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Import Competition, Formalization, and the Role of Contract Labor

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Import Competition, Formalization, and the Role of Contract Labor*

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Abstract

The debate on the effects of import competition on sectoral composition of employment remains unsettled. Using the case of the Indian manufacturing sector and exploiting plausibly exogenous variation from Chinese imports, we provide the first causal evidence that higher import competition increases the share of the formal sector employment. We find an increase in the level of formal sector employment, driven by firms in the top 50% of the productivity distribution, and in contrast, a fall in the informal sector employment. This labor reallocation from informal to formal enterprises is enabled by the usage of contract workers, who do not carry stringent firing costs and are usually not covered by trade unions. Our estimates imply that Chinese import competition led to an increase in the share of formal sector employment by 3.9 percentage points between 2000-2001 and 2005-2006, which suggests an increase in aggregate labor productivity by 3.28%. Our results are robust to an instrumental variables estimation, and controlling for a host of other potential trade channels and worker characteristics.

Keywords: Formal sector employment, Contract workers, Chinese imports, Reallocation, Misallocation.

JEL Codes: F14, F16, O17, O47, F66

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1 Introduction

Developing countries are characterized by a high share of employment in informal enterprises. This could hinder economic growth, for example, by reducing aggregate productivity due to the misallocation of resources away from productive firms (Hsieh and Klenow, 2009), or by lowering the tax base and hindering fiscal capacity (Besley and Persson, 2013; Levy, 2010). Any reallocation of employment towards more productive formal sector firms, therefore, can increase aggregate productivity and promote growth. While several policies have been considered towards this end, given that the engagement of developing countries in world trade has increased considerably over the last two decades, the role of trade in inducing formalization remains an important area of exploration.[1] In this study, we examine the effect of import competition on the allocation of employment between informal and formal sector enterprises.

Import competition can increase informal enterprise employment if formal firms move resources to the informal sector to cut costs, but can also increase formal sector employment if unproductive informal firms exit and their workers move to productive formal sector firms. The latter phenomenon particularly depends on whether incoming imports directly compete with informal firms. The overall effect of import competition on the formal enterprise share of employment is, thus, an empirical question. Not surprisingly, the empirical evidence is mixed, with most studies showing null or economically small positive effects on informality (Bosch et al., 2012; Goldberg and Pavcnik, 2003; Paz, 2014), barring a few that show significant positive effects on informality (Cisneros-Acevedo, 2019; Dix-Carneiro and Kovak, 2019).[2]

We show that higher import competition from China increased the share of employment in the formal sector manufacturing enterprises in India. This was driven both by an increase in the level of formal enterprise employment and a decline in informal enterprise

[1] A variegated set of policy options have been considered to promote formalization and the growth of small enterprises, including the lowering of registration costs or taxes for formal firms, providing capital grants to small firms, and the careful dismantling of size-based policies to incentivise growth (De Mel et al., 2013; McKenzie, 2017; Rocha et al., 2018).

[2] While most studies use a worker-based definition of informality, we use a enterprise-based definition, as we examine the reallocation of employment from informal sector enterprises to formal sector enterprises. This is similar to the definitions used by Nataraj (2011) and McCaig and Pavcnik (2018).

employment. The rise in formal enterprise employment was further steered by the top half of the productivity distribution, and is dominated by contract (temporary) workers that do not carry firing costs and are not usually unionized unlike their counterpart regular workers.[3] Overall, our results indicate that import competition led to a significant reallocation of resources from informal to formal sector enterprises. This reallocation depends crucially on whether informal enterprises in India were adversely affected by the incoming Chinese imports. Indeed, there is enormous amount of anecdotal evidence in India supporting this, for example in toy, fire-crackers, ceramics, and bi-cycle parts industries.[4] An important contribution of our study is to show that higher import competition increases formalization, a result hitherto only observed in the context of exports (McCaig and Pavcnik, 2018 and Costa et al., 2016). Further, we find that this reallocation implies a gain in aggregate labor productivity of 3.28%, and a gain in annual wages of about 1.47% for workers.

