Cooperatives, Competition, and Compensation: Evidence from Indian Manufacturing Establishments*

Parijat Lal†

November 15, 2023

Updated frequently, please click here for the latest version.

Abstract

How does the allocation of ownership and control rights within firms affect responses to economic shocks? To shed light on this question, I study the heterogeneous effects of a pro-competitive reform on cooperative manufacturing firms and their non-cooperative counterparts in India. The reform removed firm-size restrictions on the production of "reserved" items, increasing competition for incumbents in "de-reserved" product markets. Using a difference-in-differences approach, I find that *supplier cooperatives* (SCs), owned and controlled by producer-members who supply material inputs, are resilient to the shock in terms of total revenue and move away from the production of de-reserved items. SCs increase their share of income spent on materials relative to similarly sized non-cooperatives in the same industry and location, with some evidence of downward adjustments in labor spending. These cooperatives are able to withstand competitive pressure from entrants while broadly catering to the interests of their membership. On the other hand, *worker cooperatives* (WCs), owned and controlled by worker-members employed at the firm, face a sharp decline in revenue due to de-reservation, unlike their non-cooperative counterparts. A potential channel behind these results is that WCs are less likely to respond by picking up items that are not directly affected by the reform. Spending on labor does not fall as much as revenue for WCs, which is in line with the immediate interests of membership, but adjustments to labor inputs vary sigificantly across employment categories. Taken together, these results offer insights on the relationship between firm organization and adjustments to resource allocation in response to shocks.

*This work would not have been possible without the invaluable support and guidance of Michael Best, Eric Verhoogen, Jack Willis, and Suresh Naidu. I would also like to thank Christian Pop-Eleches, Ishani Tewari, Laura Boudreau, Joseph Stiglitz, Simon Galle, Waseem Noor, and Wei Qian, along with the participants of the Columbia Economics Development Colloquium, the Columbia Development Workshop, and the Best Lab for State Capacity and Development for their thoughtful suggestions and insights.

†Department of Economics, Columbia University. Email: parijat.lal@columbia.edu

1 Introduction

While most firms today allocate ownership and control rights to providers of capital, these rights can also be held by providers of other inputs. Cooperative enterprises engaged in production reflect this alternative, as they are commonly owned and controlled by either suppliers of basic materials (*supplier cooperatives*) or labor (*worker cooperatives*) on a one-member, one-vote basis. Despite their ostensible obscurity, employment in and within the scope of cooperatives is estimated at almost 10% of the global workforce (Eum, 2017), with Asia and Africa alone home to over 90% of this figure.[1] Moreover, cooperatives often enjoy support from governments through dedicated policy and resources, so the implications of their organizational form demand careful study.[2]

Since the seminal work of Ward (1958), the question of how cooperative ownership and control affect firm behavior has received significant theoretical attention.[3] Some have focused on the potential benefits of diffuse decisionmaking and ownership for both equity and efficiency (Sen, 1966; Ben-Ner, 1988; Bonin and Putterman, 1993). Others have highlighted the inefficient allocation of rents by members, arguing that this characteristic makes it difficult for cooperatives to compete with other firms (Hansmann, 1988; Kremer, 1997).[4]

One way to understand differences between cooperatives and other firms is to analyze their responses to economic shocks. Previous studies have used variation in output and prices as proxies of changing economic conditions and explored their relationship to outcomes for cooperatives and non-cooperatives. Although this descriptive work is insightful, a lack of focus on specific shocks restricts us to identifying associations between general economic trends and firm behavior.[5] Moreover, this research has been largely confined to labor-managed firms in advanced economies, when the majority of cooperatives around the world operate in low-income regions and serve the interests of self-employed producer-members. Empirical work on how cooperative organization affects performance and decisionmaking in response to specific shocks, and increasing competition in particular, remains limited.

This paper studies the heterogeneous effects of a pro-competitive shock across cooperative and non-cooperative firms in India. The shock comes from the Indian government reforming

[1] This figure includes employees in cooperatives (workers who may or may not be members) and self-employed producer members. See Table 1 for a global breakdown.

[2] For example, the 1922 Capper-Volstead Act in the United States, which provides limited exemption from antitrust laws for associations of agricultural producers, led to the emergence producers behind brands such as Land O'Lakes, Welch's, and Sunkist. Italy's Marcora Law, passed in 1985, provided state backing for two funds to support cooperatives, including through financing of buyouts by workers.

[3] See Bonin and Putterman (1993) for an early review.

[4] In the closely related context of involving workers in corporate governance, Jensen and Meckling (1979) capture this line of argument by warning that "workers will begin 'eating [the firm] up' by transforming the assets of the firm into consumption or personal assets."

[5] Pencavel (2013) provides an overview of this literature.

an industrial policy that reserved certain products for manufacture solely by small-scale firms.[6] Toward the end of the 1990s, there was a clear push to undo reservation by removing caps on the size of firms allowed to make reserved products. De-reservation gained traction starting in 2002 and continued until no reserved products remained by 2015. Incumbents, or firms making reserved products prior to the reform, experienced increased competition from entrants into the de-reserved product markets. These incumbents can be compared to firms making products that were never-reserved to estimate the effects of de-reservation. Since neither the initial policy nor its dismantling depended on the type of firm producing the reserved product, we can further study how the reform's effects varied across cooperatives and comparable non-cooperatives.

For the empirical analysis, I complement detailed panel data on firm-level characteristics spanning two decades with information on the timeline of de-reservation. Information on firm organization, output, and inputs comes from the Annual Survey of Industries (ASI), which is the most comprehensive survey of formal manufacturing firms in India. The structure of ASI allows me to: (i) identify cooperatives and their counterparts, which are similarly sized non-cooperatives in the same industry and location, (ii) determine which firms are manufacturing reserved products before the reform, and (iii) observe outcomes for these firms, as well as others not directly affected by de-reservation, after the reform. Specifics on the product list and staggered timing of the reform are collected from the Indian Ministry of Micro, Small & Medium Enterprises (MSME) and data made available by Martin et al. (2017). By combining these sources, I construct a sample of over 1,400 unique cooperatives and 45,000 non-cooperatives over 2000-2016, covering the key implementation period for de-reservation.

I use the latest difference-in-differences techniques to estimate the effects of de-reservation and study heterogeneity by firm type. Treatment is defined at the firm-level based on whether the firm is observed making any reserved product prior to the year in which that product was de-reserved.[7] The key assumption underlying identification in this context is that firms making any products that were de-reserved follow the same trends in outcomes as firms making products not affected directly by the reform. To support this assumption, I provide evidence suggesting parallel pre-trends in the main outcomes for treated and control firms. Moreover, as per Martin et al. (2017), a government expert committee on small enterprises noted that the choice of products for reservation was "necessarily arbitrary," with no mention of specific criteria in official documents. The primary analysis also excludes extant and new firms that enter previously reserved product markets after de-reservation. While previous studies have included these firms in the treated group, the decision to enter

[6] Larger firms that were already producing the selected items were allowed to keep producing them, but had their output capped at existing levels.

[7] This includes both multi-product and single-product firms.

de-reserved product markets after the reform is likely to be endogenous and could bias estimates.

The impact of de-reservation by cooperative status is estimated separately for: (i) *supplier cooperatives* (SCs) and their non-cooperative counterparts, and (ii) *worker cooperatives* (WCs) and their non-cooperative counterparts.[8] This is due to meaningful differences in the industries, structure, and incentives for each type of cooperative, despite the common principle of "one member, one vote." SCs are owned and controlled by self-employed producer-members who supply material inputs like sugarcane, milk, and cotton. These members are primarily concerned with the compensation they receive for the basic inputs they supply.[9] They are unlikely to be employees of the manufacturing firm itself and generally exercise control through a system of representative democracy in which members are elected to boards that oversee production and the hiring of non-member employees. Meanwhile, WCs are owned and controlled by worker-members who are employees of the firm and are directly involved in the manufacturing process. These cooperatives are commonly involved in artisanal work and light manufacturing such as weaving or the production of bricks. Members are primarily concerned with the compensation they receive for their labor and elect supervisors and board members from within their ranks.[10] WCs may hire non-member workers too, but do not rely on them exclusively for the manufacturing process, as is often the case for SCs.

Estimating the differential effects of de-reservation, I find that incumbent SCs are resilient to the increase in competition, as the reform does not have a significant impact on their total revenue. SCs do respond to the reform by shrinking their product scope, and this result is driven by a reduction in the number of previously reserved products they make on average. There is little evidence of these cooperatives picking up additional never-reserved products, and in general, their response closely resembles that of their non-cooperative counterparts. On the other hand, revenue declines by almost a quarter for incumbent WCs, even though their counterparts experience no significant change in revenue. There is evidence suggesting that WCs are less agile than their non-cooperative counterparts. While de-reservation leads both of these groups to shrink their product scope by making fewer reserved items, this average masks an increase in the number of never-reserved products manufactured by incumbent non-cooperatives in these industries. Shifting to never-reserved products is an intuitive response to lessen the impact of increasing competition in previously reserved

[8] Since a cooperative's industry exactly determines its type, the effective sample for treated and untreated SCs contains treated and untreated non-cooperatives in the same industries, and the same is true for WCs.

[9] In the context of cooperative sugar mills in Maharashtra, (Sukhtankar, 2012) argues that "the price paid to farmers for supplying the cane is a direct indicataor of mill profits and losses, as all residual claims are adjusted using the final price paid per tone of cane." In general, input prices can de facto be adjusted by SCs to distribute profits and losses to members. I show that SCs pay higher prices than their counterparts for the same raw material inputs on average, subject to a strict set of additional controls.

[10] Total labor compensation or emoluments, as defined in the data for this study, includes profit sharing.

markets, but WCs do not adapt in this way.

In terms of inputs, I find that de-reservation leads to an increase in the materials share of income for incumbent SCs, both in absolute terms and relative to their non-cooperative counterparts. This uptick is driven by an increase in spending on firms' primary material input, which is consistent with SCs catering to the interests of their producer-members. The increase in spending on materials is consistent with greater demand for the raw inputs used in de-reserved product markets driving up the prices of these inputs. The rise in the materials share does not come at the expense of fixed capital inputs, although there are specific cuts to labor spending in the form of reduced welfare payments and less employment of contract workers. Interestingly, SCs actually exhibit a slightly lower materials share and higher labor share of income compared to non-cooperative counterparts prior to de-reservation, so the reform may prompt a convergence between the different organizational forms.

For incumbent WCs, the decline in revenue due to de-reservation is not met with a proportionate decrease in spending on inputs. While de-reservation actually leads to a rise in the labor share of income for WCs, there is limited evidence that this finding results from the reallocation of spending away from capital or materials. On employment, the effects of competition for supervisors at WCs reflect the most consistent finding from previous empirical work on labor-managed firms: wage responses are more elastic than employment responses. Average supervisory wages at WCs fall by a sizable 20%, but there is no change in the number of supervisors employed. However, the opposite is true for non-supervisory workers at these cooperatives. Employment of non-supervisory workers declines by 13.5%, but there is no accompanying fall in their average wages. The interpretation of this apparent tradeoff between job security and variability of wages depends on the membership status of workers leaving, which is unfortunately unobservable. If separations are limited to non-member workers, this decline in firm size may be a case of member-workers protecting their interests. If the employment of member-workers is decreasing, it is possible that more lucrative opportunities outside the cooperative are becoming available in the aftermath of de-reservation. Either way, the non-supervisory workers who remain at WCs are able to negotiate an egalitarian adjustment to wage structures that are already relatively compressed, with supervisors accepting significant cuts.

Taken together, the effects of de-reservation on the output and inputs of SCs and WCs have important implications for how firm organization affects adjustments in response to shocks. The combination of unchanging revenue and higher materials share of income for incumbent SCs suggests that these cooperatives are able to withstand competitive pressure from entrants while broadly satisfying the interests of their membership.[11] This adjustment

[11] Extending my results to previous work on supplier cooperatives in India, the increased competition may even curb rent seeking behavior by elite producer-members.

allays concerns around resource reallocation that favors primary stakeholders but is detrimental to firm performance, at least in the short run. On the other hand, de-reservation negatively impacts the performance of incumbent WCs, both in absolute terms and relative to their non-cooperative counterparts. This decline does not seem to be accompanied by major reallocations away from non-labor inputs in order to protect labor spending. The negligible effects of de-reservation on the manufacture of never-reserved items by worker cooperatives points to a general rigidity that constrains their production relative to that of non-cooperative counterparts. While the precise channel behind this result is difficult to observe given the available data, the lack of agility may stem from a combination of gridlock due to the participatory nature of the firm and limitations in worker skillsets making adjustments to production more costly for WCs than for their non-cooperative counterparts.

To enhance our understanding of the relationship between firm organization and responses to economic shocks, this paper brings together several stands of literature in economics. First, it speaks to the longstanding literature on the distribution of control rights and residual claims in systems of production.[12] This work remains relevant, as societal preferences over this distribution do not always align with the realities of firm organization. For example, a recent study by Mazumder and Yan (2023) finds that Americans support more workplace democracy even after being exposed to framing emphasizing democratization's costs. A long tradition of theoretical work in economics explores these costs, as well as the potential benefits of participatory firms.[13]

The increasing collection and availability of data on firms has facilitated empirical investigations of this theoretical literature. Craig and Pencavel (1992) compare worker cooperatives and conventional firms in the North-American plywood industry, concluding that the former are more inclined to adjust pay than employment in response to changes in their economic environment. This finding has been replicated for worker cooperatives in other high- and middle-income economies, including Italy (Pencavel et al., 2006) and Uruguay (Burdin and Dean, 2009).[14] However, given the global tilt towards supplier cooperatives owned and controlled by self-employed producer-members, a focus on worker cooperatives leaves important gaps in our understanding of alternative forms of firm organization (Eum, 2017).

Studies in low-income settings have focused on supplier cooperatives in specific industries. Closely related to this paper is research by Banerjee et al. (2001), which finds that inequality in local land ownership enables rent seeking within sugar cooperatives in the Indian state

[12]This stretches from Stiglitz (1974) on sharecropping in agriculture to Nimier-David et al. (2023) on profit-sharing in French firms. A non-exhaustive list of related work includes Jensen and Meckling (1979); Svejnar (1982a); Grossman and Hart (1986); Cable and Wilson (1989); Jones and Kato (1995); Dow and Putterman (2000); Levin and Tadelis (2005).

[13]See, for instance, Ward (1958); Domar (1966); Sen (1966); Atkinson (1973); Vanek (1977); Svejnar (1982b); Ben-Ner (1988); Hansmann (1988); Bowles and Gintis (1993); Kremer (1997); Abramitzky (2011).

[14]Other research on worker cooperatives in such settings includes Jones and Svejnar (1985); Estrin et al. (1987); Prasnikar et al. (1994).

of Maharashtra. In the same setting, Sukhtankar (2012) uncovers evidence of embezzlement to finance campaigns and recompensation of farmers upon successful elections in politically controlled cooperative mills.[15] These papers provide important insights into the political economy of cooperatives in India, which can be crucial to the interpretations of my findings.

Most recently, work by Sukhtankar (2016) and Montero (2022) makes great strides in providing causal evidence on the effects of cooperative ownership rights. The former uses a geographic discontinuity created by the zoning system for sugar mills in Tamil Nadu to argue that private mills are better at providing credit, which leads to greater cane cultivation and income for local farmers. The latter relies on the discontinuous probability of agricultural cooperative formation due to land reform in El Salvador, finding that compared to outside-owned haciendas, cooperatives are more likely to produce staple crops over cash crops, and are more productive at the former and less productive at the latter. I complement this research by studying the production decisions of cooperatives in response to a specific shock that exposes them to increased competition. I also expand the scope of industries under consideration and shed light on the behavior of cooperatives as employers of non-member labor.

Finally, this study also builds on a strand of literature that delves into industrial reform and liberalization in India starting in the late 20th century. The most relevant research in this domain concerns evaluations of de-reservation. Garcia-Santana and Pijoan-Mas (2014) were among the first to study this reform, building a span-of-control model and calibrating it using data from 2001 to predict that the removal of reservation would increase manufacturing output per worker by nearly 7%. Martin et al. (2017) empirically test the results of dismantling reservation over 2000-2007 using a difference-in-differences approach, finding positive effects on output, productivity, and wages, largely driven by entrants into de-reserved product spaces. Other work has followed suit, studying the effects of this reform on product scope (Tewari and Wilde, 2019), upstream and downstream firms (Balasundharam, 2020), the role of financial constraints under competition (Galle, 2020), and the effects of input complementarities (Boehm et al., 2022). My work is less concerned with the aggregate impact of the reform, instead relying on it as a shock to observe firms' responses. To the best of my knowledge, this paper is the first to look at the heterogeneous effects of de-reservation by type of organization and disaggregate impacts on labor outcomes.

Analyses of de-reservation fit into a broader research agenda that considers the impact of India's economic liberalization. Other major reforms that have been studied include de-licensing, which dismantled a system of central controls regulating entry and production in manufacturing (Aghion et al., 2008), the removal of barriers to trade (Topalova, 2007; Goldberg et al., 2009; Edmonds et al., 2010; Topalova, 2010; Khandelwal and Topalova,

[15] For other work on farmer cooperatives in low-income countries, see Casaburi and Macchiavello (2015).

2011), and the relaxation of constraints on foreign direct investment (Bollard et al., 2013). While these reforms have been credited with India's rapid growth in recent decades, careful empirical work has also raised important questions about the distribution of these gains, which has implications for policies to compensate the losers. The study of cooperatives in this context is particularly important, given their much vaunted role in protecting the interests of low-income populations.[16]

The remainder of this paper is organized as follows. Section 2 describes the cooperative landscape in India and outlines the reservation policy and de-reservation reform. Section 3 reviews the primary data used for the analysis and Section 4 discusses the treatment and strategy for identifying firm behavior in response to the reform. The differential effects of de-reservation by type of organization are presented in Section 5, before Section 6 concludes.

2 Background

This section presents an overview of cooperatives in India and outlines key features of the de-reservation reform.

2.1 Cooperative Landscape in India

The recent creation of a national Ministry of Cooperation and tax cuts for cooperatives in the latest budget signal a renewed policy focus on cooperative organization in India.[17] Announced in 2021 by the central government, the ministry has been set up to provide a fresh administrative, legal, and policy framework for cooperatives, which can be found in 91% of villages across the country in some form. The decision has been accompanied by claims that a cooperative-based model of economic development is best suited for inclusive growth in the country.[18] Given the allocation of scarce public resources to support cooperatives and their prevalence in industries of direct importance to India's rural poor, the implications of cooperative organization in this setting demand careful study.

Cooperatives have maintained a sizeable presence in India throughout its history.[19] Estimates from the National Cooperative Union of India (NCUI) for 2016-17 put the number

[16] The United Nations declared 2012 as the "International Year of the Cooperative," noting that "cooperatives have proven themselves a resilient and viable business model that can prosper even during difficult times [and] prevent many families and communities from sliding into poverty." See https://www.un.org/en/events/coopsyear/ for more on this.

