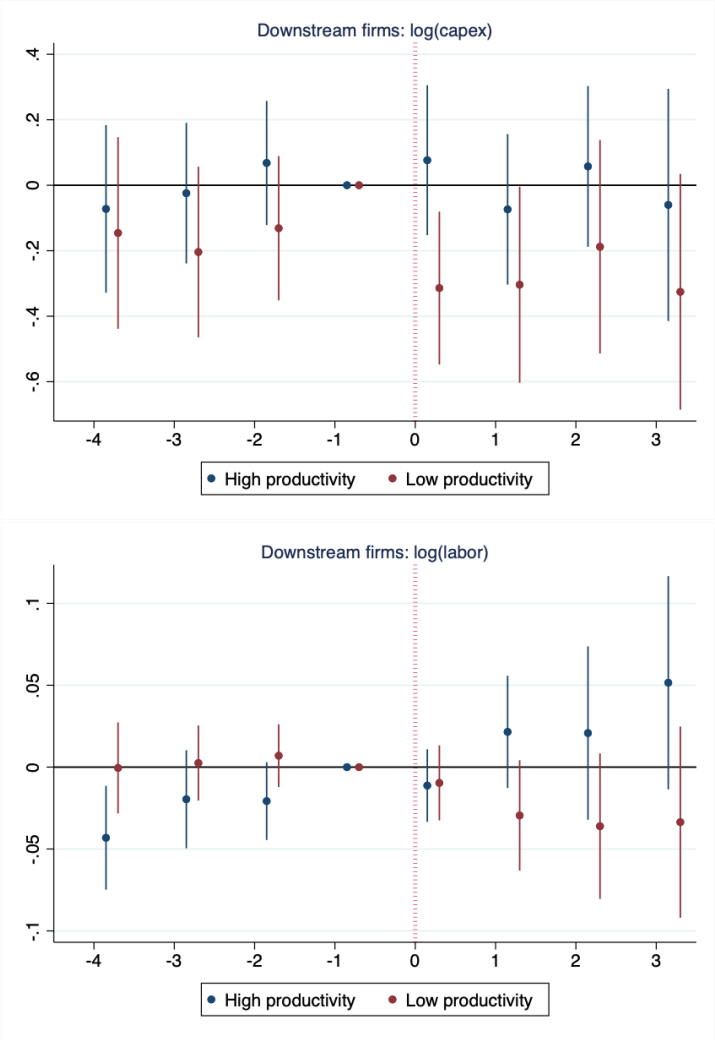
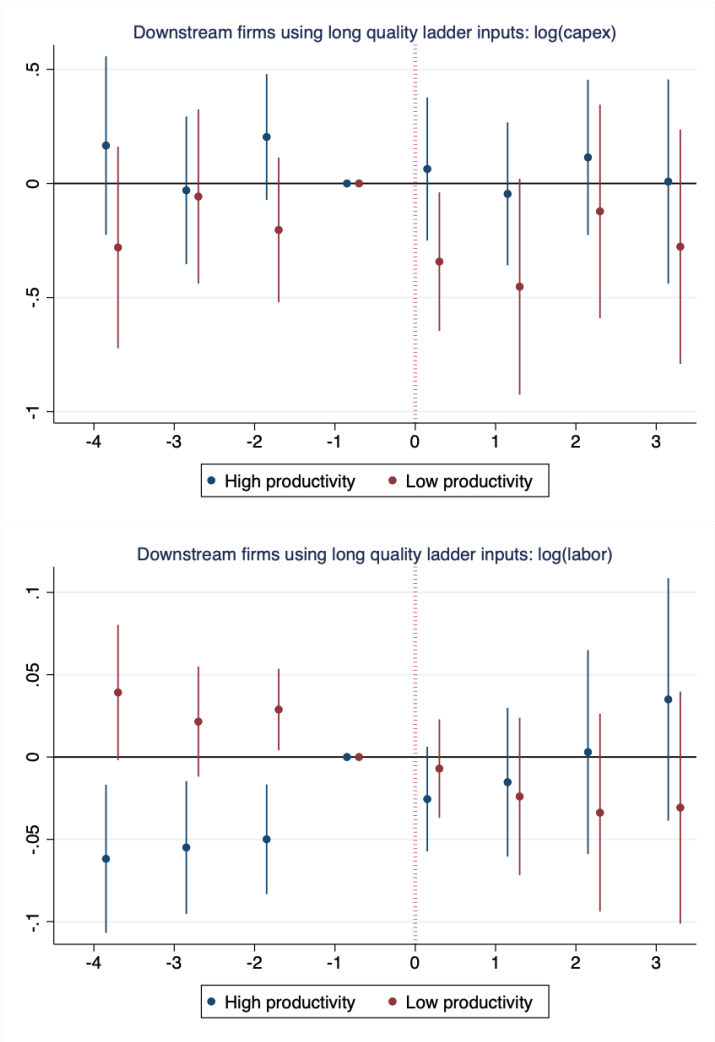