Studying the impact of import competition on labor reallocation between informal and formal enterprises could be challenging for a few reasons. First, comprehensive data on informal enterprises are not usually available. India is the only country we are aware of where nationally representative surveys of informal enterprises covering both urban and rural areas, and using non-household sampling units are available.[5] We exploit the availability of these enterprise data, and complement them with formal sector firm-level data for the years 2000-2001 and 2005-2006, to study the allocation of employment between these sectors in this period. In examining formalization in this setting, we rely on an enterprises-based definition of informality, similar to Nataraj (2011) and McCaig and Pavcnik (2018). Further, we also use worker-level surveys to examine the same question. Our results hold robustly across these variegated data sources.

The second challenge lies in identifying the effects of import competition on employ-

[3] Contract workers and regular workers in India typically face the same complexities of tasks, thus enabling firms to substitute between them (Singh et al., 2017).

[4] See, for example, Assocham (2013a,b); Khan (2014); Roy (2013); Sathyanarayana (2014).

[5] Brazil conducts informal enterprise surveys every five years, but these are restricted to urban areas. The informal sector surveys of Mexico (ENAMIN) were conducted only in urban areas until 2005. Further, both ENAMIN and Cameron's Employment and Informal Sector Surveys use household as the sampling unit to survey details on household-owned enterprises. On the contrary, India's unorganized sector surveys cover all regions (except some extremely remote areas), and use the Economic Census of India that provides a comprehensive coverage of units undertaking any economic activity, as the sampling frame.

ment, which is often riddled with simultaneity concerns. To obtain causal effects, we exploit plausibly exogenous variation in Chinese imports into India, arguably driven by China's own internal reforms (Acemoglu et al., 2016; Autor et al., 2013).[6] To address any remaining concerns, we employ an instrumental variable strategy that uses Chinese imports by a set of Latin American countries as an instrument for Chinese imports into India (following Acemoglu et al., 2016).[7] To further rule out other possible alternate trade channels as competing explanations for the formalization effects we observe, our regressions also control for industry-level trade flows that could be correlated with our instrument and employment. These include import competition in India from low- and middle- income and high-income countries, competition posed by China in markets that India export to (low- and middle- income and high-income countries), and India's export share to countries in the instrumental variable list.

While Chinese imports provide plausible exogenous variation, they are important for two additional reasons. First, the magnitude of Chinese imports are sizeable. The share of Chinese imports to overall imports to India stood at a remarkable 18 percent in 2007. While Chinese import share to India rose by over 16 times between 1998-2007, imports from other low- and middle, and high-income countries to India only doubled. Second, imports from China directly compete with goods produced by the informal sector in India, and hence adversely affect the firms in this sector. This is a specific situation that may not be observed in other settings, for example, in the case of high-income country imports coming to India.

Our study is also related to the literature on the role of misallocation in holding productivity low, and the role of reforms in improving aggregate productivity outcomes (Alfaro

[6] Among other things, these internal reforms enabled the setting up of special economic zones (Alder et al., 2013), facilitated technology transfers through foreign direct investments (Autor et al., 2016) and multinational activity (Naughton, 2006), and promoted the mass migration of workers from rural to urban areas (Chen et al., 2010). Further, China's accession to the World Trade Organization in 2001 provided an additional boost to its exports (Branstetter and Lardy, 2006).