[17] https://economictimes.indiatimes.com/news/economy/policy/govt-announces-slew-of-tax-relief-to-cooperative-sector-budget-outlay-at-rs-1150-38cr-for-coop-ministry/articleshow/97523477.cms?from=mdr.

[18] https://timesofindia.indiatimes.com/india/cooperative-model-is-best-suited-for-indias-growth-story-says-amit-shah/articleshow/92659576.cms#

[19] See Section C.1 for a brief history of the cooperative movement in India.

of non-credit cooperatives across the country at 676,750, with a total membership of 84 million. More than a quarter of these organizations are housing and consumer cooperatives, but a substantial share are also engaged in production. Notably, cooperatively owned firms account for 29% of formal fertilizer production, 39% of installed sugar factories, 18% of the marketable surplus of milk, and almost 30% of total spindleage in the country. While cooperatives are present across all 28 states of India, almost 60% are located in six states: Maharashtra, Gujarat, Andhra Pradesh, Telangana (formerly part of Andhra Pradesh), Uttar Pradesh, and Madhya Pradesh.[20]

There are important differences in organization within cooperative firms, which are likely to have a bearing on their production and employment decisions. To ground the analysis in this paper, I present examples of cooperative organizations across two main archetypes: (i) *supplier cooperatives* (SCs) that are owned and controlled by self-employed producer-members, generally farmers, who supply primary material inputs, and (ii) *worker cooperatives* (WCs) that are owned and controlled by worker-members who are directly employed by the firm themselves.

Supplier cooperatives (SCs)

Supplier cooperatives rely on the steady purchase of raw agricultural inputs from their members. In theory, the suppliers of material inputs own and control the firm by democratically electing its leadership. Firms are likely to hire specialized non-member labor to facilitate production. In general, the average producer-member is very distant from the day-to-day management of the firm, which is likely to curb the effective control each of them can exercise. This separation may also allow management to make decisions that may have proved contentious upon deliberation with membership, as long as the latter group feels that its interests are generally being taken care of. Examples of prominent SCs in this context include:

- *Gujarat Co-Operative Milk Marketing Federation (GCMMF)*: Known popularly as *Amul*, which is a household brand name, this dairy producer has an annual turnover of USD 5.1 billion.[21] The organization is jointly controlled by millions of milk producers and follows a three-tiered model. First, village-level cooperative societies are in charge of purchasing and collecting milk from producer-members, and these societies are run by representatives elected from within the ranks of the dairy farmers. Second, milk is processed into dairy products at one of several district-level manufacturing

[20]From *Indian Cooperative Movement: A Statistical Profile* (2018) by the National Cooperative Union of India, available at: https://www.kribhco.net/assets/img/Coorporative/Statistical_Profile_2018.pdf. See Figure 13 for a geographic distribution of these cooperatives.

[21]Ranked second in the world by turnover over GDP per capita, according to the World Cooperative Monitor, available at: https://monitor.coop.

plants, which represent the firms observed in this study. The boards of these plants are composed of elected producer-members who are in charge of managing production and hiring non-member personnel. Finally, a state-level federation is tasked with the distribution of milk products through a retail network.[22]

- *Cooperative Sugar Mills in Maharashtra*: Each mill is overseen by a democratically elected board of directors. Members have the option to purchase up to 50 shares, with each share requiring farmers to allocate a certain portion of their land to cultivate sugar every year, which the factory commits to buying. Regardless of the number of shares one purchases, each member is granted only a single vote. Mills may also source cane from non-members in times of scarcity. While most of the 10,000-25,000 members of each cooperative are small-scale farmers, formal authority often tends to be concentrated among larger growers (Banerjee et al., 2001).[23]

Several broad characteristics of SCs are worth noting. First, it is unclear whether the employment protections associated with worker cooperatives in other contexts will be extended to the employees of these firms. Since the primary stakeholders are producer-members who are unlikely to work directly in these establishments, the concerns of labor in this context may be sidelined when facing the shock of de-reservation. Second, given the power imbalance in favor of minority local elite members, these cooperatives may not make decisions that center the interests of majority small-scale producer-members.[24] This possibility is reflected by sentiments, highlighted in sociological work, claiming that a SC is "nothing but a joint-stock company in the garb of a cooperative," with the larger farmers as the major shareholders (George, 1988). Banerjee et al. (2001) and Sukhtankar (2012) offer empirical evidence for this phenomenon in Maharashtra, arguing that input prices are suppressed by larger growers to extract rents from cooperative mills.

Worker cooperatives (WCs)

The case studies below provide a snapshot of the kinds of WCs covered in this paper:

- *Kerala Dinesh Beedi (KDB) Workers' Cooperative Society*: *Beedis* or *bidis* are small tobacco cigarettes made from *tendu* leaf, smoked by around 250 million Indians as of the mid-1980s. Production in this industry is often dominated by independent private contractors and workers face poor working conditions. Workers organized cooperatively under KDB to produce *beedis*, with the total number of worker-members

[22]See https://amul.com/m/about-us.

[23]Despite moves towards greater autonomy of cooperatives, the government also heavily regulates their constitution in the state.

[24]Since all members are producers, interests may largely overlap. The ability of general membership to hold representatives accountable through the internal electoral process is also an important factor.

across cooperatively owned production units reaching over 33,000 in 1993. Shop floor workers elect day-to-day management from within their ranks, and these directors in turn elect a member general body that has the ultimate authority to set policy Franke et al. (1998).

- *Alcond Employees Industrial Cooperative in West Bengal*: Previously a private firm that closed in 1982 when its original owners withdrew their investment. Factory workers gained control of the business, which produces conductors and wires for power transmission. This was done with the assistance of the Left Front state government, which provided loans for necessary working capital and acquired the land. Members are trained in each aspect of the production process and operation of machinery. A general conference is held every two years to elect leaders, with regular collective meetings in addition to this forum (Kerswell and Pratap, 2019).

- *Mahila Bunkar Sahakari Samiti:* With the support of the Indian Institute of Natural Resources (IINREM), a non-government organization, and training projects funded by government agencies, around 150 women in Surajpur (village in western Uttar Pradesh) were trained and organized into a weaving cooperative. Office bearers are elected from amongst the women weavers and Fabindia, a national retailing house, is a major buyer of the cooperative's products.[25]

These cooperatives differ from SCs along several key dimensions. First, the primary stakeholders are suppliers of labor, which may result in these firms protecting labor spending over other inputs in response to de-reservation. Second, unlike the producer-members of SCs, worker-members are directly engaged in the manufacturing process and are close to the day-to-day management of the firm. This proximity may allow them to exercise more direct control over the firm and make managers more accountable to members relative to those at SCs. Third, while WCs may hire non-member employees like SCs, their workforce is likely to be dominated by members. The workforce of WCs is also likely to be relatively homogenous in terms of the skillsets it covers. This feature, along with incentives to minimize turnover, may mean that WCs have a difficult time adapting to new products or technologies.

2.2 Reservation and De-Reservation

Small-scale industry (SSI) is a prominent part of the Indian economy, serving as the second largest employer after agriculture and responsible for 40% of gross industrial value-added (Boehm et al., 2022). The Indian government has a history of supporting SSI since independence. As Mohan (2002) argues, the initial impetus behind size-based policies was an

[25] See https://indiatogether.org/stories/surajpur.htm.

understanding among leadership that the entry and growth of small-scale enterprises was fettered by imperfections in factor markets–land, labor, and most importantly, capital–that favored larger firms. In addition to these distortions, special support for SSI was motivated by a belief that it would promote labor-intensive production, which was vital in an underdeveloped economy with a surplus of labor.

A core feature of the government's promotion of SSI was the reservation policy initiated in 1967. Designed to protect small-scale enterprises from what was seen as unfair competition, this policy applied to the manufacturing sector and earmarked specific products for production by SSI. While only 47 items were initially eligible, the reservation list expanded to cover more than 1,000 products by 1996. Overall, reserved products constituted around 12% of manufacturing output in India and approximately 30% of output within the small-scale sector (Tewari and Wilde, 2019). Perhaps surprisingly, no specific selection criteria were mentioned in official documents beyond the ability of small-scale industry to manufacture the relevant items.[26] In fact, reports of an expert committee on small enterprises characterized the selection of products as "necessarily arbitrary" (Hussain, 1997; Mohan, 2002).

Originally, the policy defined SSI as covering any manufacturing undertakings with plant and machinery worth up to Rs. 500,000 and fewer than 50 employees. Firms that exceeded these thresholds but were already producing reserved products prior to the policy were allowed to continue their production with output capped at existing levels.[27]. Over time, the investment ceiling was raised and the employment requirement was eliminated. By 1999, industrial establishments with plant and machinery worth up to Rs. 10 million (at historical cost) were covered under the policy.

In the early 1990s, spurred in part due to an economic crisis and ensuing conditions imposed by the World Bank and the International Monetary Fund, India initiated a liberalization of various industrial and trade policies. However, reservation policy remained relatively untouched until the end of the decade, which is helpful in isolating the effects of de-reservation from other sweeping reforms. It was not until 1995 that a special committee was appointed to reassess the list of reserved products, and based on its recommendations, the process of de-reservation began in 1997 with the removal of 15 items from protections under the policy.[28] The dismantling of reservation truly accelerated in the 2000s, with 100-250 products de-reserved each year between 2003 and 2008 (see Figure 1). Only 22 products remained reserved at the end of this period, and the last of these were removed in 2015.

[26]This ability may itself be endogenous, but the wide range of categories covered, coupled with significant variation in reservation status within these categories, is reassuring.

[27]Any expansion had to be accompanied by a commitment to exporting a majority of the additional output Mohan (2002), and exporting is very uncommon in the sample for this study.

[28]Some items had been removed from the list sporadically in the 1970s and 1980s, but these removals were not part of a dedicated process.

Reserved products spanned a variety of industrial sectors featuring both cooperatives and non-cooperatives. This coverage provides me an opportunity to study the impacts of de-reservation across different types of organization.

3 Data and Measurement

In this Section, I provide an overview of the primary data used in the analysis and outline the process for classifying cooperatives, before providing summary statistics for the relevant sample.

3.1 Firm-Level Data

Studying cooperatives' decisions and outcomes in relation to their counterparts requires firm-level data on major characteristics, including organization type, as well as output and inputs. For my analysis, I rely on the Annual Survey of Industries (ASI) from 2000-2016, which is the most comprehensive source of industrial statistics on the formal manufacturing sector in India.[29] Data for the ASI is collected by the Government of India's Ministry of Statistics and Program Implementation (MOSPI) every fiscal year, which begins on April 1. The ASI consists of two parts: (i) a census of all manufacturing establishments, or plants, that employ more than 100 workers[30], and (ii) a random sample of formal establishments with between 10 and 100 workers.[31] The sampling probability of establishments in the second category depends on their state and industry, and the analysis will use sampling weights provided along with the microdata. It is also worth noting that the unit of production in ASI, a manufacturing establishment or plant, is defined as having the same management, combined accounts, and resources.[32]

Several features of ASI make it well suited for this analysis. First, it reports the type of organization for each firm, which allows me to distinguish between cooperatives and non-cooperatives. Second, the data capture inputs, output, and industries for firms at a highly granular level. This detail is crucial for my ability to measure exposure to de-reservation for each firm, as detailed in Section 4.1. Second, MOSPI has released identifiers that allow the same establishments to be tracked over time for ASI tracts starting from

[29] Firm identifiers can be extended back to 1993, but product coverage is severely limited for years prior to 2000.

[30] Until 2003, the census covered establishments employing more than 200 workers.

[31] This condition is restricted to establishments that employ between 20 and 100 workers if the plant does not use electricity (Bertrand et al., 2021).

[32] Plants under common ownership cannot be aggregated, but less than 7.5% of all plants belong to a firm with multiple plants that file separate survey returns (Boehm et al., 2022). Keeping this caveat in mind, I use the terms "establishment," "plant," and "firm" interchangeably throughout this paper.

1998. Third, although this requirement may vary across states, a minimum of 7 persons is generally required for an organization to register as a cooperative society in India. As a result, the census and sampling frame for ASI should jointly cover a sizable share of cooperative manufacturing establishments in the country, as well as non-cooperative firms with comparable employment levels.

3.1.1 Heterogeneity Across Cooperative Firms

While I can observe whether a firm is cooperatively owned, the dataset does not distinguish between types of cooperatives. I use detailed information on the industry of each establishment to: (i) classify cooperatives into SCs and WCs, and (ii) construct the effective sample for each type by identifying counterparts. Industry codes follow the National Industrial Classification (NIC), which was initially released in 1970 and revised in 1987, 1998, 2004, and 2008. I use concordances provided by MOSPI to convert all industry codes to the NIC-87 schedule.[33] Then, I look for existing examples of cooperatives in each of the 3-digit industries reported by cooperative firms to inform a manual classification into one of the two types. For a full list of covered industries and classifications, please refer to Table 6.

Most cases are straightforward based on this qualitative research. For example, NIC-87 codes 201 "Manufacture of dairy products" and 206 "Manufacture and refining of sugar (vacuum pan sugar factories)" clearly signify supplier cooperatives. On the other hand, NIC-87 codes 272 "Manufacture of structural wooden goods" and 320 "Manufacture of refractory products and structural clay products" refer to worker cooperatives. To check the accuracy of this procedure for firms that fall under the same 2-digit industry, I use information on the inputs produced by firms. For example, I make sure that the main input for firms identified as cotton-grower SCs under NIC-87 code 230 "Cotton ginning, cleaning and baling" is listed as "Cotton, Raw." Similarly, I verify that firms classified as weaver WCs under NIC-87 code 233 "Weaving and finishing of cotton textiles on handlooms" use an intermediate input like "Yarn, Finished."

This procedure means that a cooperative's 3-digit industry exactly determines its type (SC or WC). Similarly, a non-cooperative's 3-digit industry exactly determines whether it appears in the subsample for SCs or WCs.

[33] 3-digit NIC-87 codes are equivalent to the 4-digit industries under the International Standard Industrial Classification of All Economic Activities (ISIC) maintained by the United Nations Statistics Division. A key advantage of the NIC-1987 codes is that they often distinguish between production in mills and more manual manufacturing, and they also classify baling and pressing of fibers separately from finishing and weaving. This grouping is helpful in differentiating SCs from WCs, especially in the production of cloth and textiles.

3.1.2 Cooperative Employment and Membership

When it comes to cooperative organizations, and WCs in particular, the distinction between members and non-member employees can be critical. Under most circumstances, non-members are not afforded any ownership or control rights in a cooperative, which is the case for most workers at non-cooperative firms. The biggest limitation of the ASI dataset in this context is that it does not provide any information on the number of members, either self-employed producers or workers, and non-members associated with cooperative establishments. This limitation prevents me from using the share of employment that is part of the cooperative's membership to classify different types, which is the approach followed by Burdin and Dean (2009).

Instead, what firms report is their total employment, disaggregated into salaried workers, workers employed through contractors, and supervisory workers.[34] The classification of cooperatives into different types allows me to make inferences on the probable membership status of employees. Concretely, contract workers are unlikely to be members of either type of cooperative. Salaried workers and supervisors are unlikely to be members under SCs, but are highly likely to be members under WCs.

3.2 Sample Overview

In order to compare cooperatives with their non-cooperative counterparts, I restrict the sample to 3-digit industry and state combinations that feature both types of organizations. I am left with the following subsamples: (i) 1,156 unique SCs (8,436 observations) and 20,341 of their non-cooperative counterparts (75,735 observations), and (ii) 477 unique WCs (1,913 observations), and 24,985 of their counterparts (72,097 observations).

Table 3 presents means for firm characteristics prior to de-reservation, with sampling weights applied. SCs are much larger than their counterparts in terms of employment, which is driven in part by a large tail of small non-cooperatives in the relevant industries. Reassuringly, there is considerable overlap between SCs and their counterparts by initial size quintiles, which I use as controls in the analysis. Compensation in general is higher at SCs, and this gap does not seem to be driven by differences in the contract worker, supervisor, or female shares of employment across cooperative status. While SCs are less likely to be treated relative to comparable non-cooperatives, this difference is not statistically significant when controlling for industry, size, and location.

[34] Establishments can also indicate how many "Other" and "Unpaid" persons are involved, but the reporting on these measures is inconsistent.

WCs and their counterparts are similar in terms of employment. The latter provide better compensation on average, especially for supervisors. The ratio of supervisory to worker wages at WCs is much lower than that for any of the other three groups, including SCs, implying a compressed wage structure that is characteristic of labor-managed firms in other settings. The share of contract workers is lower at WCs relative to non-cooperative counterparts, but still sizable, suggesting that at least 13% of employees in these cooperatives are non-members on average. One thing to note is that the female share of employment is relatively high for WCs, and this fact is due to the presence of many female-only firms. This could be one reason WCs face additional constraints, as factors such as access to credit or the social acceptability of certain vocations may be highly dependent on gender. Finally, although WCs are more likely to be treated than their counterparts, this difference is also not statistically significant when controlling for industry, size, and location.

To provide an overview of how aggregate income is allocated by firms, Figures 2 and 8 present a breakdown of spending on major input categories by firm organization prior to de-reservation.[35] Note that the share of income spent on the primary material input is actually slightly lower for SCs than for their counterparts, while labor and capital shares are higher for SCs. This fact is surprising, because we might expect producer-members to maximize the share of income going to material inputs, especially as profits are generally distributed to members through prices for inputs at SCs.[36] Table 4 offers suggestive evidence for this channel of remuneration, as SCs pay a higher unit price on average for the *same* inputs than their counterparts in the same industry, size quintile, and state. This result goes against the findings of Sukhtankar (2016) for the sugar industry in Maharashtra, but I cover a greater range of industries and offers one explanation for the staying power of cooperatives in India.

As expected, WCs do have a substantially higher labor share relative to their counterparts. While the materials share of income for WCs is lower than for their counterparts, WCs actually have a relatively greater level of capital stock. It is important to note that this plot does not necessarily imply higher profitability for non-cooperatives, as spending on materials and labor for SCs and WCs, respectively, is inclusive of profit sharing with members.

[35]Note that the capital share here is a proxy for the level of fixed capital employed by firms. To calculate capital payments, I follow Hsieh and Klenow (2009) and Brooks et al. (2021), assuming a constant rate of depreciation and interest across firms. I then multiply this rate by the value of fixed capital. Results are similar if I instead use estimates of depreciation and interest reported by firms, although there are more missing values for these variables.

[36]The large share of revenues going to labor at SCs might suggest that profits are actually being distributed to the membership through non-wage payments. However, wages make up 85% of labor spending at SCs, which is comparable to the figure of 87% for their non-cooperative counterparts. Moreover, the ASI instruction manuals spell out that wages should only reflect remuneration for workers, who are defined as persons engaged in the manufacturing process, or those holding supervisory positions. Elected representatives at SCs may hire workers from within the ranks of producer-members, but given the sheer scale of membership, labor spending would only flow to a minute share.

4 Empirical Strategy

This section describes the identification of firms directly impacted by de-reservation and estimation of the reform's differential impacts across cooperatives and non-cooperatives.