Figure 5: Downstream incumbents using long quality ladder inputs

The figure reports the effect of the dynamics of the de-regulation on downstream incumbents by ex-ante productivity. Downstream firms are classified as having low or high productivity based on below or above median productivity in the most recent year before the reform. Standard errors are clustered at the product level. The regression equation is: $y_{i,t} = \sum_{n=-4,n!=-1}^{3} \Gamma_n \mathbb{1}(n)_{i,t} + \delta_i + \delta_t + \varepsilon_{i,t}$



A Appendix

Table A1: Economies of scale

	(1) log(Output)	(2) log(Output)	(3) log(Output)
log(Fixed assets)	0.067***	0.052***	0.057***
	(50.444)	(30.206)	(22.536)
log(Cost of prodn)	0.920***	0.930***	0.926***
	(582.148)	(451.979)	(319.053)
Industry × Year FE	Yes	Yes	Yes
Observations	65265	34079	18584
R^2	0.959	0.956	0.948

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A2: New entry in deregulated market

	(1) log(#entrants)	(2) log(#entrants)	(3) log(#entrants)
Dereg	-0.023	-0.011	-0.005
	(-0.670)	(-0.289)	(-0.127)
Dereg × Long QL products	0.158**	0.250***	0.228***
	(2.117)	(2.724)	(2.703)
District FE	Yes	Yes	Yes
State × Product FE	No	Yes	Yes
State × Year FE	No	No	Yes
Year FE	Yes	Yes	No
Product FE	Yes	No	No
Observations	40931	32602	32564
R^2	0.232	0.370	0.388

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A3: Robustness: Downstream entry

The table reports the effect of de-regulation on downstream entry. The dependent variable in panel A is the log of number of new establishments. Columns (3) and (4) report results for downstream markets that use short and long quality ladder inputs. Short QL is a dummy variable that takes the value 1 for downstream markets that use short quality ladder (below median quality dispersion) de-regulated inputs. Long QL is a dummy variable that takes the value 1 for downstream markets that use long quality ladder (above median quality dispersion) de-regulated inputs. Standard errors are clustered at the product level. The regression equation is:
$y_{p,d,t} = \beta_1 DownDereg_{p,t} + \delta_p + \delta_t + \delta_d + \varepsilon_{p,d,t}$

height	(1) log(#entrants)	(2) log(#entrants)	(3) log(#entrants)	(4) log(#entrants)
DownDereg × Short QL inputs	-0.003	-0.004	-0.003	-0.004
	(-0.150)	(-0.188)	(-0.129)	(-0.177)
DownDereg × Long QL inputs	0.044	0.047*	0.030*	0.030**
	(1.637)	(1.765)	(1.921)	(2.048)
District FE	Yes	Yes	Yes	Yes
State × Product FE	Yes	Yes	Yes	Yes
State × Year FE	No	No	Yes	Yes
Year FE	Yes	Yes	No	No
Observations	104787	98155	104759	98133
R^2	0.359	0.348	0.368	0.357

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A3: Downstream incumbents - dynamics of productive firms