[7] The Latin American countries that we use for constructing the instrumental variable are Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico, Paraguay, Peru, Uruguay, and Venezuela. The relevance condition will be satisfied if India and these countries simultaneously import similar products from China and experience a surge in Chinese imports, and this is attested in our case through a strong first-stage relationship. The exclusion criterion relies on the considerable length of distance between these countries and India, due to which trade volumes between them are likely low.

and Chari, 2014; Garcia-Santana and Pijoan-Mas, 2014). Particularly, theories show that institutions that increase the costs of operating in the formal sector lead to misallocation in the form of a large informal sector (Boedo et al., 2014; Hsieh and Klenow, 2009). We show here that trade reforms, and particularly in our case, Chinese import competition could reduce misallocation through the reallocation of labor from the informal to the formal sector, leading to aggregate productivity gains.

Further, competition led reallocation would be more pronounced in contexts where misallocation is already high to begin with. Cases in point of such contexts are the embedded institutions of stringent labor firing regulations and powerful unions that are prevalent in some states in India (Besley and Burgess, 2004). We therefore expect that formalization transition due to import competition is driven by firms in states with stringent labor firing regulations and stronger union presence. Indeed, we empirically observe this heterogeneity. We also observe that formalization transition in these states are, in turn, driven by contract labor. This is not surprising because of the absence of firing laws and union associations for contract workers. These results are consistent with theories that point to the role of employment protection laws (EPL) in limiting job flows and in the reallocation of labor (Boedo and Mukoyama, 2012; Hopenhayn and Rogerson, 1993; Kambourov, 2009), and studies that empirically show this in the context of India (Adhvaryu et al., 2013), United States (Autor et al., 2007), and Italy (Kugler and Pica, 2008). In these settings too, consistent with our findings, evidence shows that contract or temporary workers enable firms to adjust their workforce, as documented in India (Chaurey, 2015; Saha et al., 2013) and the United States (Autor, 2003). These results on contract labor are further consistent with Bertrand et al. (2015) that demonstrate the role of contract labor in the resilience of the formal sector manufacturing in India.

We contribute to the growing literature on the effects of Chinese import competition on employment (Acemoglu et al., 2016; Autor et al., 2013, 2014; Bloom et al., 2016; Iacovone et al., 2013; Utar and Ruiz, 2013). Within this, studies that examine labor reallocation is relatively rare. Our work directly relates to Costa et al. (2016) who find that Chinese imports have no effect on informal employment in Brazil, and Cisneros-Acevedo (2019) who

find a positive effect on informal employment in Peru. These studies focus on a worker-based definition of informality, much like the rest of the literature, in contrast to our focus on an enterprise based definition that enables us to study reallocation.

We evaluate the potential gains in aggregate labor productivity from this trade-induced shift of workers across the two sectors. To do this, we first estimate the labor productivity gap between formal and informal sector manufacturing firms using standard development accounting methods (Caselli, 2005). Next, we deduce what our estimates imply in terms of the aggregate increase in labor productivity. The labor productivity gap is found to be 3.84, after adjusting for differences in human capital, output elasticity, and measurement error between formal and informal sectors. This gap implies that in response to Chinese import competition between 2000-2001 and 2005-2006, there has been an increase in aggregate labor productivity by 3.28%.

Formalization not only brings aggregate productivity gains for the employers, but also for workers. Reallocation of workers from the informal to formal sector is dominated by contract labor. Unlike informal sector workers, contract workers in India are legally hired under the ambit of the Contract Labour Act 1970 that mandates the provision of the minimum wage, timely wage payment, and welfare amenities such as safety and amenities at workplace. Further, wages and proportion of workers receiving benefits are higher among contract workers than informal enterprise workers. Our estimates suggest that there was a gain in annual wages of about 1.47% for workers due to the reallocation from informal to formal sector.

The aggregate results imply that a one percentage point increase in Chinese import competition led to an increase in formal share of employment by 1.47 percentage points, formal sector employment by 4.52% and contract employment by 10.59%, and a decline in informal employment by 15.75%, and a decline in overall employment by 8.29%. While we do find substantial job losses, consistent with much of the literature (Autor et al., 2013), we also witness labor reallocation from the informal to the formal sector leading to aggregate productivity gains that has hitherto not been empirically shown in the context of import competition. Such high levels of reallocation in a short period is remarkable

because theories and prior empirical evidence show that labor reallocation across sectors, industries, or regions after a trade shock is usually slow (Dix-Carneiro, 2014). Our results can be attributed to the institution of contract labor in the Indian setting that enables the process of reallocation in the Indian setting.