4.1 De-Reservation Treatment

To create the treatment variable, the list of reserved items and timeline of de-reservation is first matched with product codes listed by firms in ASI. Until 2009, products in ASI were recorded using a 5-digit Annual Survey of Industries Commodity Classification (ASICC) code. The codes for certain reserved products change in 2008, and these discrepancies are accounted for manually. Starting in 2010, the ASI switched to a 7-digit National Product Classification for Manufacturing Sector (NPCMS) scheme for all inputs and outputs. I concord the NPCMS and ASICC codes for reserved products using a table provided by the Indian Ministry of Statistics and Program Implementation (MOSPI). I am able to extend the sample period until 2016, which makes this the first study to follow firms through to the end of the de-reservation process in 2015.

Next, I consider every product that a firm makes over the sample period and identify firms that report making a reserved product at any point. 95% of firms that ever make a reserved product only make a single one. Almost half of the remaining 5% make reserved products that were de-reserved in the same year, making it straightforward to assign a unique date of de-reservation for the firm. In the remaining cases, I follow Martin et al. (2017) and use the product reserved first for the treatment date. Through this method, I construct a binary firm-level treatment indicator *Deres* that switches on after the reserved product made by a firm is de-reserved.

The treatment group of interest consists of *incumbent* firms that are observed making a reserved product prior to its year of de-reservation. For the main analysis, I exclude firms that only produce a reserved product after it is de-reserved, as the decision to enter a previously reserved market is likely to introduce selection bias. The excluded group includes *movers*, which are existing firms that move into the formerly reserved product space after de-reservation, and *entrants*, which are new firms formed after the de-reservation of the product they are currently making.

4.2 Primary Specification

To estimate the heterogeneous effects of de-reservation on incumbent firms by cooperative status, I estimate specification (1) separately in subsamples for: (i) SCs and their counterparts, and (ii) WCs and their counterparts. Since de-reservation is staggered, I use the

difference-in-differences imputation estimator developed by Borusyak et al. (2023). Estimating β_1 and β_2 through this procedure is appropriate given the focus on heterogeneous treatment effects and the potential bias from negative weighting due to comparisons in which the untreated group effectively constitutes already-treated units.

$$Y_{idlt} = \beta_1 Deres_{it} + \beta_2 \left(Deres_{it} \times C_i\right) + \gamma_i + \delta_{dt} + \xi_{lt} + \eta t C_i + \varepsilon_{idlt} \tag{1}$$

Y_{idlt} represents the outcome of interest for firm i in industry d, initial employment size quintile l, and year t. As discussed earlier, the primary treatment variable, $Deres$, goes from 0 to 1 when the reserved product assigned to firm i becomes de-reserved, and C_i is an indicator for whether firm i is a cooperative.

Given the panel structure of the data, I include firm fixed effects γ_i to account for time-invariant characteristics specific to firms and industry-year fixed effects δ_{dt} to control for shocks common to all firms within an industry d in a given year t. Since SCs and their counterparts differ in employment size on average, I also add size-year fixed effects to control for factors common to firms within an initial (pre-treatment) size quintile l in year t. Adding state-year fixed effects yields unchanged results. Finally, to separate the effects of de-reservation from general trends by firm organization, I include linear time trends by cooperative status. Standard errors are clustered at the firm level to adjust for within-firm correlation over time.

The imputation estimator is constructed in three steps. First, ordinary least squares (OLS) is used to estimate specification (1) for the untreated $Deres_{it} = 0$ sample. These estimates are used to impute the expected counterfactual outcome for treated firms in in the absence of treatment. Second, estimates of β_1 and β_2 are calculated for treated firms using the imputed values. Third, the estimates are averaged and combined to obtain the average effects of de-reservation on outcome Y_{idlt} for non-cooperatives $\left(\hat{\beta}_1\right)$ and cooperatives $\left(\hat{\beta}_1 + \hat{\beta}_2\right)$.

4.3 Identification

The assumption underlying identification in this context is that in the absence of de-reservation, outcomes for firms making reserved products (treated) and firms making never-reserved products (control) would have followed parallel trends. I provide support for this assumption by a visual inspection and test for parallel pre-trends that involves estimating the following dynamic specification for outcomes of interest:

$$Y_{idlt} = \gamma_i + \delta_{dt} + \xi_{lt} + \sum_{h=-4}^{5} \beta_h \cdot \mathbf{1}\left\{t = E_i + h\right\} + \varepsilon \tag{2}$$

E_i represents the year in which the reserved product made by firm i is de-reserved, and $\mathbf{1}\{t = E_i + h\}$ is an indicator that switches on for firms observed h years after de-reservation. Although ASI is not a balanced panel, which introduces variation in sample composition for each period h, the sampling weights provided by MOSPI should attenuate this issue.

Figures 16 and 17 plot the estimates from specification (2) for the main outcomes of interest in both the SC and WC subsamples, respectively. Broadly, the event-study plots suggest little evidence for differential pre-trends across treated and control firms. Further, I fail to reject joint-tests of $\beta_h = 0$ for $h < 0$. Finally, systematic variation in the timing of de-reservation may be a concern. Tewari and Wilde (2019) highlight that there is considerable variation in the timing of de-reservation within narrow product categories, such as vegetable oils, which limits the scope for a structural explanation of timing. Furthermore, as Figure 1 shows, a majority of reserved items were de-reserved in quick succession between 2003-2008. After this period, the final set of items was de-reserved in 2015. To account for this potentially non-random grouping, I restrict my sample to 2000-2014 in Section A.2 and show that results still hold. These checks, along with evidence from previous empirical work on de-reservation, suggest that we are able to treat de-reservation as quasi-random.

A separate question is whether any observed heterogeneity in the effects of de-reservation across SCs and non-cooperative counterparts (or WCs and their counterparts) is caused by cooperative status alone. While I control for changes that affect all firms within industries, initial size quintiles, and locations, Table 3 does indicate differences in observable characteristics across cooperatives and their counterparts. These differences may be a due to their organizational form itself, but the lack of exogenous variation in whether a firm is organized cooperatively means that we have to be careful in attributing causality for the heterogeneity in treatment effects. With this caveat in mind, we can analyze whether the differential effects we observe are consistent with qualitative differences in incentives and constraints across cooperatives and non-cooperatives.

5 Differential Effects of De-Reservation

Before evaluating the differential responses of cooperatives and non-cooperatives to de-reservation, it is important to verify whether the reform increased competitive pressure for incumbents in state-industry combinations that feature both types of firms.[37] We can think of this process as checking for the existence of a first stage. To provide supporting evidence, I estimate a variant of specification (2), adding an interaction between treatment and an indicator for whether the treated firm is a mover, i.e., whether it started making the

[37] Galle (2020) has shown that de-reservation leads to declining markups for directly impacted firms, which offers support for the pro-competitive nature of the shock.

previously reserved product *after* de-reservation.[38] Note that movers are excluded from the main analysis starting in Section 5.1 below, as entry into de-reserved markets is likely to be endogenous.

Figure 4 plots an event-study for the full set of state-industry combinations with both cooperatives and non-cooperatives between 2000-2016. De-reservation increases revenue for movers by almost 25%, with a weakly negative impact of approximately 3.5% for incumbents. Figures 14 and 15 repeat this analysis for the SC and WC subsamples, respectively, with similar patterns in both cases. Taken together, these results suggest that incumbent firms making previously reserved products did have to contend with entrants into the impacted markets. Moreover, industries relevant to both SCs and WCs are subject to this pro-competitive shock.

5.1 Output

Having established the pro-competitive nature of the reform, I first consider the differential effects of de-reservation by cooperative status on revenue and production for incumbents.

5.1.1 *Incumbent supplier cooperatives are resilient to the reform*

Figure 5 displays the heterogeneous effects of de-reservation on output for incumbent supplier cooperatives and their non-cooperative counterparts. First, I show that SCs face no change in total revenue from the pro-competitive shock.[39] These cooperatives reduce their product scope in response to the reform, and as we might expect, this result is driven by a reduction in the number of de-reserved products manufactured. The overwhelming majority of firms producing a reserved item prior to de-reservation make only a single one.[40] Since we are excluding movers in this analysis, the point estimate of -0.346 for de-reserved products implies that approximately a third of incumbent SCs stop making the de-reserved item after the reform. In general, the effects of de-reservation on production do not vary significantly between supplier cooperatives and their non-cooperative counterparts.

How comparable is the production of incumbent SCs and their counterparts prior to the reform? Table 5 shows that on average, SCs produce more products overall and the share of their revenue coming from reserved products is slightly lower. These differences are not significant at the 10 percent level when controlling for industry, size quintile, and state.

[38] For the main analysis below, movers will be dropped.

[39] The point estimates for SCs are equivalent to $\left(\hat{\beta}_1 + \hat{\beta}_2\right)$ from specification (1), where $\hat{\beta}_1$ is the estimated treatment effect for non-cooperative counterparts.

[40] The average number of reserved products manufactured by incumbent SCs prior to the reform is 1.05.

However, incumbent supplier cooperatives remain significantly more likely to be producing multiple products (by about 13 percentage points) than their non-cooperative counterparts. To check whether this difference in composition is masking considerable variation in effects by cooperative status, I repeat the analysis and control for whether a firm produced multiple products prior to de-reservation. The results of this exercise are shown in Figure 18, and again show no significant differences in effects across SCs and their non-cooperative counterparts.

As previous work suggests, there is often a close relationship between local governments and supplier cooperatives in India. The negligible effects of de-reservation on revenue for supplier cooperatives may be a result of the reform being accompanied by added support from the state. To address this channel, I rule out significant changes in subsidies, outstanding loans, or tax payments for SCs as a result of de-reservation. While these results do not negate the support that cooperatives receive from the state in this context, they suggest a nontrivial role for the production decisions of cooperatives in responding to increasing competition.

5.1.2 *Incumbent WCs experience a sharp decline in revenue*

Figure 6 presents the differential effects of de-reservation on output for incumbent worker cooperatives and their non-cooperative counterparts. De-reservation decreases revenue for exposed WCs by almost a quarter, while their incumbent non-cooperative counterparts face no change in total revenue. The size of this contraction is much larger than previously estimated changes in prices for de-reserved products[41], which suggests that WCs are also producing less in quantity terms after the reform.

The effects of de-reservation on products also indicate meaningful differences between the responses of WCs and their counterparts. There is a reduction in product scope for both types of firms, but the size of the estimate is much larger for WCs, with the difference significant at the 1 percent level. On average, de-reservation results in WCs producing 0.67 fewer products, driven largely by firms dropping products that have been de-reserved. Interestingly, non-cooperatives in these industries, unlike WCs, actually increase the number of never-reserved products they produce on average. This difference is also significant at the 1 percent level. Shifting to new products not directly affected by the reform is a plausible strategy to mitigate the effects of increased competition, but this approach does not seem to be adopted by WCs.

We can return to Table 5 for an overview of how incumbent WCs differ from their incumbent counterparts prior to de-reservation. Once we control for industry, size, and state, there is no

[41] Balasundharam (2020) estimates a decline of 8% at most.

significant difference by cooperative status in the likelihood of producing multiple products or the total number of products produced prior to the reform. However, the share of revenue coming from reserved products is significantly lower for WCs, by around 8 percentage points, than for their counterparts. This gap implies that incumbent non-cooperatives have a greater degree of exposure to de-reservation, but are still able to better withstand the shock, in part by moving into new never-reserved products. Again, I repeat the analysis and control for whether a firm produced multiple products prior to de-reservation. The results of this exercise are shown in Figure 19, and the findings are qualitatively unchanged.

5.2 Inputs

Having established the heterogeneous effects of de-reservation on production, I now focus on how firms adjust their inputs in response to the reform.

5.2.1 *Incumbent SCs increase their materials share of income*

In theory, supplier cooperatives should cater to the interests of the producer-members who jointly own and control the firm. The main role these members play vis-à-vis the production process is supplying the primary material input, such as raw milk, sugarcane, or tea leaves. Revenue generated by these cooperatives is paid out to members through the price paid for their material inputs, so that remuneration is proportional to the amount of inputs supplied. For SCs, spending on materials captures both the value of basic inputs and the distribution of profits to members.[42]

Figure 7 presents the effects of de-reservation on the shares of SC revenue going to major factors of production. The most striking result is the strong positive estimate on the materials share for SCs. Concretely, de-reservation leads to a rise of 4.2. percentage points in the materials share, and this effect is significantly different from zero at the 1 percent level and from the estimate for non-cooperative counterparts at the 10% level. As outlined in ASI, materials spending includes the costs of raw materials, chemicals, consumable stores, and packing. SC producer-members are primarily concerned with the first of these costs, and in particular, spending on the firm's primary material input. To check that the result for materials share is not driven by categories arguably irrelevant for the membership of SCs, I consider the reform's impact on the share of revenue spent solely on each firm's primary material input. Reassuringly, the effect on this margin is a positive 5.3 percentage points for SCs (almost a 9% increase over the pre-reform mean of 60%).

[42] As discussed earlier in Section 3.2, I provide suggestive evidence for this in Table 4.

In sum, while de-reservation has no significant effect on the revenue of incumbent SCs, a greater share of this total is going to the primary material input after the reform. This result is consistent with added competition in de-reserved markets increasing demand and prices for relevant inputs. As Sukhtankar (2016) notes, firms that process raw agricultural inputs rely on a steady supply of produce and have strong incentives to ensure that their suppliers do not sell to other plants. Increasing the share of revenue distributed to membership could be an approach to guarantee loyalty by SCs. Although the non-cooperative counterparts face the same pressures, the management at these firms is presumably less attentive to and influenced by the demands of material input suppliers.[43]

The increase in materials share for SCs does not appear to come from a significant reallocation of spending away from other major factors of production. Neither the labor nor the capital share of income declines as a result of de-reservation for SCs.[44] For these inputs, the impact of de-reservation on the relative allocations of revenue is similar across SCs and their counterparts. In this sense, the producer-members of incumbent supplier cooperatives are not eating into compensation for other factors of production, despite the existing labor and capital shares of income being significantly higher at SCs than at their counterparts.

Despite an unchanging labor share of income, there is evidence for incumbent SCs making significant cuts to specific labor inputs as a result of de-reservation. Figures 9 and 10 highlight the heterogeneous effects of de-reservation by cooperative status on measures of pay and employment, respectively. There is a large reduction in welfare payments per employee, by about 42%, for SCs, and this estimate is significantly different from zero and the effect for non-cooperative counterparts at the 10 percent level. Since de-reservation does not have a significant effect on the total level of employment at SCs, this result implies a decline in aggregate welfare expenses.

According to ASI manuals, welfare payments in this context include expenditure on anything ranging from the supply of food, clothing, and lodging to educational, cultural, and recreational facilities for employees. Banerjee et al. (2001) argue that large sugarcane producer-members in Maharashtra exploit their relative power over smaller producer-members by depressing cane prices. These elites then siphon off the cooperative's retained earnings and fund temples, schools, colleges, and hospitals to garner social approval. If this behavior is pervasive across industries and settings, the effect I find may imply that the increased competition for SCs curbs rent seeking by their elite producer-members.

[43]Moreover, the suppliers are not necessarily an organized group in this case, which may dampen the perceived (and real) threat of collective defection in the form of sideselling.

[44]Note that there is some evidence for such reallocation away from both labor and capital in Figure 22, when the sample is restricted to 2000-2014. This could suggest that the incumbent firms being treated in 2015 are attenuating the reform's impact on labor and capital shares of revenue, especially given the limited number of post-reform periods for this group. However, the positive effect on the share of revenue going to the primary material input remains for the restricted sample.

Finally, studying the employment response of SCs is interesting given the lack of previous work on their role as employers. Since these cooperatives are owned and controlled by suppliers of material inputs, there is no reason to expect that either producer-members or the managers hired by their elected representatives will prioritize labor in the same way as worker cooperatives. I observe that SCs cut their employment of contract workers, arguably the easiest category to downsize, by almost a half in response to the reform, and this estimate is significantly different from zero at the 10 percent level. SCs appear to replace some of this labor by increasing the average number of supervisors they employ, which counters the reduction in aggregate labor spending, especially given the high supervisory wages at SCs in this context.[45]

5.2.2 *Incumbent WCs exhibit tradeoffs between compensation and employment*

Figure 8 presents the effects of de-reservation on the shares of WC revenue going to major factors of production. Since total revenue for incumbent WCs declined by 20% in response to de-reservation, the results here suggest that labor and materials spending did not fall proportionately. In particular, the rising labor share of income is in line with worker-members attempting to minimize their own losses.[46]

The adjustment of labor inputs by worker cooperatives has received significant attention in prior empirical work. Studies of firms owned and managed by labor in advanced economies have consistently found that these cooperatives are more likely to adjust wages than employment relative to non-cooperatives in response to shocks. Although the membership status of employees is unobservable in this context, the estimated effects of de-reservation for WCs in Figures 11 and 12 do not necessarily conform to this trend.

Surprisingly, de-reservation does not have a significant effect on total compensation or bonus payments per employee for incumbent WCs. In contrast, there is a significant decrease in total employment at WCs, driven by an 11% decline in the number of salaried workers and an 18% fall in the number of contract workers. The effects of de-reservation only follow the pattern of less elastic employment and more elastic wages for supervisors at WCs. Average supervisory wages fall by 21%, and this effect is significantly different from zero (and the negligible effect on supervisory wages at non-cooperative counterparts) at the 1 percent level. On the other hand, de-reservation has no significant impact on the number of supervisors employed by worker cooperatives.

[45]The increase in supervisors may be due to direct hires or a mixture of internal promotions for salaried workers, accompanied by the hiring of additional non-supervisory workers. Unfortunately, the data do not allow me to distinguish between these channels.

[46]Total labor spending reported in ASI includes both wages and profit-sharing bonuses.

Taken together, these results suggest that while WCs are more likely to reduce their employment of non-supervisory workers than supervisors, the remaining workers are able to negotiate a compression of the wage structure that only cuts supervisory wages. It is unclear whether these findings represent a clear departure from the behavior observed for worker cooperatives in other settings. The fall in employment of salaried workers could be entirely due to non-member workers leaving WCs. No change in the employment of worker-members, coupled with variable supervisory wages, would be consistent with the pattern found in previous literature. On the other hand, if worker-members are among the salaried workers that leave WCs, our interpretation would depend on the profile of these members. An exodus of higher ability worker-members in search of more lucrative opportunities would provide evidence for the degeneration hypothesis predicted by Kremer (1997), among others. However, de-reservation may also simply have put a severe strain on the ability of incumbent WCs to protect employment, including for their members.

6 Conclusion

In this paper, I study how the allocation of ownership and control rights to suppliers of material inputs or labor may affect how firms respond to a plausibly exogenous shock. Specifically, I focus on the heterogeneous impacts of de-reservation, a pro-competitive industrial policy reform, on manufacturing cooperatives and their non-cooperative counterparts in India.