The table reports the effect of the dynamics of the de-regulation on downstream incumbents by ex-ante productivity. The dependent variable is the log of sales, profits, bank debt and productivity. Downstream firms are classified as having low or high productivity based on below or above median productivity in the most recent year before the reform. $\mathbb{1}(n)$ is an indicator function that takes the value 1, n years after de-reservation of inputs used, and 0 otherwise. Standard errors are clustered at the product level. The regression equation is: $y_{i,t} = \sum_{n=-4,n!=-1}^{3} \Gamma_n \mathbb{1}(n)_{i,t} + \delta_i + \delta_t + \varepsilon_{i,t}$

	High productivity firms				Low productivity firms			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	log(sales)	log(labour)	log(profit)	log(capex)	log(sales)	log(labour)	log(profit)	log(capex)
-4	-0.163***	-0.043***	-0.255***	-0.072	0.006	-0.000	0.250***	-0.146
	(-6.299)	(-2.668)	(-6.601)	(-0.553)	(0.254)	(-0.035)	(7.579)	(-0.977)
-3	-0.085***	-0.020	-0.148***	-0.024	0.025	0.003	0.216***	-0.204
	(-3.849)	(-1.285)	(-4.304)	(-0.221)	(1.166)	(0.214)	(6.151)	(-1.534)
-2	-0.040**	-0.021*	-0.086***	0.068	0.010	0.007	0.102***	-0.131
	(-2.265)	(-1.712)	(-2.918)	(0.704)	(0.598)	(0.713)	(3.894)	(-1.169)
0	0.030*	-0.011	0.078***	0.076	-0.031**	-0.010	-0.096***	-0.314***
	(1.829)	(-0.997)	(3.029)	(0.655)	(-2.065)	(-0.824)	(-3.570)	(-2.637)
1	0.075***	0.022	0.146***	-0.074	-0.061***	-0.030*	-0.179***	-0.304**
	(3.451)	(1.231)	(4.246)	(-0.628)	(-3.078)	(-1.717)	(-4.889)	(-1.991)
2	0.085***	0.021	0.241***	0.058	-0.120***	-0.036	-0.333***	-0.188
	(3.351)	(0.771)	(6.483)	(0.459)	(-4.852)	(-1.592)	(-8.628)	(-1.131)
3	0.078**	0.052	0.280***	-0.060	-0.153***	-0.034	-0.494***	-0.325*
	(2.449)	(1.553)	(6.553)	(-0.332)	(-4.504)	(-1.128)	(-11.154)	(-1.773)
Establishment FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	58624	43859	55005	58455	64601	46745	51488	64497
R^2	0.958	0.957	0.915	0.760	0.943	0.956	0.894	0.712

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A4: Downstream firms using long quality ladder inputs

The table reports the effect of the de-regulation on downstream incumbents by ex-ante productivity for downstream incumbents that use long quality ladder inputs. The dependent variable is the log of sales, labour employed, profits, investment, and bank debt and profit margins. Downstream firms are classified as having low or high productivity based on below or above median productivity in the most recent year before the reform. DownDereg is a dummy variable that takes the value 1 for downstream firms after the reform, 0 otherwise. Standard errors are clustered at the product level. The regression equation is: $y_{i,p,t} = \beta_1 DownDereg_{p,t} + \beta_2 DownDereg_{p,t} \times Productivitydummy_i + \delta_i + \delta_t + \varepsilon_{i,p,t}$

	(1)	(2)	(3)	(4)	(5)	(6)
	log(sales)	log(labour)	log(profit)	Profit margin	log(capex)	log(debt)
DownDereg	-0.086***	-0.033**	-0.401***	-0.116***	-0.237*	0.020
	(-3.354)	(-1.985)	(-11.890)	(-7.376)	(-1.835)	(0.737)
DownDereg × High productivity	0.202***	0.057**	0.722***	0.236***	0.258	-0.036
	(6.677)	(2.262)	(16.018)	(10.647)	(1.639)	(-0.952)
log(assets)	0.449***	0.203***	0.354***	-0.003	0.277***	0.444***
	(33.533)	(22.814)	(30.042)	(-0.576)	(5.539)	(29.813)
Establishment FE	Yes	Yes	Yes	Yes	Yes	Yes
Year × Productivity bin FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	101284	72974	86976	101282	101027	98486
R^2	0.954	0.958	0.915	0.644	0.738	0.926

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$