The rest of the paper is organized as follows. Section 2 shows the data sources and stylized facts. Section 3 presents the empirical strategy. Section 4 presents and discusses the results and the robustness checks. Section 5 concludes the paper.

2 Data, Stylized Facts, and Empirical Strategy

2.1 Data Sources

Our primary source of worker level data is the Employment-Unemployment survey conducted by the National Sample Survey Organization (NSSO). This is a quinquennial cross-section survey and we utilize data for two years, namely, 1999-2000 and 2004-2005. The survey reports data on worker characteristics such as age, gender, education, martial status, residence location, religion, and social group. Crucially for our purposes, the survey reports data on the employer's characteristics such as firm size and usage of electricity that enables us to glean whether the worker works in the formal or the informal sector. As per the Factories Act, 1948, any factory using power and employing 10 or more workers, and if not using power and employing 20 or more workers is deemed to be registered in the formal sector.

Our primary sources of establishment-level data are the unorganized sector enterprise surveys conducted by the NSSO, and the Annual Survey of Industries (ASI) conducted by the Industrial Statistics (IS) wing of the Central Statistical Office (CSO), Government of India. The ASI, a unit level panel dataset, covers all registered establishments in the country with 100 or more workers, and randomly samples establishments with less than 100 workers.[8] The ASI does not provide identifiers for firms, but only their constituent

[8] Prior to 2001, 200 workers was the threshold above which the ASI conducted a full census of large establishments, and this changed to 100 workers from 2001.

individual establishments/plants. We use the ASI data both aggregated at the state-industry level in 2000-2001 and 2005-2006 to match with the years the NSSO unorganized sector survey data are available to study reallocation, and at the unit level from 1998-1999 to 2007-2008 to study outcomes within the formal sector.[9] Both the NSSO and the ASI report information on the number of workers in the informal and formal sector establishments respectively. In addition, the ASI also reports information separately on regular employment and contract employment.[10]

Industries in India are classified as per the National Industries Classification (NIC). We use the NIC-2004 classification which has a one-to-one correspondence with International Standard Industrial Classification (ISIC) revision 3.1 at the 4-digit level.

Our primary source of trade data is the UN-COMTRADE database. This database provides import and export data at the product level, namely the Harmonized System (HS) 6-digit level classification. To construct our key variables at the industry level, we map these HS classifications into 4-digit industry classification based on the NIC-2004 definitions.[11] From this database, we compiled data on Chinese imports to India, and to a set of low- and middle-, and high-income countries. We also compiled total imports to India from low- and middle-, and high-income (other than China and the IV countries), and India's export share to countries in the instrumental variable list. To construct the import competition measure (described in section 3), we also the require baseline production data in India. For this, we used both formal sector output from the ASI in the year 1994, and informal sector output from the survey of unorganized manufacturing enterprises conducted by NSSO in the year 1995. We use data on input and output tariffs from Ahsan and Mitra (2014) for the years between 1995 and 2003, and from Chakraborty and Raveh (2018) for the years between 2004 and 2007.

[9] 1998 is the first year for which ASI is available with an establishment identifier. We restrict our sample to 2007-2008 to avoid the potentially confounding effects of the financial crisis on the relation between Chinese imports and employment.

[10] Another important micro-level dataset on Indian firms is the Prowess, which is published by the Centre for Monitoring Indian Economy (CMIE). However, unlike the ASI, Prowess is not representative of the formal manufacturing sector and does not collect data on contract workers.