I find that supplier cooperatives (SCs), owned and controlled by producer-members who supply raw material inputs, are resilient to the increased competition in terms of their revenue. Much like their non-cooperative counterparts, SCs respond by decreasing their production of items that were no longer reserved for manufacture by small-scale firms. These cooperatives differ from their counterparts in their adjustments on the input side. In line with the interests of producer-members, SCs increase the share of revenue allocated to their primary material inputs. They accompany this with cuts to welfare expenses and a reduction in their employment of contract workers. In sum, supplier cooperatives are able to withstand the reform and deliver changes benefitting their membership at large, although further work is needed to tease out the distribution of gains among members.

On the other hand, worker cooperatives (WCs), owned and controlled by worker-members employed at the firm, face a sharp decline in revenues due to de-reservation. WCs appear to be less agile in their production than their non-cooperative counterparts, which may be one reason for the former's relatively poor performance. Although these cooperatives do not decrease spending on labor in proportion to the loss of revenue, de-reservation does have significant negative effects on their employment of contract and non-supervisory workers, as well as the wages of supervisors.

While cooperatives may not appear prominently in discourse on economic policy, they remain prevalent around the world, receiving dedicated resources and attention from governments in many cases. This is particularly true of supplier cooperatives in Asia and Africa, as these firms are particularly relevant to the 93% of global agricultural employment present in these regions. Previous research has largely focused on the political capture of SCs, especially in contexts with significant inequality. Further work here can offer insights into how this political economy affects the passthrough of public resources committed to these cooperatives, such as agricultural subsidies, or the diffusion of technologies and knowledge through networks of producers.

The economic value (or lack thereof) offered by SCs also demands careful attention. This study focuses on supplier cooperatives in which producer-members exert control, at least in theory, over the processing of inputs they supply. Before this step of the supply chain, marketing agricultural produce collectively can help individual farmers counteract the monopsony power of large private buyers. One area for future research is the extent to which vertical integration offers additional value beyond the bargaining power that marketing cooperatives can provide producer-members.

Finally, while the significance of WCs may have diminished in recent decades, their behavior can also offer important lessons on the potential advantages and pitfalls of participatory workplaces. Firms continue to be owned and controlled primarily by suppliers of capital, but cooperatives can serve as guideposts for the implications of alternative arrangements, especially amid resurgent calls for greater democracy and dignity in economic spaces.

References

Abramitzky, Ran. 2011. "Lessons from the Kibbutz on the Equality-Incentives Trade-off." *Journal of Economic Perspectives* 25 (1): 185–208. 10.1257/jep.25.1.185.

Aghion, Philippe, Robin Burgess, Stephen J. Redding, and Fabrizio Zilibotti. 2008. "The Unequal Effects of Liberalization: Evidence from Dismantling the License Raj in India." *American Economic Review* 98 (4): 1397–1412, https://pubs.aeaweb.org/doi/10.1257/aer.98.4.1397.

Atkinson, A. B. 1973. "Worker Management and the Modern Industrial Enterprise." *The Quarterly Journal of Economics* 87 (3): 375–392.

Balasundharam, Vybhavi. 2020. "Bottlenecks versus ripple effects: The role of linkages in product market liberalization." *Working Paper*.

Banerjee, Abhijit, Dilip Mookherjee, Kaivan Munshi, and Debraj Ray. 2001. "Inequality, Control Rights, and Rent Seeking: Sugar Cooperatives in Maharashtra." *Journal of Political Economy* 109 (1): 138–190, https://www.journals.uchicago.edu/doi/10.1086/318600.

Ben-Ner, Avner. 1988. "The Life Cycle of Worker-Owned Firms in Market Economies." *Journal of Economic Behavior & Organization* 10 287–313.

Bertrand, Marianne, Chang-Tai Hsieh, and Nick Tsivanidis. 2021. "Contract Labor and Firm Growth in India." *NBER Working Paper Series* Working Paper 29151 59.

Boehm, Johannes, Swati Dhingra, and John Morrow. 2022. "The Comparative Advantage of Firms." *Journal of Political Economy* 130 (12): , https://www.journals.uchicago.edu/doi/10.1086/720630.

Bollard, Albert, Peter J. Klenow, and Gunjan Sharma. 2013. "India's mysterious manufacturing miracle." *Review of Economic Dynamics* 16 (1): 59–85, https://linkinghub.elsevier.com/retrieve/pii/S1094202512000658.

Bonin, John P., and Louis Putterman. 1993. "Incentives and Monitoring in Cooperatives with Labor-Proportionate Sharing Schemes." *Journal of Comparative Economics* 17 663–686.

Borusyak, Kirill, Xavier Jaravel, and Jann Spiess. 2023. "Revisiting Event Study Designs: Robust and Efficient Estimation." *Review of Economic Studies*.

Bowles, Samuel, and Herbert Gintis. 1993. "A Political and Economic Case for the Democratic Enterprise." *Economics and Philosophy* 9 75–100.

Brooks, Wyatt J., Joseph P. Kaboski, Yao Amber Li, and Wei Qian. 2021. "Exploitation of labor? Classical monopsony power and labor's share." *Journal of Development Economics* 150. 10.1016/j.jdeveco.2021.102627.

Burdin, Gabriel, and Andres Dean. 2009. "New evidence on wages and employment in worker cooperatives compared with capitalist firms." *Journal of Comparative Economics* 37 (4): 517–533, `https://linkinghub.elsevier.com/retrieve/pii/S0147596709000560`.

Cable, John, and Nicholas Wilson. 1989. "Profit-Sharing and Productivity: An Analysis of UK Engineering Firms." *The Economic Journal* 99 (396): 366–375.

Casaburi, Lorenzo, and Rocco Macchiavello. 2015. "Loyalty, Exit, and Enforcement: Evidence from a Kenya Dairy Cooperative." *American Economic Review: Papers & Proceedings* 105 (5): 286–290.

Craig, Ben, and John Pencavel. 1992. "The Behavior of Worker Cooperatives: The Plywood Companies of the Pacific Northwest." *American Economic Review* 82 (5): 1083–1105, `https://www.jstor.org/stable/2117468`, Publisher: American Economic Association.

Domar, Evsey D. 1966. "The Soviet Collective Farm as a Producer Cooperative." *American Economic Review* 56 (4): 734–757.

Dow, Gregory K., and Louis Putterman. 2000. "Why capital suppliers (usually) hire workers: what we know and what we need to know." *Journal of Economic Behavior & Organization* 43 (3): 319–336. 10.1016/S0167-2681(00)00124-4.

Edmonds, Eric V., Nina Pavcnik, and Petia Topalova. 2010. "Trade Adjustment and Human Capital Investments: Evidence from Indian Tariff Reform." *American Economic Journal: Applied Economics* 2 (4): 42–75.

Estrin, Saul, Derek C. Jones, and Jan Svejnar. 1987. "The productivity effects of worker participation: Producer cooperatives in western economies." *Journal of Comparative Economics* 11 (1): 40–61.

Eum, Hyung Sik. 2017. "Cooperatives and Employment: Second Global Report."Technical report, International Organization of Industrial, Artisanal and Service Producer Cooperatives (CICOPA).

Franke, Richard W., Pyralal Raghavan, and T. M. Thomas Isaac. 1998. *Democracy at Work in an Indian Industrial Cooperative: The Story of Kerala Dinesh Beedi.* Cornell International Industrial and Labor Relations Reports, Ithaca, NY: Cornell University Press, . 10.7591/9781501717550-005.

Galle, Simon. 2020. "Competition, Financial Constraints and Misallocation: Plant-level Evidence from Indian Manufacturing." *Working Paper*.

Garcia-Santana, Manuel, and Josep Pijoan-Mas. 2014. "The reservation laws in India and the misallocation of production factors." *Journal of Monetary Economics* 66 193–209. 10.1016/j.jmoneco.2014.04.017.

George, Shanti. 1988. "Co-operative and Indian Dairy Policy." In *Who Shares? Cooperatives and Rural Development*, edited by Baviskar, B. S., and D. W. Attwood, Delhi: Oxford University Press.

Goldberg, Pinelopi, Amit K. Khandelwal, Nina Pavcnik, and Petia Topalova. 2009. "Trade Liberalization and New Imported Inputs." *American Economic Review: Papers & Proceedings* 99 (2): 494–500.

Grossman, Sanford J., and Oliver D. Hart. 1986. "The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration." *Journal of Political Economy* 94 (4): 691–719. 10.1086/261404.

Hansmann, Henry. 1988. "Ownership of the Firm." *Journal of Law, Economics, and Organization* 4 (2): 267–304.

Hsieh, Chang-Tai, and Peter J. Klenow. 2009. "Misallocation and Manufacturing TFP in China and India." *Quarterly Journal of Economics* 124 (4): 1403–1448.

Hussain, Abid. 1997. "Report of the Expert Committee on Small Enterprises."Technical report, Department of Small Scale Industries and Agro and Rural Industries, Government of India, New Delhi.

Jensen, Michael C., and William H. Meckling. 1979. "Rights and Production Functions: An Application to Labor-Managed Firms and Codetermination." *Journal of Business* 52 (4): 469–506.

Jones, Derek C., and Takao Kato. 1995. "The Productivity Effects of Employee Stock-Ownership Plans and Bonuses: Evidence from Japanese Panel Data." *American Economic Review* 85 (3): 391–414.

Jones, Derek C., and Jan Svejnar. 1985. "Participation, Profit Sharing, Worker Ownership and Efficiency in Italian Producer Cooperatives." *Economica* 52 (208): 449.

Kerswell, Timothy, and Surendra Pratap. 2019. *Worker Cooperatives in India*. Singapore: Springer Singapore, . 10.1007/978-981-13-0384-5.

Khandelwal, Amit K., and Petia Topalova. 2011. "Trade Liberalization and Firm Productivity: The Case of India." *Review of Economics and Statistics* 93 (3): 995–1009.

Kremer, Michael. 1997. "Why are Worker Cooperatives So Rare?" *NBER Working Paper Series* Working Paper 6118.

Levin, Jonathan, and Steven Tadelis. 2005. "Profit Sharing and the Role of Professional Partnerships." *Quarterly Journal of Economics* 120 (1): 131–171.

Martin, Leslie A., Shanthi Nataraj, and Ann E. Harrison. 2017. "In with the Big, Out with the Small: Removing Small-Scale Reservations in India." *American Economic Review* 107 (2): 354–386. 10.1257/aer.20141335.

Mazumder, Soumyajit, and Alan Yan. 2023. "What Do Americans Want From (Private) Government? Experimental Evidence Demonstrates that Americans Want Workplace Democracy." *American Political Science Review.* 10.31235/osf.io/j9asz.

Mohan, Rakesh. 2002. "Small-Scale Industry Policy in India: A Critical Evaluation." In *Economic Policy Reforms and the Indian Economy*, edited by Krueger, Anne O. 213–297, University Chicago Press.

Montero, Eduardo. 2022. "Cooperative Property Rights and Development: Evidence from Land Reform in El Salvador." *Journal of Political Economy* 130 (1): 48–93.

Nimier-David, Elio, David Alexandre Sraer, and David Thesmar. 2023. "The Effects of Mandatory Profit-Sharing on Workers and Firms: Evidence from France." *NBER Working Paper Series* Working Paper 31804.

Pencavel, John. 2013. "Worker Cooperatives and Democratic Governance." In *Handbook of Economic Organization: Integrating Economic and Organization Theory*, edited by Grandori, Anna, Cheltenham: Edward Elgar Publishing Limited.

Pencavel, John, Luigi Pistaferri, and Fabiano Schivardi. 2006. "Wages, Employment, and Capital in Capitalist and Worker-Owned Firms." *ILR Review* 60 (1): 23–44.

Prasnikar, Janez, Jan Svejnar, Dubravko Mihaljek, and Vesna Prasnikar. 1994. "Behavior of Participatory Firms in Yugoslavia: Lessons for Transforming Economies." *Review of Economics and Statistics* 76 (4): 728. 10.2307/2109774.

Sen, Amartya K. 1966. "Labour Allocation in a Cooperative Enterprise." *The Review of Economic Studies* 33 (4): 361–371.

Stiglitz, Joseph E. 1974. "Incentives and Risk Sharing in Sharecropping." *The Review of Economic Studies* 41 (2): 219–255. 10.2307/2296714.

Sukhtankar, Sandip. 2012. "Sweetening the Deal? Political Connections and Sugar Mills in India." *American Economic Journal: Applied Economics* 4 (3): 43–63.

Sukhtankar, Sandip. 2016. "Does firm ownership structure matter? Evidence from sugar mills in India." *Journal of Development Economics* 122 46–62.

Svejnar, Jan. 1982a. "Employee Participation in Management, Bargaining Power and Wages." *European Economic Review* 18 291–303.

Svejnar, Jan. 1982b. "On the Theory of a Participatory Firm." *Journal of Economic Theory* 27 313–330.

Tewari, Ishani, and Joshua Wilde. 2019. "Product Scope and Productivity: Evidence from India's Product Reservation Policy." *Southern Economic Journal* 86 (1): 339–362.

Topalova, Petia. 2007. "Trade Liberalization, Poverty, and Inequality: Evidence from Indian Districts." In *Globalization and Poverty*, edited by Harrison, Ann E. 291–336, Cambridge, MA: University of Chicago Press.

Topalova, Petia. 2010. "Factor Immobility and Regional Impacts of Trade Liberalization: Evidence on Poverty from India." *American Economic Journal: Applied Economics* 2 1–41.

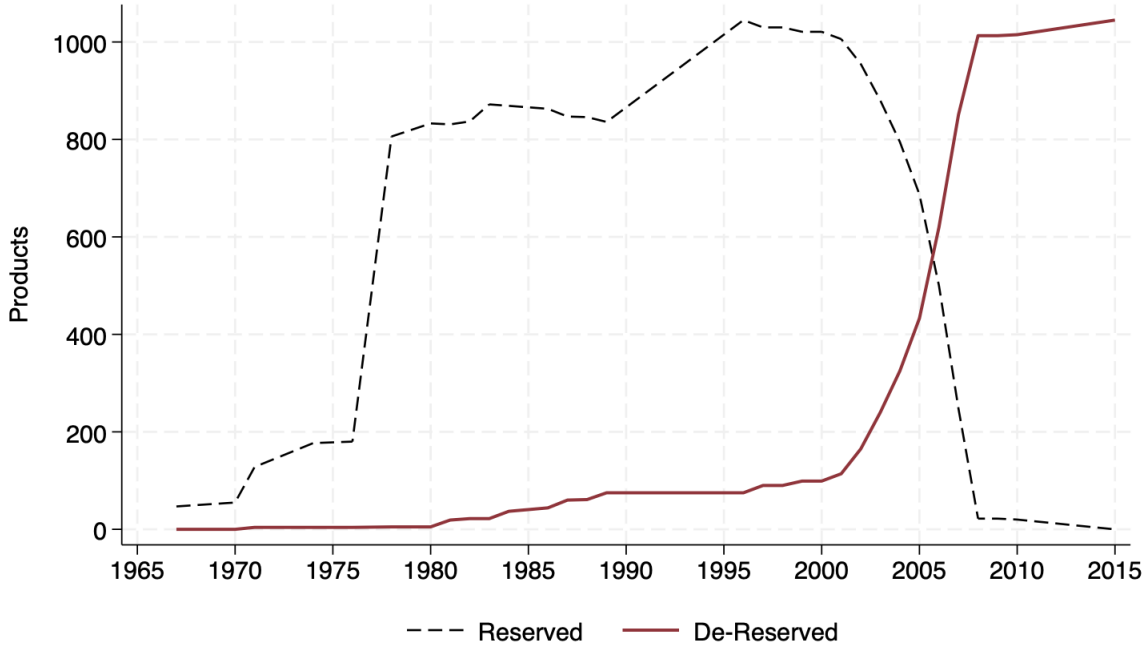
Vaidyanathan, A. 2013. "Future of Cooperatives in India." *Economic and Political Weekly* 48 (18): 30–34, `https://www.jstor.org/stable/23527305`, Publisher: Economic and Political Weekly.

Vanek, J. 1977. *The Labor Managed Economy: Essays by J. Vanek*. Ithaca, NY: Cornell University Press.

Ward, Benjamin. 1958. "The Firm in Illyria: Market Syndicalism." *The American Economic Review* 48 1–25. 10.1007/978-1-349-03117-7_1.

Figures

Figure 1: Total Reserved and De-Reserved Products Over Time



Note: Figure based on Mohan (2002), Martin et al. (2017), and publications by the Ministry of Micro, Small, and Medium Enterprises, Government of India.

Figure 2: Pre-Reform Factor Shares for SCs and Counterparts

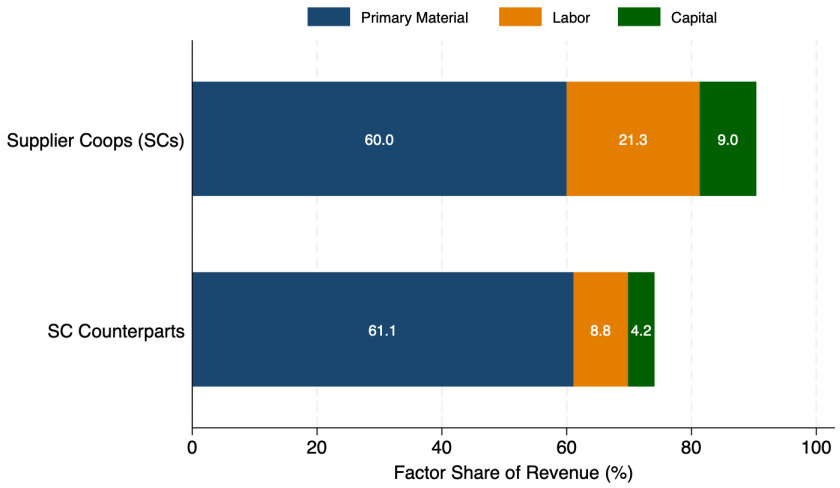
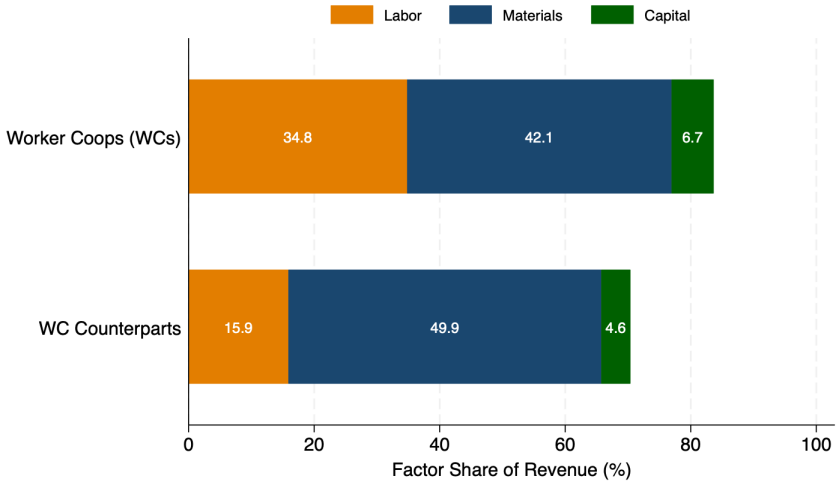
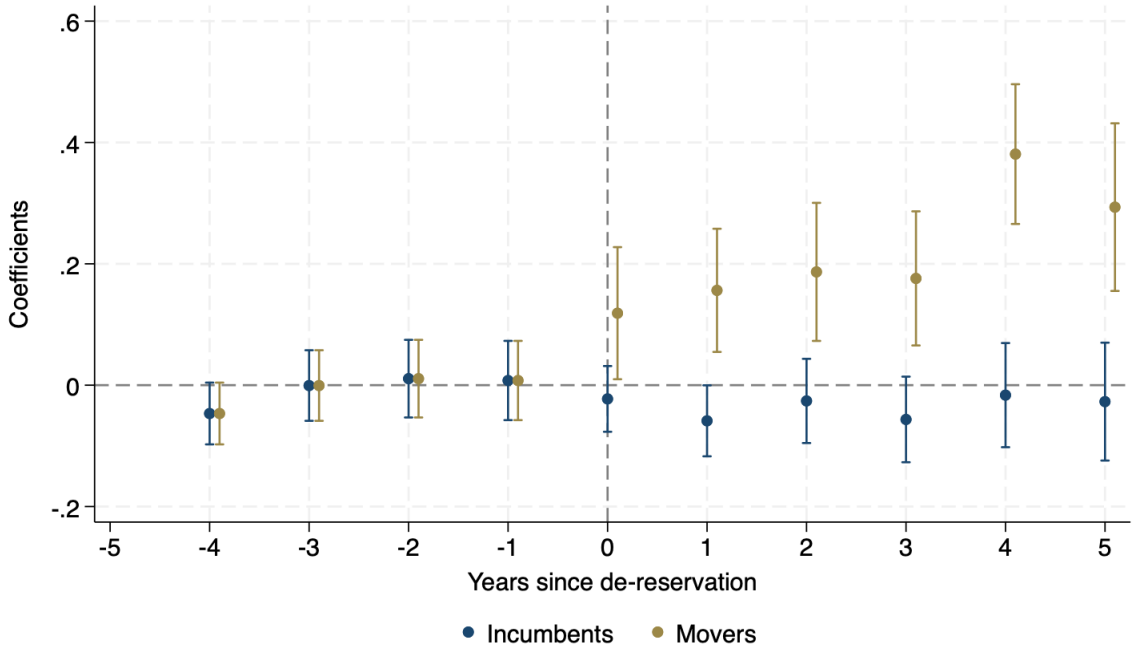


Figure 3: Pre-Reform Factor Shares for WCs and Counterparts



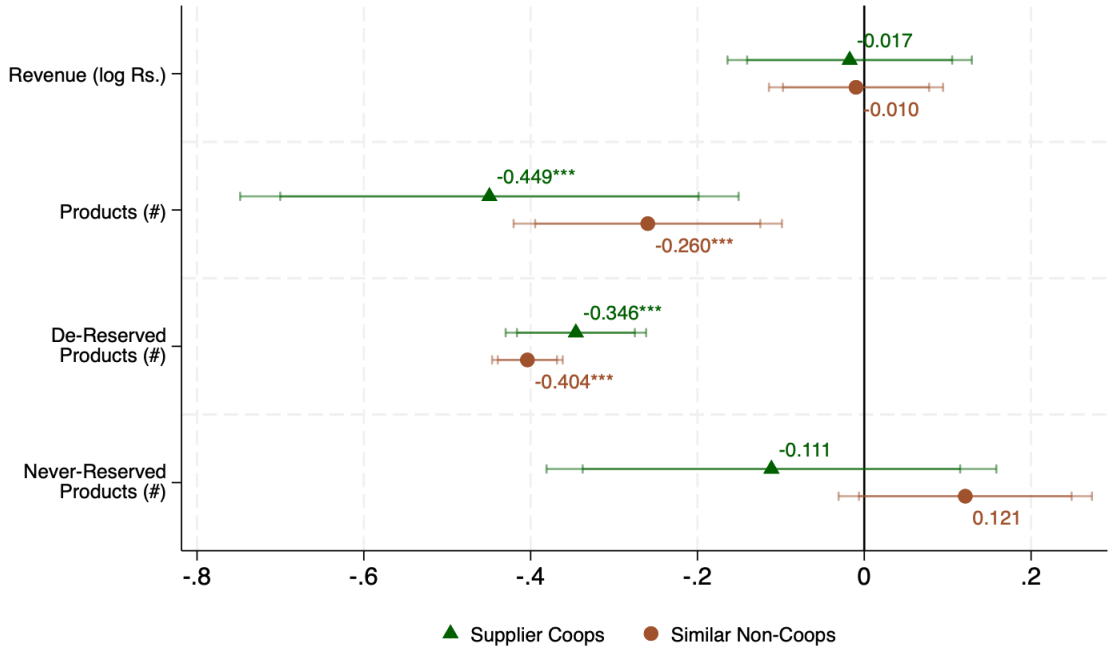
Note: These figure reports spending on input categories as a share of revenue for firms prior to de-reservation. Total ouput includes the factory value of goods produced, as well as income received for any goods resold or services provided. In Figure 7, spending on the primary material refers to the total cost of the firm's main raw input. Spending on materials in Figure 8 includes the value of all basic material inputs, chemicals, consumable stores, and packing. Spending on labor includes wages, bonus payments, welfare payments, and employer contributions to provident funds for employees. Payments to capital are calculated by assuming a constant rate of depreciation and interest across firms and multiplying this rate by the value of average fixed capital over the accounting year.

Figure 4: Impact of De-Reservation on Total Revenue (log Rs.)



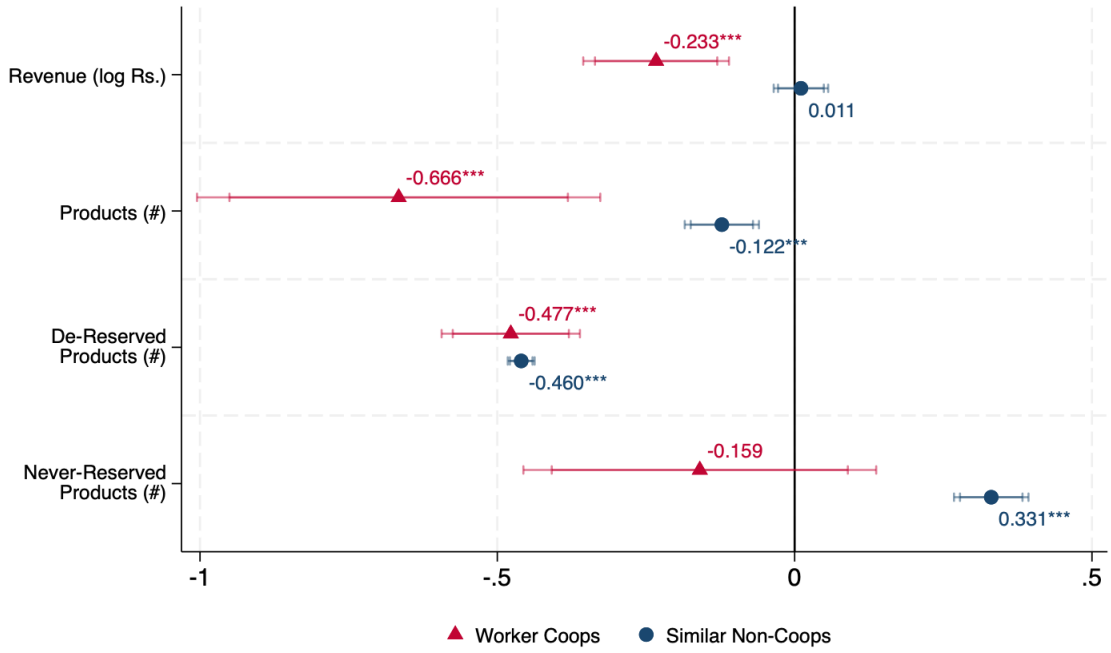
Note: This figure plots estimates from a variant of specification (2) that adds an interaction between treatment and an indicator for whether the treated firm is a mover, i.e., whether it started making the previous reserved product after de-reservation, for each horizon. The regression includes firm fixed effects, industry-year fixed effects, and initial firm-size quintile-year fixed effects. The outcome in this case is total revenue, which includes the factory value of goods produced, as well as income received for any goods resold or services provided. Values for revenue are deflated by a wholesale price index for each 3-digit industry. Standard errors are clustered at the firm level.

Figure 5: Effects of De-Reservation on Output for SCs and Counterparts



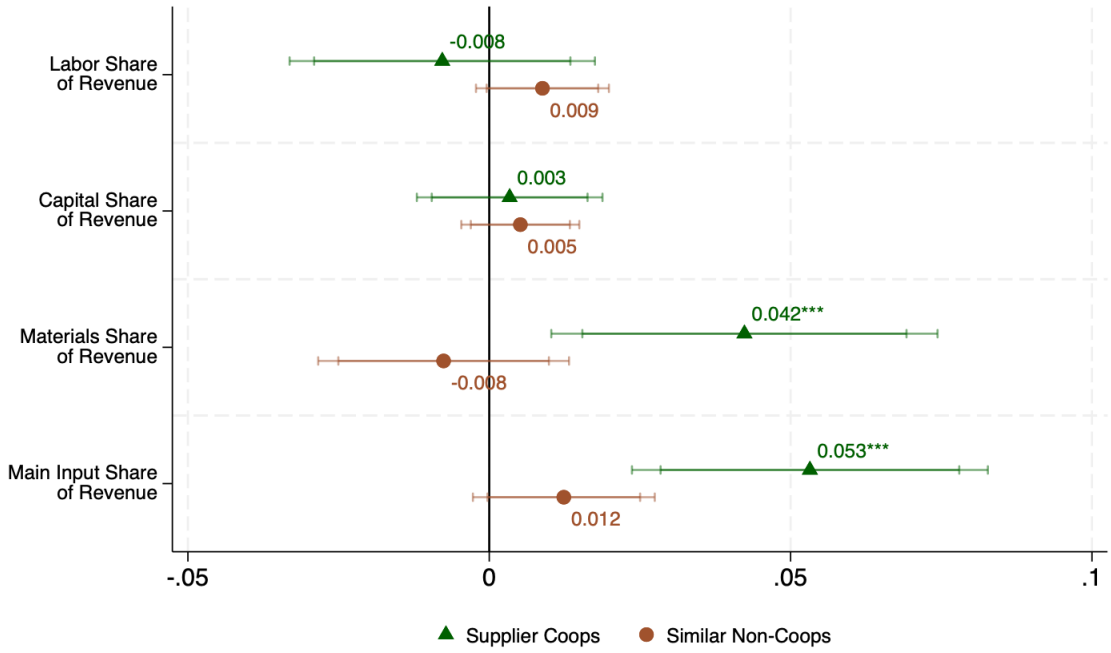
Note: This figure plots estimates of treatment effects for each group from specification (1) for the outcomes specified on the vertical axis, along with 90% and 95% confidence intervals, with standard errors clustered at the firm level. The regression specification for the imputation estimator includes firm fixed effects, NIC-87 2-digit industry-year fixed effects, and initial firm size quintile-year fixed effects, as well as a linear time trend for cooperatives. Values for revenue are deflated by a wholesale price index for each 3-digit industry. The sample here includes only NIC-87 3-digit industries that feature both SCs and their non-cooperative counterparts. *** $p < .01$, ** $p < .05$, and * $p < .1$ for tests of the hypothesis that the relevant point estimate is equal to zero.

Figure 6: Effects of De-Reservation on Output for WCs and Counterparts



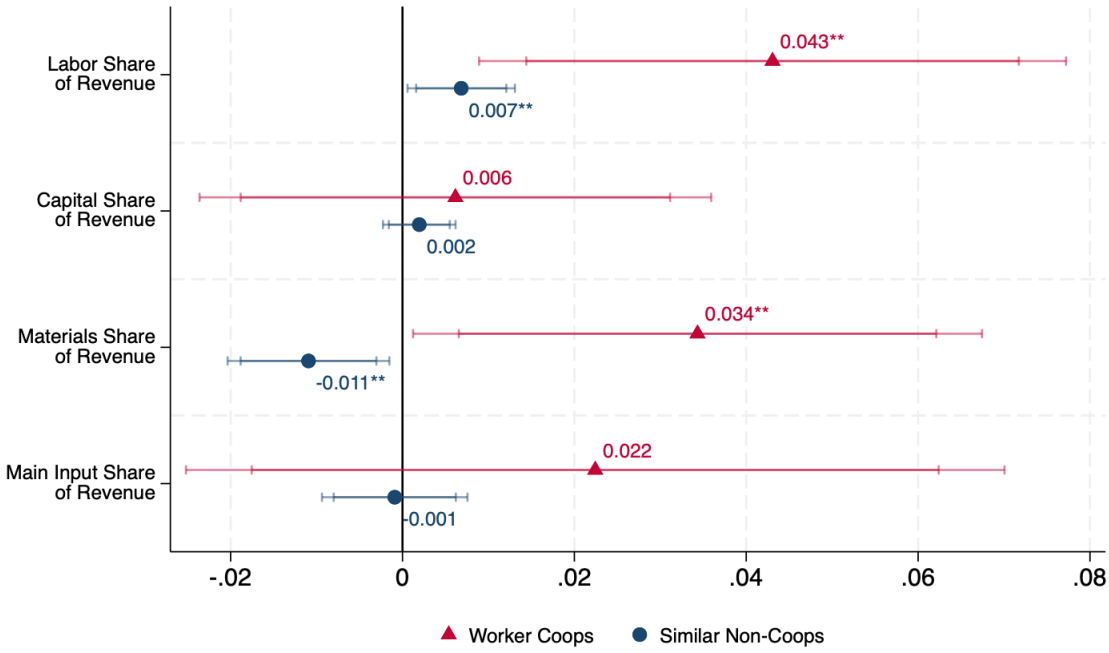
Note: This figure plots estimates of treatment effects for each group from specification (1) for the outcomes specified on the vertical axis, along with 90% and 95% confidence intervals. The regression specification for the imputation estimator includes firm fixed effects, NIC-87 2-digit industry-year fixed effects, and initial firm size quintile-year fixed effects, as well as a linear time trend for cooperatives. Values for revenue are deflated by a wholesale price index for each 3-digit industry. The sample here includes only NIC-87 3-digit industries that feature both WCs and their non-cooperative counterparts. *** $p < .01$, ** $p < .05$, and * $p < .1$ for tests of the hypothesis that the relevant point estimate is equal to zero.

Figure 7: Effects of De-Reservation on Input Shares for SCs and Counterparts



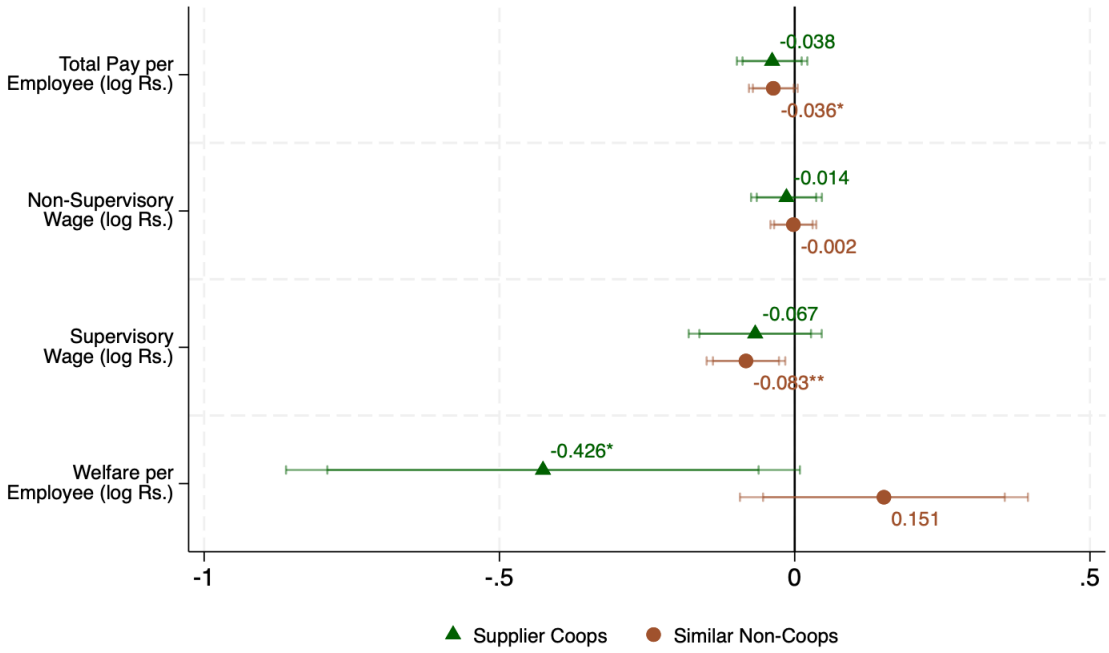
Note: This figure plots estimates of treatment effects for each group from specification (1) for the outcomes specified on the vertical axis, along with 90% and 95% confidence intervals, with standard errors clustered at the firm level. The regression specification for the imputation estimator includes firm fixed effects, NIC-87 2-digit industry-year fixed effects, and initial firm size quintile-year fixed effects, as well as a linear time trend for cooperatives. The sample here includes only NIC-87 3-digit industries that feature both SCs and their non-cooperative counterparts. *** $p < .01$, ** $p < .05$, and * $p < .1$ for tests of the hypothesis that the relevant point estimate is equal to zero.