[11] The correspondence between HS and ISIC revision 3 are available at https://wits.worldbank.org/product_concordance.html. The correspondence between ISIC revision 3 and 3.1 is available from https://unstats.un.org/unsd/statcom/doc02/isic.pdf. The ISIC revision 3.1 has a one-to-one correspondence with NIC-2004.

For the heterogeneity analyses, we use data from two separate sources. First, we use a state-level measure of strength of regulations related to unions from a survey conducted by Dougherty (2009). This measure captures state-level differences in regulations related to different aspects of union representation, namely, labor law reforms relating to restrictions on the minimum number of workers in an union, recognition of unions as bargaining agents, provisions for union formation in an enterprise, rules related to strikes, and code of conduct between employers and unions. Second, we use the state-level measure of labour regulation by Besley and Burgess (2004), which reflects the state-level differences in stringency in the firing of regular workers under Industrial Disputes Act, 1947 (IDA), the key employment protection legislation in the Indian context.

2.2 Stylized Facts

We check whether the overall increase in formal enterprise share in employment is a result of industries with high formal share increasing their employment share in manufacturing (between), or due to within industry changes (within). For this, we decompose the overall change in formal enterprise share in employment, ΔFW, between 2000-2001 and 2005-2006 into the respective within and between industry components as follows:

$$\Delta FW = \sum_j (0.5 * (s_{jt} + s_{jt-1}))\Delta fw_{jt} + \sum_j (0.5 * (fw_{jt} + fw_{jt-1}))\Delta s_{jt} \tag{1}$$

where fw_{jt} denotes formal share in employment for industry j in year t, and s_{jt} denotes employment share of industry j in total employment in manufacturing. We combine employment at the industry level using the formal and informal enterprise data from the ASI and the NSSO's unorganized sector surveys to conduct this analysis. The first term captures the change in formal share in employment due to changes in formal sector employment across firms within an industry whereas the second term captures movement of formal workers across industries. Table 1 reports the decomposition between 2000-2001 and 2005-2006 using the firm level surveys. We find that change in overall formal share in employment is predominantly driven by within-industry change (column 2) and that the

magnitude of the between-industry effect is relatively small (column 3). We obtain similar results if we decompose the share of contract workers and the share of regular workers. The relationship between import competition and formal share in employment we explore in this paper also similarly highlights within-industry changes in response to increased import competition from China. Next, we turn to a more rigorous examination of the link between Chinese import competition and formalization in our empirical analysis.

3 Empirical Approach and Identification

In this study, we estimate the effects of Chinese import competition on employment shares (of various types) in India. Towards this end, we obtain a measure of Chinese import penetration in an industry j at time t, given by:

$$IMP_{jt}^{China} = \frac{M_{jt}^{China}}{(Y_{j,94} + M_{j,94} - X_{j,94})} \tag{2}$$

where M_{jt}^{China} is the total imports of Chinese goods in industry j at time t; $Y_{j,94}$, $M_{j,94}$ and $X_{j,94}$ refer to production, total imports, and total exports for industry j in India in 1994. By normalizing Chinese imports to India over absorption (domestic production plus imports less exports) before the start of our study period, our measure captures the differential increase in Chinese imports across industries based on the initial size of an industry in the domestic market.

While Chinese imports are plausibly exogenous because they are primarily driven by China's internal reforms leading to productivity gains, and China's accession to the WTO in 2001, there are several reasons why an ordinary least squares regression of employment on import competition could produce biased estimates. For example, industry level demand shocks that drive Chinese imports could also simultaneously influence employment, or labor saving or displacing technologies that may drive imports could also be correlated with domestic employment. To address these issues, our empirical specifications control for fixed effects at the state-year, industry(3-digit)-year, and state-(4-digit)industry- levels.