Figure 8: Effects of De-Reservation on Input Shares for WCs and Counterparts



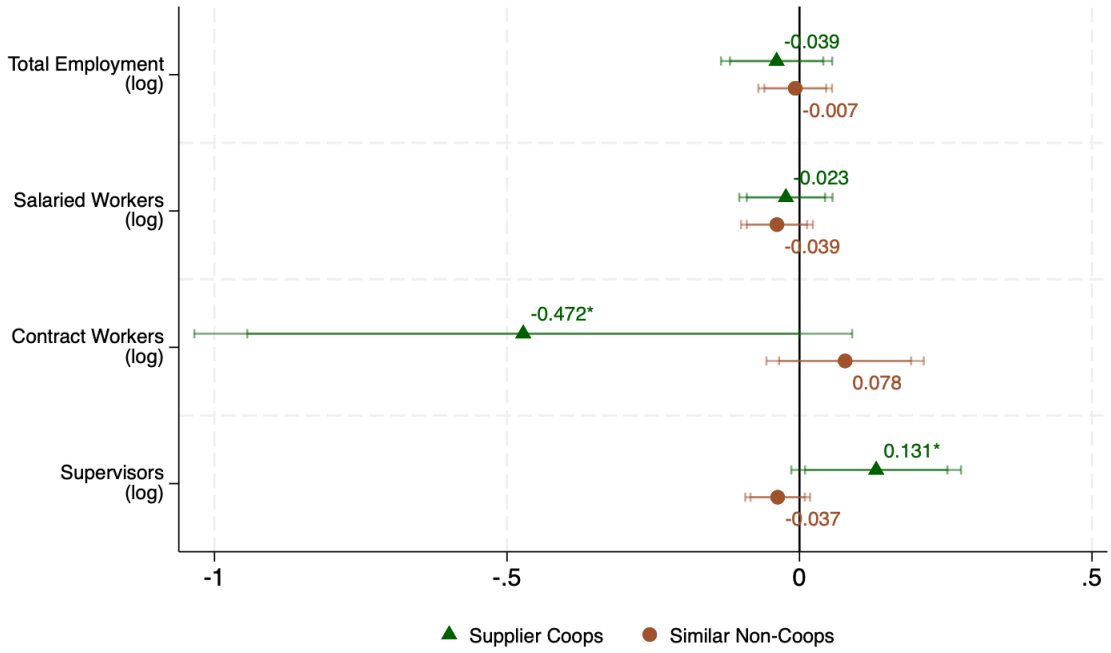
Note: This figure plots estimates of treatment effects for each group from specification (1) for the outcomes specified on the vertical axis, along with 90% and 95% confidence intervals, with standard errors clustered at the firm level. The regression specification for the imputation estimator includes firm fixed effects, NIC-87 2-digit industry-year fixed effects, and initial firm size quintile-year fixed effects, as well as a linear time trend for cooperatives. The sample here includes only NIC-87 3-digit industries that feature both WCs and their non-cooperative counterparts. *** $p < .01$, ** $p < .05$, and * $p < .1$ for tests of the hypothesis that the relevant point estimate is equal to zero.

Figure 9: Effects of De-Reservation on Compensation for SCs and Counterparts



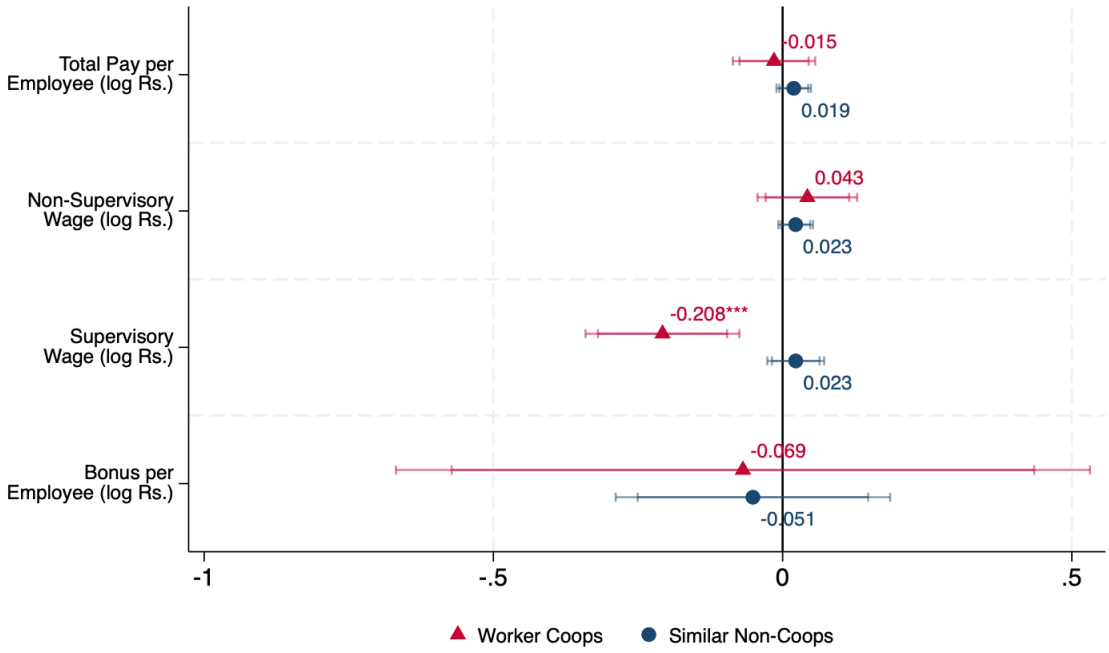
Note: This figure plots estimates of treatment effects for each group from specification (1) for the outcomes specified on the vertical axis, along with 90% and 95% confidence intervals, with standard errors clustered at the firm level. The regression specification for the imputation estimator includes firm fixed effects, NIC-87 2-digit industry-year fixed effects, and initial firm size quintile-year fixed effects, as well as a linear time trend for cooperatives. The sample here includes only NIC-87 3-digit industries that feature both SCs and their non-cooperative counterparts. *** $p < .01$, ** $p < .05$, and * $p < .1$ for tests of the hypothesis that the relevant point estimate is equal to zero.

Figure 10: Effects of De-Reservation on Employment for SCs and Counterparts



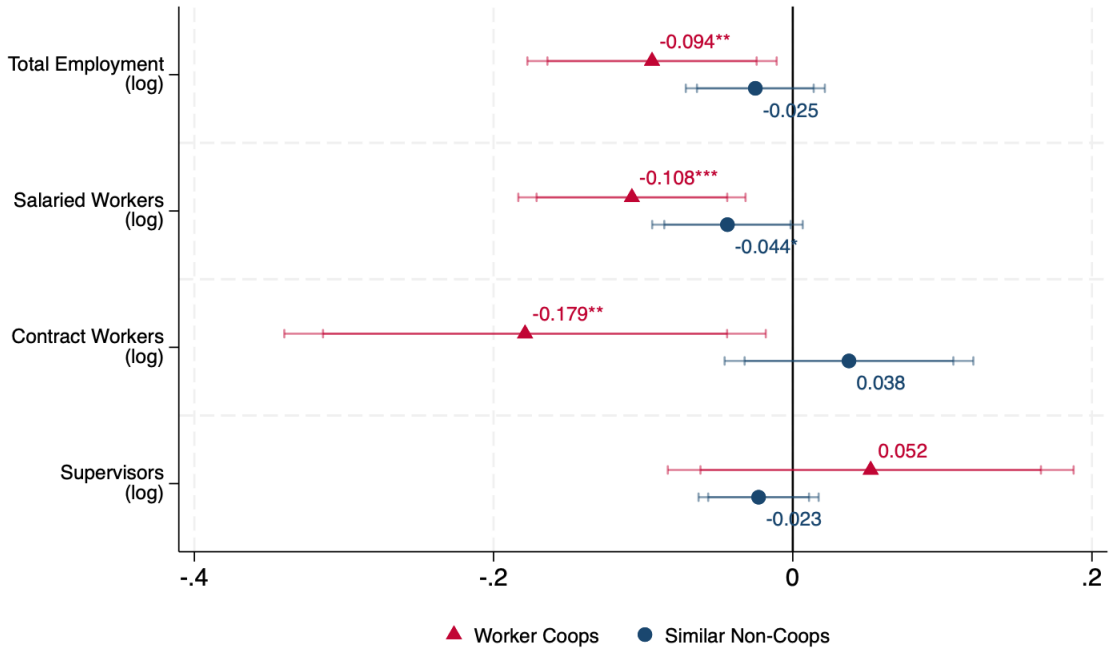
Note: This figure plots estimates of treatment effects for each group from specification (1) for the outcomes specified on the vertical axis, along with 90% and 95% confidence intervals, with standard errors clustered at the firm level. The regression specification for the imputation estimator includes firm fixed effects, NIC-87 2-digit industry-year fixed effects, and initial firm size quintile-year fixed effects, as well as a linear time trend for cooperatives. The sample here includes only NIC-87 3-digit industries that feature both SCs and their non-cooperative counterparts. *** $p < .01$, ** $p < .05$, and * $p < .1$ for tests of the hypothesis that the relevant point estimate is equal to zero.

Figure 11: Effects of De-Reservation on Compensation for WCs and Counterparts



Note: This figure plots estimates of treatment effects for each group from specification (1) for the outcomes specified on the vertical axis, along with 90% and 95% confidence intervals, with standard errors clustered at the firm level. The regression specification for the imputation estimator includes firm fixed effects, NIC-87 2-digit industry-year fixed effects, and initial firm size quintile-year fixed effects, as well as a linear time trend for cooperatives. The sample here includes only NIC-87 3-digit industries that feature both WCs and their non-cooperative counterparts. *** $p < .01$, ** $p < .05$, and * $p < .1$ for tests of the hypothesis that the relevant point estimate is equal to zero.

Figure 12: Effects of De-Reservation on Employment for WCs and Counterparts



Note: This figure plots estimates of treatment effects for each group from specification (1) for the outcomes specified on the vertical axis, along with 90% and 95% confidence intervals, with standard errors clustered at the firm level. The regression specification for the imputation estimator includes firm fixed effects, NIC-87 2-digit industry-year fixed effects, and initial firm size quintile-year fixed effects, as well as a linear time trend for cooperatives. The sample here includes only NIC-87 3-digit industries that feature both WCs and their non-cooperative counterparts. *** $p < .01$, ** $p < .05$, and * $p < .1$ for tests of the hypothesis that the relevant point estimate is equal to zero.

Tables

Table 1: Global Distribution of Cooperative Employment

	Coops	Employees	Worker-Members	Supplier-Members
Asia	2,156	7,427	8,574	219,247
Africa	375	1,940	38	20,410
America	181	1,896	982	3,237
Europe	222	4,711	1,555	9,157
Oceania	2	75	-	147
Total	2,937	16,049	11,149	252,199

Note: The source for these figures is Eum (2017). All values are reported in '000s. The number of cooperatives includes organizations not involved in production, such as credit and housing cooperatives.

Table 2: Industries for Cooperatives in India's Formal Manufacturing Sector

Top Industries for Supplier Cooperatives	**Top Industries for Worker Cooperatives**
Manufacture of dairy products	Manufacture of *bidi*
Manufacture and refining of sugar	Manufacture of structural clay products
Cotton ginning, cleaning, and baling	Manufacture of blankets, shawls, carpets
Manufacture of prepared animal and bird feed	Manufacture of of thread and cordage
Preparation of raw wool for spinning	Manufacture of floor coverings of jute
Processing and blending of tea	Manufacture of plastic products
Grain milling	Manufacture of wooden furniture and fixtures
Manufacture of fertilizers and pesticides	Manufacture of metal products

Note: This information is based on NIC-87 3-digit industries reported by cooperative firms in ASI.

Table 3: Firm Characteristics by Type of Organization

Variable	(1) SCs	(2) SC CParts	(3) Diff (1-2)	(4) WCs
Employment	105.06	42.75	30.99	29.05
Contractor Share	0.12	0.11	0.13	0.18
Supervisor Share	0.10	0.11	0.09	0.11
Female Share	0.23	0.20	0.33	0.14
Total Pay (Rs. in '000s)	105.34	75.65	66.79	83.29
Worker Wage (Rs. in '000s)	79.60	53.01	49.29	59.08
Supervisor Wage (Rs. in '000s)	203.93	168.09	118.16	191.13
P(Incumbent)	0.05	0.09	0.23	0.15
P(Multi-Product)	0.50	0.53	0.30	0.23
Total Products	2.31	1.96	1.65	1.46
Reserved Products	0.05	0.08	0.19	0.13
Reserved Share	0.03	0.06	0.16	0.13
Observations	1,156	20,341	477	24,985

Note: These are mean values for firms prior to de-reservation. Sampling multipliers are applied.

Table 4: Primary Material Input Prices by Type of Organization

Variable	(1) SCs	(2) SC CParts	(3) Diff (1-2)	(4) WCs	(5) WC CParts	(6) Diff (3-4)
Nominal Price (log Rs.)	7.57	7.45	0.15**	8.03	7.32	0.11
Real Price (log Rs.)	8.02	7.83	0.17**	8.43	7.73	0.12
Observations	871	12,053	12,924	364	11,163	11,527

Note: These are mean prices per unit for firms prior to de-reservation. The real price is obtained by deflating the nominal price using a wholesale price index matched to each NIC-87 3-digit industry. Difference columns report the mean differences controlling for product, firm industry, initial size, and state. *** $p < .01$, ** $p < .05$, and * $p < .1$ for tests of the hypothesis that the relevant difference is equal to zero. Sampling multipliers are applied.

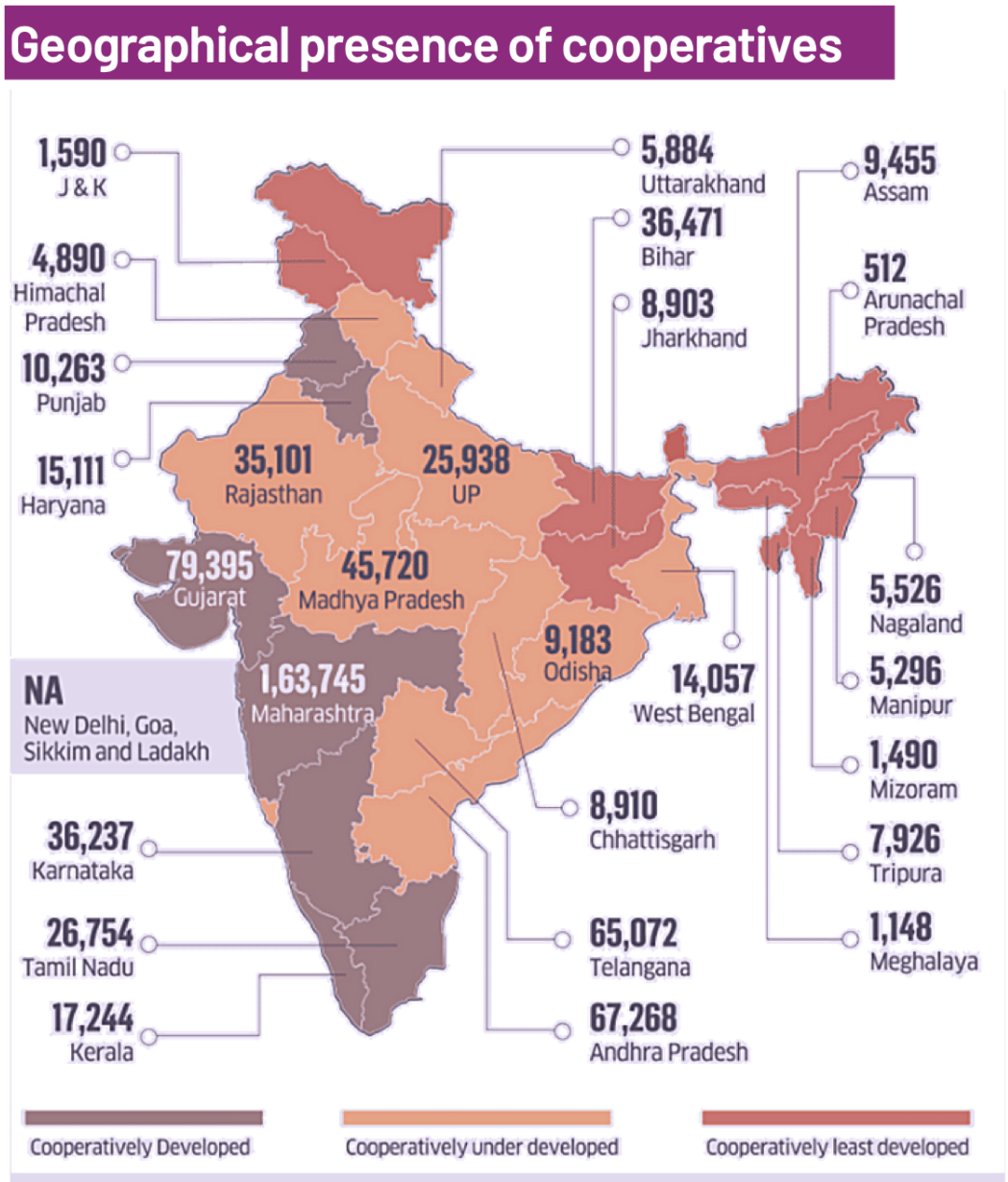
Table 5: Production Characteristics for Treated Firms by Type of Organization

Variable	(1) SCs	(2) SC CParts	(3) Diff (1-2)	(4) WCs	(5) WC CParts	(6) Diff (3-4)
P(Multi-Product)	0.94	0.75	0.13**	0.49	0.30	0.05
Total Products	3.91	2.90	0.52	2.32	1.62	0.19
Reserved Products	1.05	1.04	0.02	1.07	1.02	0.05
Reserved Share	0.62	0.68	0.05	0.69	0.88	-0.08***
Observations	61	1,754	1,815	110	4,379	4,489

Note: These are mean values for firms prior to de-reservation. Difference columns report the mean differences controlling for firm industry, initial size, and state. *** $p < .01$, ** $p < .05$, and * $p < .1$ for tests of the hypothesis that the relevant difference is equal to zero. Sampling multipliers are applied.

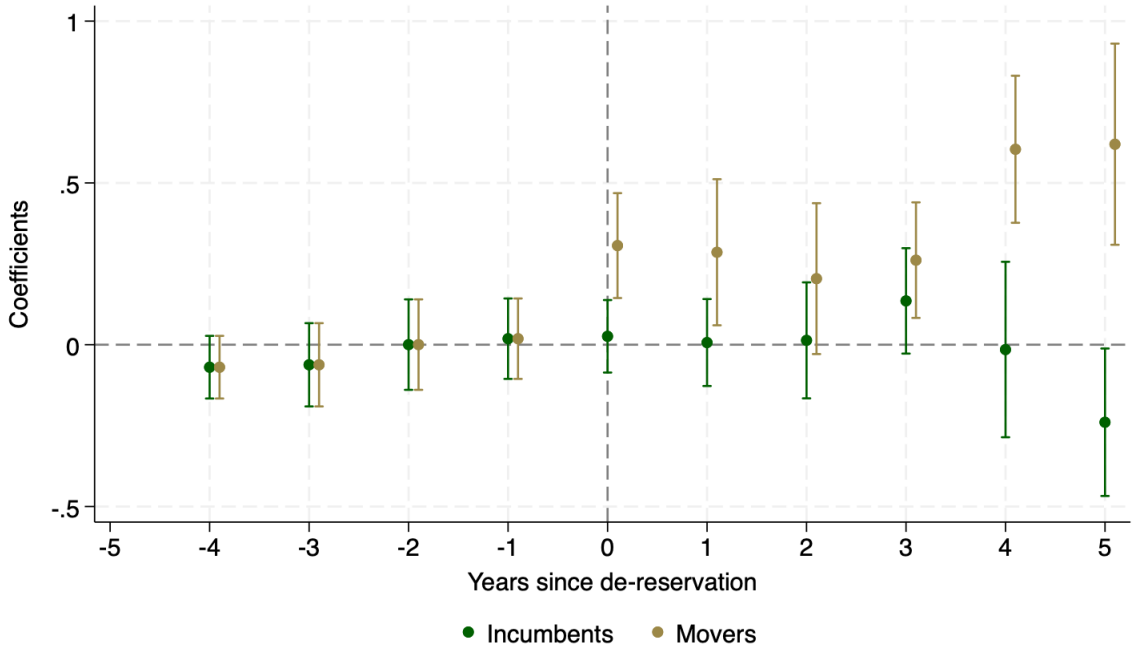
A Additional Figures

Figure 13: Geographic Distribution of Cooperatives in India



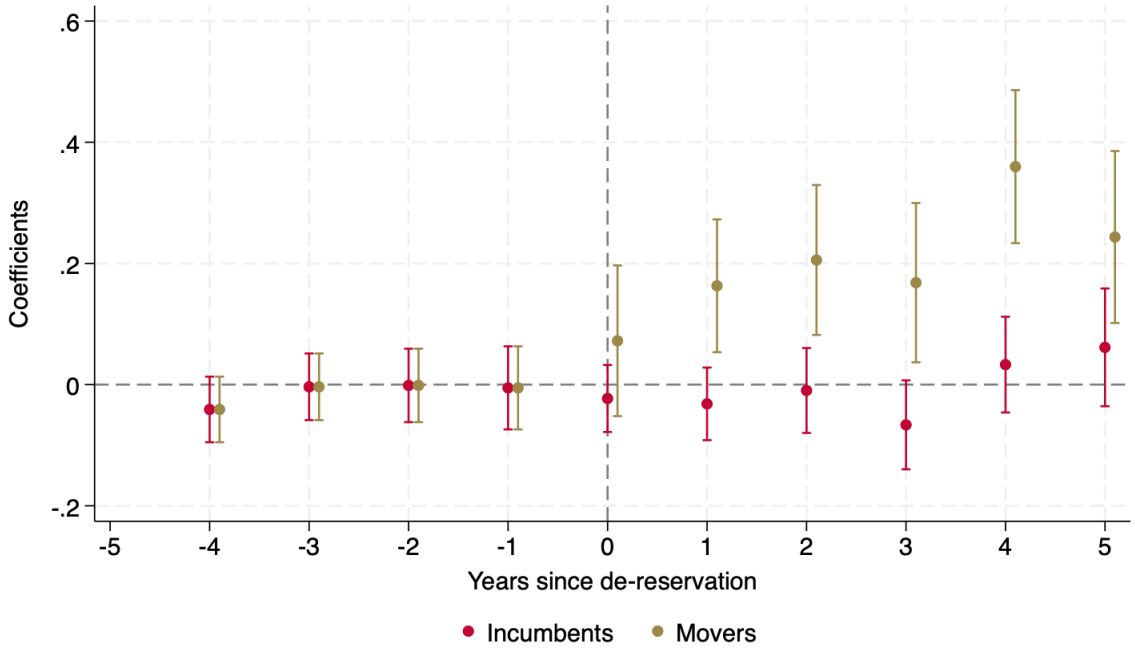
Note: The source for this figure is the Deccan Herald.

Figure 14: Impact of De-Reservation on Total Revenue (log Rs.) in SC Industries



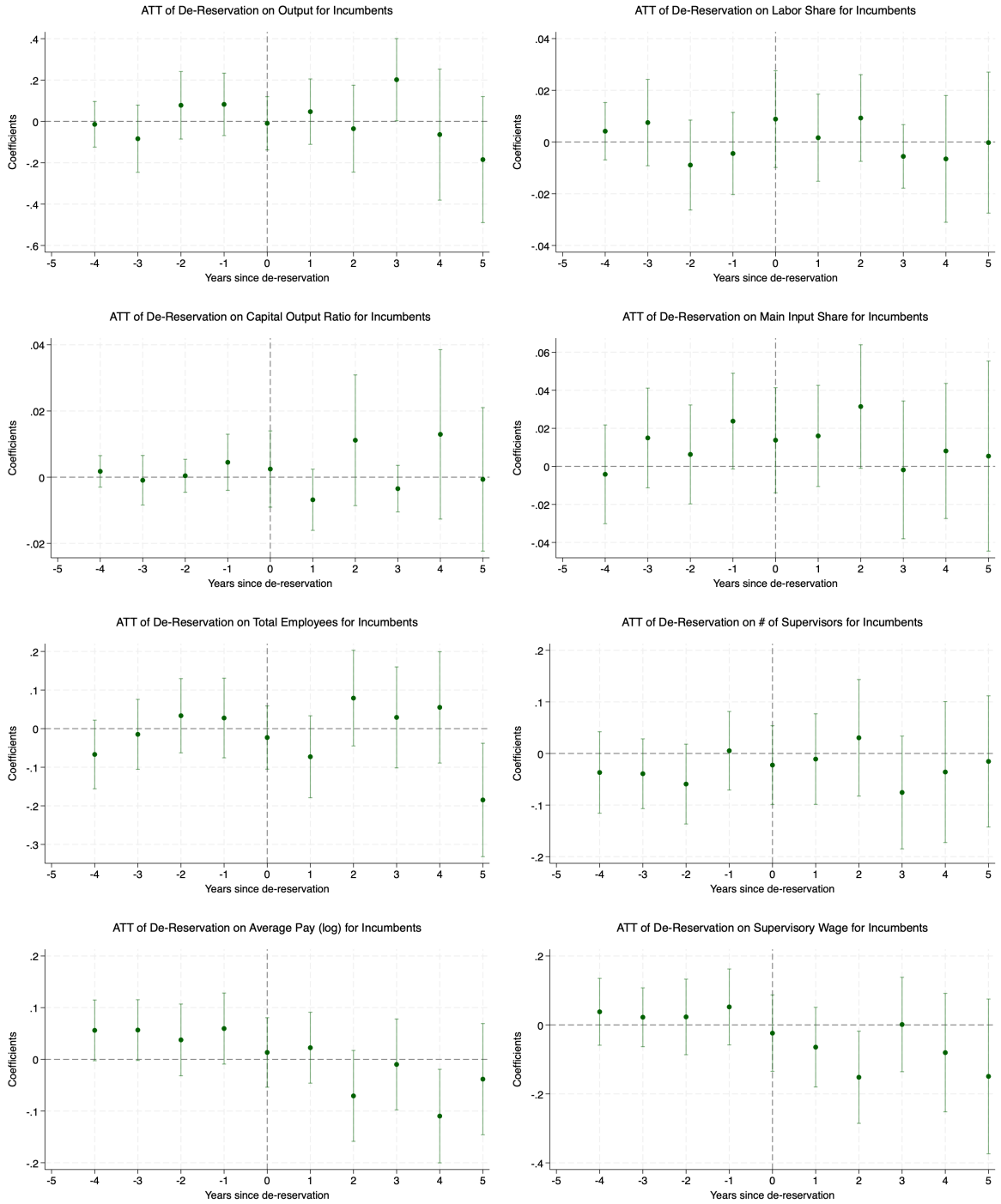
Note: This figure plots estimates and 95% confidence intervals from a variant of specification (2) that adds an interaction between treatment and an indicator for whether the treated firm is a mover, i.e., whether it started making the previous reserved product after de-reservation, for each horizon. The regression includes firm fixed effects, industry-year fixed effects, and initial size quintile-year fixed effects. The outcome in this case is total revenue, which includes the factory value of goods produced, as well as income received for any goods resold or services provided. The sample here includes only NIC-87 3-digit industries that feature both SCs and their non-cooperative counterparts. Standard errors are clustered at the firm level.

Figure 15: Impact of De-Reservation on Total Revenue (log Rs.) in WC Industries



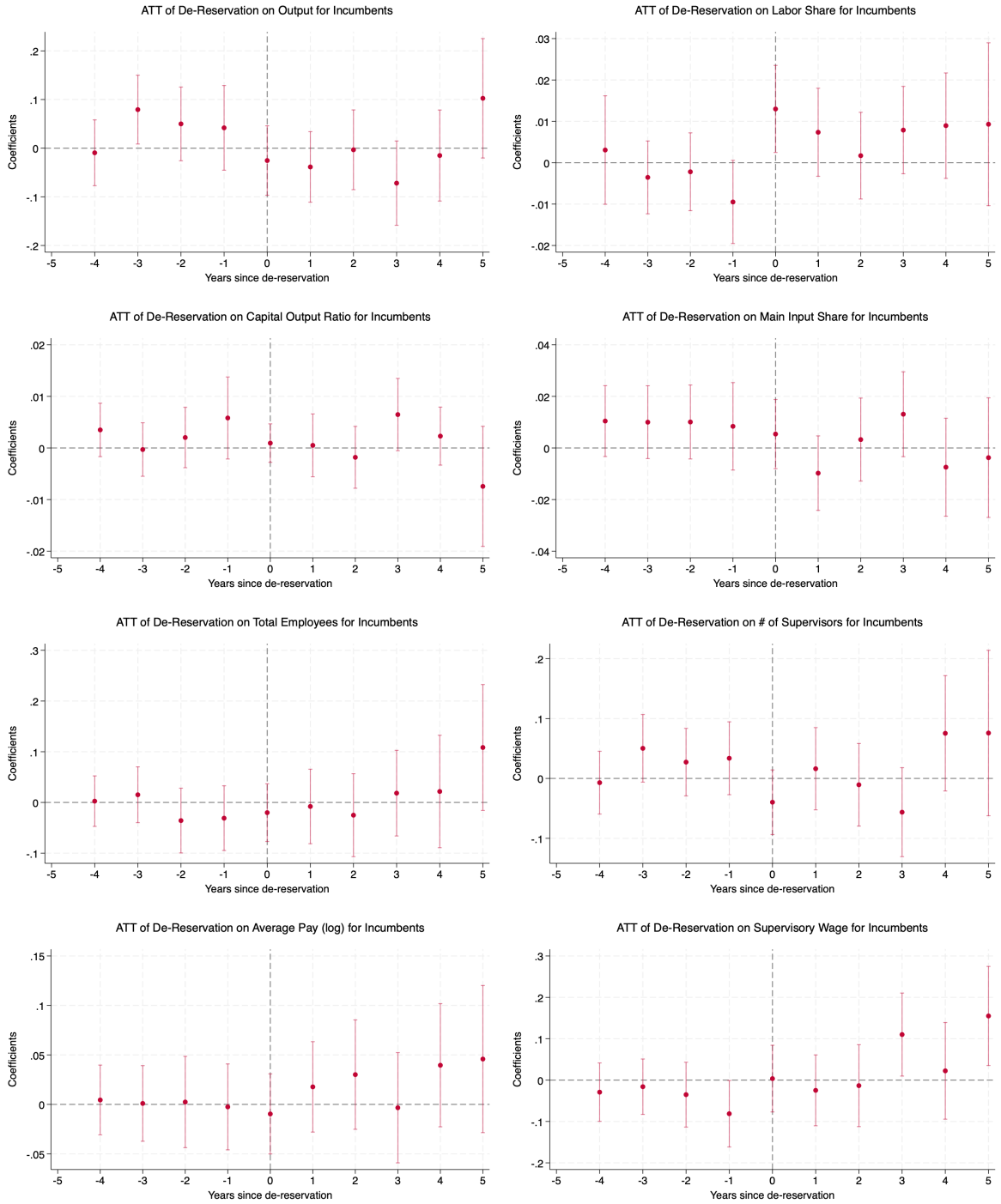
Note: This figure plots estimates and 95% confidence intervals from a variant of specification (2) that adds an interaction between treatment and an indicator for whether the treated firm is a mover, i.e., whether it started making the previous reserved product after de-reservation, for each horizon. The regression includes firm fixed effects, industry-year fixed effects, and initial size quintile-year fixed effects. The outcome in this case is total ouput, which includes the factory value of goods produced, as well as income received for any goods resold or services provided. The sample here includes only NIC-87 3-digit industries that feature both WCs and their non-cooperative counterparts. Standard errors are clustered at the firm level.

Figure 16: Differences in Pre-Trends for SC Subsample



Note: These figures plot estimates and 95% confidence intervals from specification (2) for the outcomes indicated in the title of each plot, with standard errors clustered at the firm level. The sample here includes only NIC-87 3-digit industries that feature both SCs and their non-cooperative counterparts.

Figure 17: Differences in Pre-Trends for WC Subsample



Note: These figures plot estimates and 95% confidence intervals from specification (2) for the outcomes indicated in the title of each plot, with standard errors clustered at the firm level. The sample here includes only NIC-87 3-digit industries that feature both WCs and their non-cooperative counterparts.

A.1 Controlling for Multi-Product Status

Figure 18: Effects of De-Reservation on Output for SCs and Counterparts

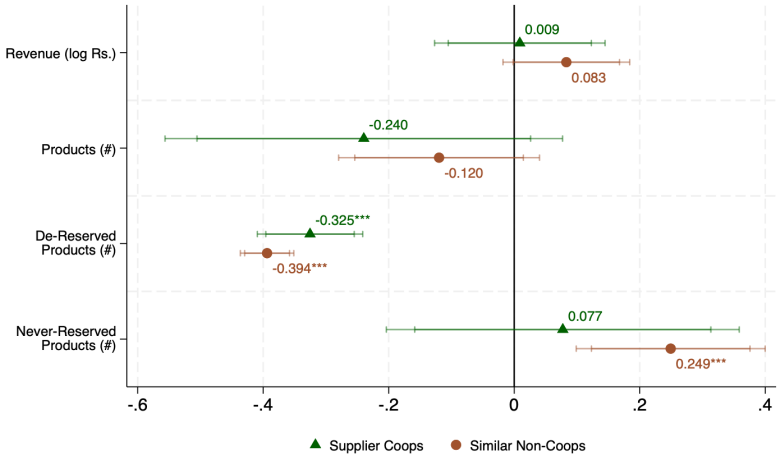
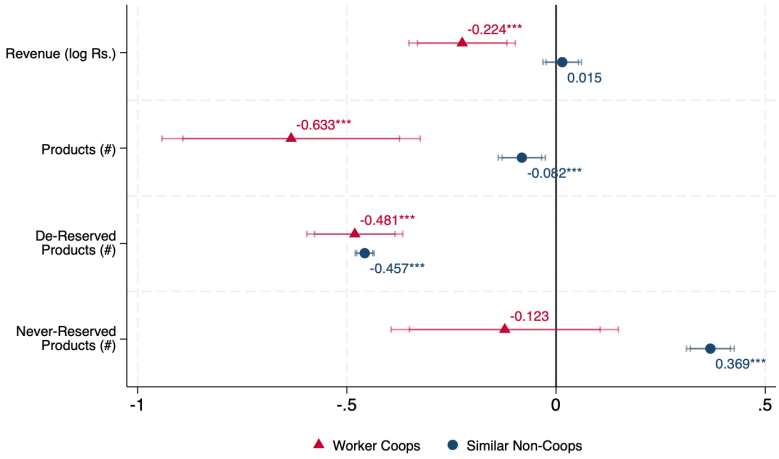


Figure 19: Effects of De-Reservation on Output for WCs and Counterparts



Note: These figures plots estimates of treatment effects for each group from specification (1) for the outcomes specified on the vertical axis, along with 90% and 95% confidence intervals, with standard errors clustered at the firm level. The regression specification for the imputation estimator includes firm fixed effects, NIC-87 2-digit industry-year fixed effects, and initial firm size quintile-year fixed effects, as well as a linear time trend for cooperatives. Crucially, the regressions here also control for whether a firm was initially producing multiple products. The samples here include either NIC-87 3-digit industries with SCs and non-cooperatives (Figure 18), or WCs and non-cooperatives (Figure 19). *** $p < .01$, ** $p < .05$, and * $p < .1$ for tests of the hypothesis that the relevant point estimate is equal to zero.

A.2 Restricting Sample to 2000-2014

Figure 20: Effects of De-Reservation on Output for SCs and Counterparts

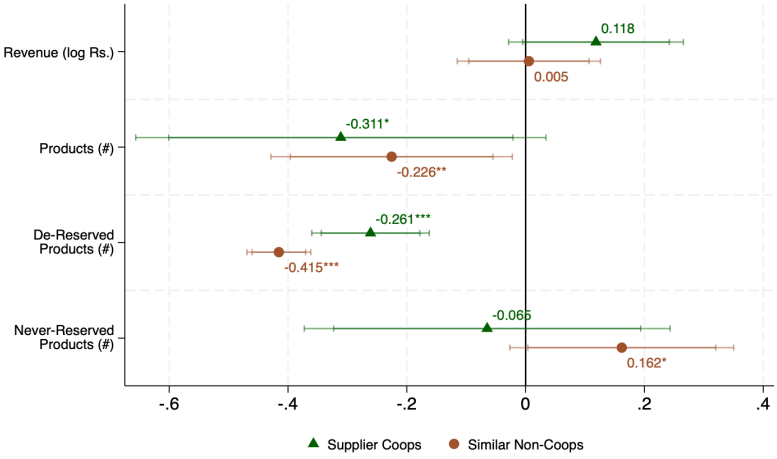
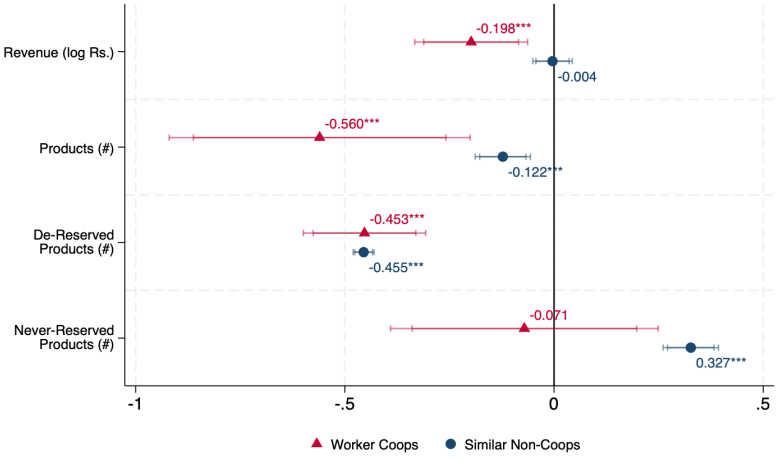


Figure 21: Effects of De-Reservation on Output for WCs and Counterparts



Note: These figures plots estimates of treatment effects for each group from specification (1) for the outcomes specified on the vertical axis, along with 90% and 95% confidence intervals, with standard errors clustered at the firm level. The regression specification for the imputation estimator includes firm fixed effects, NIC-87 2-digit industry-year fixed effects, and initial firm size quintile-year fixed effects, as well as a linear time trend for cooperatives. Values for revenue are deflated by a wholesale price index for each 3-digit industry. The samples here include either NIC-87 3-digit industries with SCs and non-cooperatives (Figure 20), or WCs and non-cooperatives (Figure 21). 2015 and 2016 are excluded to account for the potentially non-random selection of items for de-reservation in 2015. *** $p < .01$, ** $p < .05$, and * $p < .1$ for tests of the hypothesis that the relevant point estimate is equal to zero.

Figure 22: Effects of De-Reservation on Input Shares for SCs and Counterparts

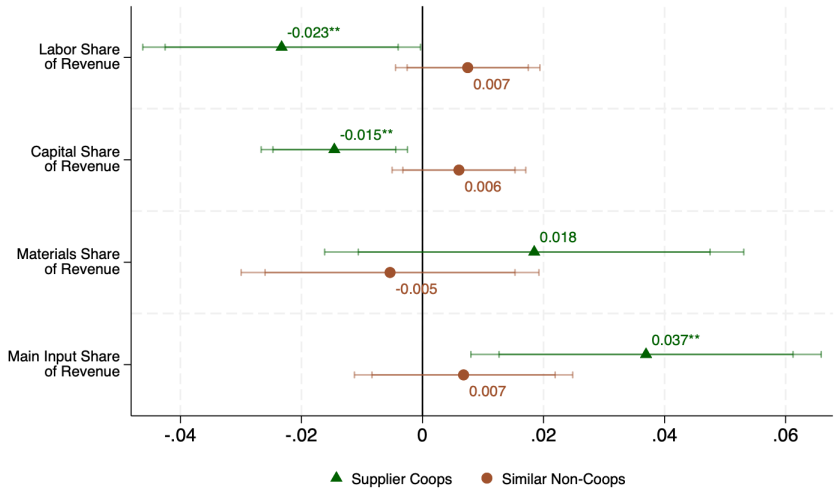
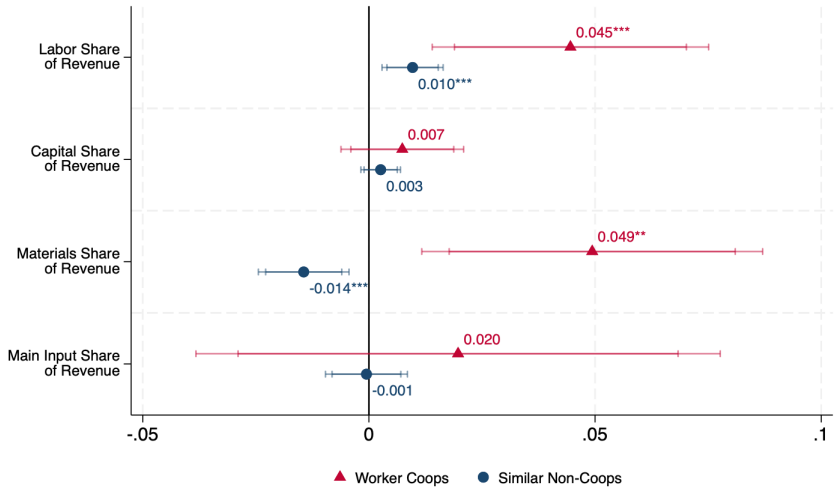


Figure 23: Effects of De-Reservation on Input Shares for WCs and Counterparts



Note: These figures plots estimates of treatment effects for each group from specification (1) for the outcomes specified on the vertical axis, along with 90% and 95% confidence intervals, with standard errors clustered at the firm level. The regression specification for the imputation estimator includes firm fixed effects, NIC-87 2-digit industry-year fixed effects, and initial firm size quintile-year fixed effects, as well as a linear time trend for cooperatives. Values for revenue are deflated by a wholesale price index for each 3-digit industry. The samples here include either NIC-87 3-digit industries with SCs and non-cooperatives (Figure 22), or WCs and non-cooperatives (Figure 23). 2015 and 2016 are excluded to account for the potentially non-random selection of items for de-reservation in 2015. *** $p < .01$, ** $p < .05$, and * $p < .1$ for tests of the hypothesis that the relevant point estimate is equal to zero.

Figure 24: Effects of De-Reservation on Compensation for SCs and Counterparts

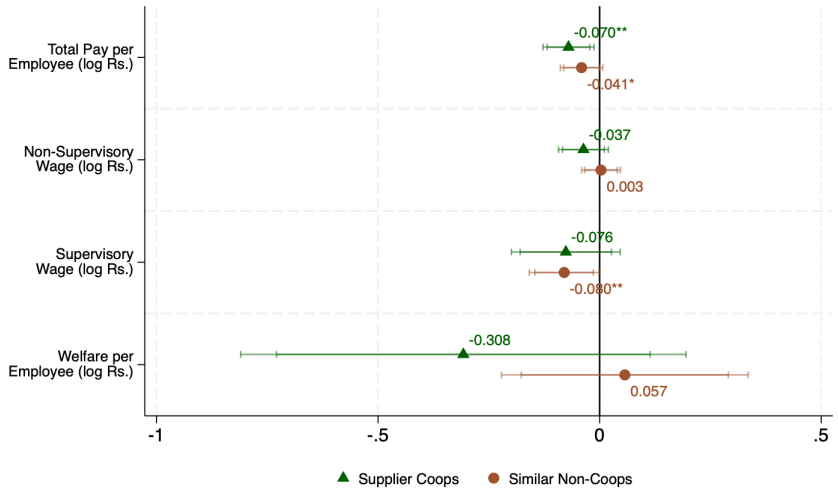
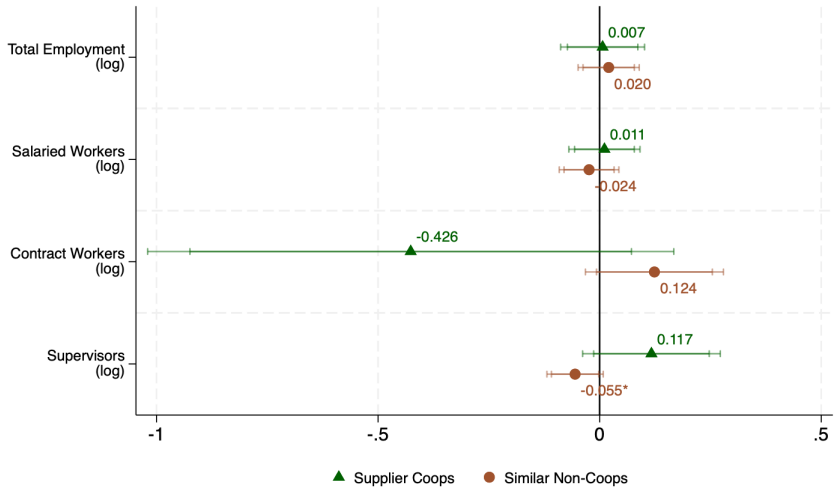


Figure 25: Effects of De-Reservation on Employment for SCs and Counterparts



Note: These figures plots estimates of treatment effects for each group from specification (1) for the outcomes specified on the vertical axis, along with 90% and 95% confidence intervals, with standard errors clustered at the firm level. The regression specification for the imputation estimator includes firm fixed effects, NIC-87 2-digit industry-year fixed effects, and initial firm size quintile-year fixed effects, as well as a linear time trend for cooperatives. Values for revenue are deflated by a wholesale price index for each 3-digit industry. The sample here includes only NIC-87 3-digit industries that feature both SCs and their non-cooperative counterparts. 2015 and 2016 are excluded to account for the potentially non-random selection of items for de-reservation in 2015. *** $p < .01$, ** $p < .05$, and * $p < .1$ for tests of the hypothesis that the relevant point estimate is equal to zero.

Figure 26: Effects of De-Reservation on Compensation for WCs and Counterparts

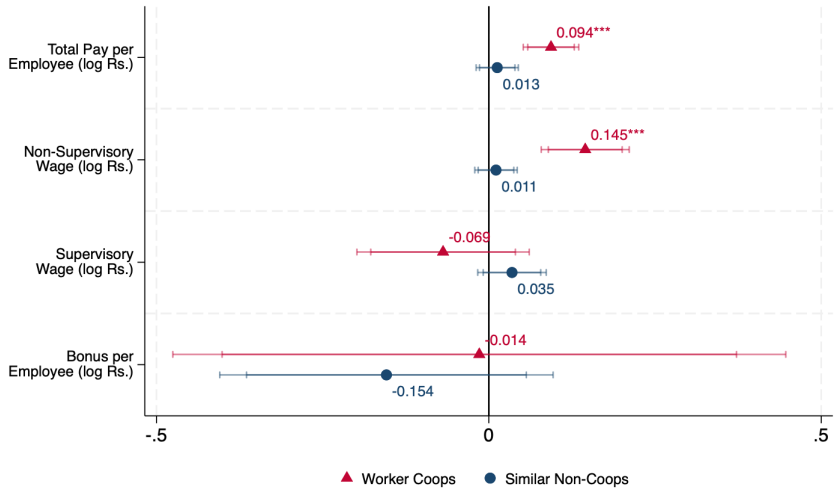
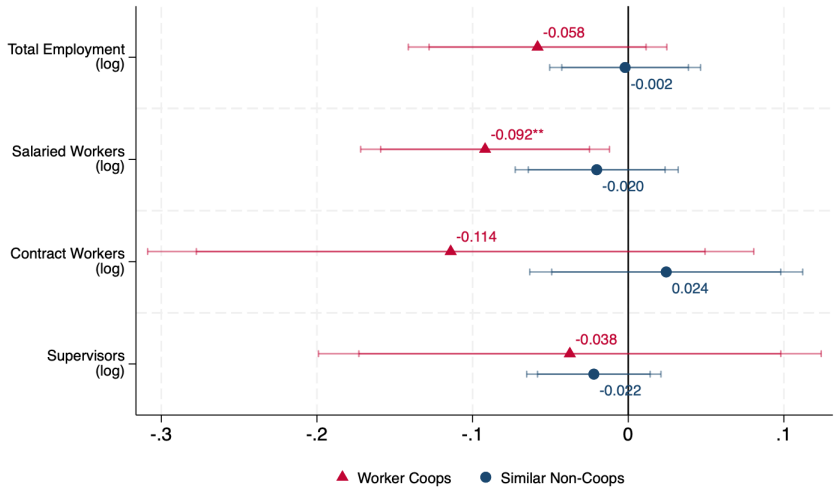


Figure 27: Effects of De-Reservation on Employment for WCs and Counterparts



Note: These figures plots estimates of treatment effects for each group from specification (1) for the outcomes specified on the vertical axis, along with 90% and 95% confidence intervals, with standard errors clustered at the firm level. The regression specification for the imputation estimator includes firm fixed effects, NIC-87 2-digit industry-year fixed effects, and initial firm size quintile-year fixed effects, as well as a linear time trend for cooperatives. The sample here includes only NIC-87 3-digit industries that feature both WCs and their non-cooperative counterparts. 2015 and 2016 are excluded to account for the potentially non-random selection of items for de-reservation in 2015. *** $p < .01$, ** $p < .05$, and * $p < .1$ for tests of the hypothesis that the relevant point estimate is equal to zero.

B Additional Tables

Table 6: Industries and Cooperative Type

NIC-87	Industry Description	Coop Type
201	Manufacture of dairy products	SC
202	Canning and preservation of fruits and vegetables	SC
203	Processing, canning, and preserving of fish, crustacea and similar foods	SC
204	Grain milling	SC
206	Manufacture and refining of sugar (vacuum pan sugar factories)	SC
207	Production of indigenous sugar, 'boora', 'khandsari', 'gur', etc. from sugar-cane, palm juice, etc.	SC
208	Production of common salt	SC
209	Manufacture of cocoa products and sugar confectionery (including sweet meats)	SC
210	Manufacture of hydrogenated oils and vanaspati ghee etc.	SC
211	Manufacture of vegetable oils and fats (other than hydrogenated)	SC
212	Manufacture of animal oils and fats; manufacture of fish oil	SC
213	Processing and blending of tea including manufacture of instant tea	SC
214	Coffee curing, roasting, grinding, and blending, etc. including manufacturing of instant coffee	SC
215	Processing of edible nuts	SC
216	Manufacture of ice	SC
217	Manufacture of prepared animal and bird feed	SC
218	Manufacture of starch	SC
219	Manufacture of food products n.e.c.	SC
220	Distilling, rectifying, and blending of spirits; ethyl alcohol production from fermented materials	SC
221	Manufacture of wines	SC
223	Production of country liquor (arrack and toddy etc.)	SC
224	Manufacture of soft drinks and syrups	SC
226	Manufacture of bidi	WC
228	Manufacture of 'snuff', 'zarda', chewing tobacco and other tobacco products n.e.c.	WC
229	Manufacture of pan-masala, catechu, and chewing lime	WC
230	Cotton ginning, cleaning and baling	SC
233	Weaving and finishing of cotton textiles on handlooms	WC
234	Weaving and finishing of cotton textiles on powerlooms	WC
235	Cotton spinning, weaving, and processing in mills	SC
236	Bleaching, dyeing and printing of cotton textiles	WC
240	Preparation of raw wool, silk and artificial/synthetic textiles fibres for spinning	SC
248	Bleaching, dyeing and printing of artificial/synthetic textile fabrics	WC
250	Jute and mesta pressing and baling	SC
255	Spinning, weaving, and finishing of coir textiles	WC
259	Bleaching, dyeing and printing of other vegetable fibre textiles	WC
260	Manufacture of knitted or crocheted textile products	WC
261	Manufacture of all types of thread, cordage, ropes, twines and nets	WC
262	Embroidery work, zari work and making of ornamental trimmings	WC

NIC-87	Industry Description	Coop Type
263	Manufacture of blankets, shawls, carpets, rugs, and other similar textile products	WC
264	Manufacture of floor coverings of jute, mesta sann-hemp and other kindred fibres and of coir	WC
265	Manufacture of all types of textile garments and clothing accessories n.e.c.	WC
267	Manufacture of made-up textile articles; except apparel	WC
269	Manufacture of textiles/textile products not elsewhere classified	WC
270	Sawing and planing of wood (other than plywood)	WC
271	Manufacture of veneer sheets, plywood and their products	WC
272	Manufacture of structural wooden goods (including treated timber)	WC
273	Manufacture of wooden and cane boxes, crates, drums, barrels and other containers	WC
274	Manufacture of wooden industrial goods n.e.c.	WC
276	Manufacture of wooden furniture and fixtures	WC
279	Manufacture of products of wood, bamboo, cane, reed and grass	WC
280	Manufacture of pulp, paper and paper board, including manufacture of newsprint	WC
281	Manufacture of containers and boxes of paper or paper board	WC
283	Manufacture of special purpose paper whether or not printed n.e.c.	WC
284	Printing and publishing of newspapers	WC
285	Printing and publishing of periodicals, books, journals, directories, atlases, maps, sheet music	WC
288	Book binding on account of others	WC
289	Printing and allied activities not elsewhere classified	WC
290	Tanning, curing, finishing, embossing and japanning of leather	WC
291	Manufacture of footwear (excluding repair) except of vulcanized or moulded rubber or plastic	WC
293	Manufacture of consumer goods of leather and substitutes of leather	WC
301	Manufacture of fertilizers and pesticides	SC
304	Manufacture of drugs, medicines and allied products	WC
305	Manufacture of perfumes, cosmetics, lotions, hair dressings, toothpastes in any form	WC
306	Manufacture of man-made fibres	SC
309	Manufacture of chemical products n.e.c.	SC
311	Manufacture of footwear made primarily of vulcanised or moulded rubber and plastics	WC
312	Manufacture of rubber products n.e.c.	SC
313	Manufacture of plastic products n.e.c.	WC
320	Manufacture of refractory products and structural clay products	WC
322	Manufacture of earthen and plaster products	WC
323	Manufacture of non-structural ceramic ware	WC
324	Manufacture of cement, lime and plaster	WC

NIC-87	Industry Description	Coop Type
326	Stone dressing and crushing; manufacture of structural stone goods and stoneware	WC
327	Manufacture of asbestos cement and other cement products	WC
329	Manufacture of miscelaneous non-metallic mineral products n.e.c.	WC
332	Manufacture of ferro-alloys	WC
335	Aluminium manufacturing	WC
337	Casting of metals	WC
338	Processing/re-rolling of metal scraps other than iron and steel scraps	WC
340	Manufacture of fabricated structural metal products	WC
342	Manufacture of furniture and fixtures primarily of metal	WC
343	Manufacture of hand tools, weights and measures and general hardware	WC
346	Manufacture of metal cutlery, utensils, and kitchenware	WC
349	Manufacture of metal products n.e.c.	WC
350	Manufacture of agricultural machinery and equipment and parts thereof	WC
351	Manufacture of machinery and equipment used by construction and mining industries	WC
352	Manufacture of prime movers, boilers, steam generating plants and nuclear reactors	WC
353	Manufacture of industrial machinery for food and textile industries	WC
354	Manufacture of industrial machinery for other than food and textile industries	WC
356	Manufacture of general purpose non-electrical machinery/equipment	WC
357	Manufacture of machine tools, their parts and accessories	WC
359	Manufacture of special purpose machinery/equipment	WC
360	Manufacture of electrical industrial machinery apparatus and parts thereof	WC
361	Manufacture of insulated wires and cables	WC
362	Manufacture of accumulators, primary cells, and primary batteries	WC
366	Manufacture of television receivers	WC
368	Manufacture of electronic valves and tubes and other electronic components n.e.c.	WC
370	Ship and boat building	WC
378	Manufacture of bullock carts, pushcarts, and handcarts n.ec.	WC
389	Manufacture of miscellaneous products n.e.c.	WC

C Institutional Details on Cooperatives in India

C.1 History

The history of cooperatives in India stretches back to the early 20th century under British rule. Colonial officials saw cooperative organization as a suitable approach for providing credit to farmers and relieving them from the clutches of predatory moneylenders, introducing the Co-operative Credit Societies Act of India in 1904 (Vaidyanathan, 2013). Subsequent growth in the credit cooperative movement was followed by the rise of agricultural cooperatives. The All India Cooperative Institutes Association (later renamed to the National Cooperative Union of India (NCUI)) was set up in 1929 to act as the national apex organization for cooperative enterprises. Eventually, during World War II, production in industrial cooperatives was also promoted as one of the measures to address rising prices of basic consumer goods.[47]

After independence in 1947, the Indian government followed a mixed-economy model that focused on cooperatives as a form of democratric economic planning. Cooperative organizations featured heavily in the central government's first eight Five-Year Plans from 1951 to 1991, and the National Cooperative Development Corporation was set up during this period to plan and promote specific programs. These included the provision of technical support to small farmers and primary cooperatives, organization of rural credit cooperatives, collaboration between public sector and cooperative banks, consolidation of cooperative federal organizations, and an expansion of cooperatives in the public distribution system.

With the advent of globalization and economic liberalization described in Section 2.2, the government's focus shifted away from the cooperative model. In the early 1990s, amendments were proposed to the Indian Constitution that would promote an independent cooperative movement and reduce government supervision and involvement. Calls for change were motivated by the fact that the growth of cooperatives in India had largely been driven by top-down government initiatives rather than mass mobilization at the grassroots level spurred by the spirit of cooperative enterprise (Vaidyanathan, 2013). State oversight would continue, however, as a new National Cooperative Policy in 2002 outlined a regulatory role for the government in ensuring timely elections, auditing, and safeguarding cooperative members' interest. While subsequent policies to encourage the autonomy of cooperative enterprises were implemented by states across India, their impact remains unclear.[48]

[47] 2021 report on India by the International Co-operative Alliance and the European Union, available at: https://coops4dev.coop/sites/default/files/2021-07/India%20Key%20Figures%20National%20Report.pdf.

[48] Sukhtankar (2012) documents links between local politics and sugar cooperatives, which raises questions on their purported independence.