To address any remaining endogeneity concerns, our principal identification strategy

uses an instrumental variable approach. Specifically, we instrument Chinese imports to India (given by equation 2) by Chinese imports to a set of countries, following Autor et al. (2013) and Acemoglu et al. (2016), as given by:

$$IV_{jt}^{China} = \frac{M_{jt}^{Others}}{(Y_{j,94} + M_{j,94} - X_{j,94})} \tag{3}$$

where M_{jt}^{Others} refers to Chinese imports to industry j in time t in a set of Latin American countries, namely Argentina, Brazil, Costa Rica, Chile, Colombia, Mexico, Paraguay, Peru, Uruguay, and Venezuela.[12] The instrument isolates the variation in Chinese imports that is only due to supply side shocks from China. Chinese imports to the instrument-country list are expected to be strongly correlated with Chinese imports to India if the basket of goods exported from China to India and these countries are similar, and if these countries experienced similar rise in Chinese exports. This assumption is testable. Figure 1 shows the evolution of Chinese import share from 1998 to 2007 for India and various country groups. The rise in the Chinese import share was very similar for India and the instrument-countries. Further, the choice of Latin American countries ensures that the exclusion criterion is likely to be satisfied, as these countries are not major trade partners with India, and thus the correlation between Chinese imports to these countries and India is solely due to the supply side component of Chinese imports arising from gains in manufacturing productivity for Chinese firms.

We further take into account alternative trade channels (varying at the same level as our import competition measure) that could influence employment, and that are potentially correlated with Chinese imports. We control for Chinese imports in inputs to an industry to account for the confounding effect from access to potentially cheaper Chinese inputs. Further, concurrent changes in trade policy may be correlated with Chinese imports to India, which is addressed by controlling for industry level output and input tariffs.[13] Another concern is that Chinese imports to India may be correlated with imports from other coun-

[12] While tariffs have been used as instrumental variables for imports in many contexts, in India, tariffs are not exogenous post 1996 (Topalova and Khandelwal, 2011).

[13] Besides tariffs reductions, other liberalization measures like the delicensing of industries, and the FDI liberalization had already been implemented by the late 1990s (Martin et al., 2017).

tries. To address this, we control for import penetration in India from low- and middle-, and high-income countries in all specifications. Further, Chinese imports to India may also be correlated with Chinese imports into other countries, and our estimates may capture the effect of increased competition from China in destination markets for Indian exporters. To address this, we control for Chinese import share in low- and middle-, and high-income countries, excluding the set of IV countries. Finally, we control for India's exports to the IV countries to control for the direct effect of Chinese import competition for Indian exporters in these countries.[14]

4 Results

In the following sections, we examine the relationship between Chinese import competition and formal share of employment using worker-level surveys and formal and informal sector firm-level surveys. Next, we explore mechanisms driving the increase in formal sector employment through the firm-level panel dataset. Finally, we estimate the aggregate productivity gains from reallocation due to Chinese import competition.

4.1 Worker Transitions to Formal Sector

We start by estimating the effect of Chinese import competition on the probability of a worker being employed in the formal sector using the worker-level data from the NSSO's employment-unemployment survey:

$$formal_{ijst} = \beta_1 IMP_{jt-1}^{China} + \mathbf{X}_{ijst}\delta + \mathbf{Z}_{jt-1}\psi + \alpha_{j(3)t} + \alpha_{st} + \alpha_{js} + \nu_{ijst} \tag{4}$$

where i denotes a worker, s denotes a state, and j denotes an industry defined at the 4-digit level (NIC 2004).

$formal_{ijst}$, our outcome variable of interest, is an indicator variable which is equal to 1 if a worker is employed in the formal sector. Our classification is based on the Factories Act,

[14] We discuss the construction of these variables in Appendix A.

1948, that stipulates that all factories employing 10 or more workers (that uses electricity), and those employing 20 or more workers (that do not use electricity) have to be registered in the formal sector. We are able to make this classification from the NSS Unemployment-Employment survey that reports data on workers' employer details, such as the number of workers and the use of electricity. Further, since some factories below these employment thresholds are also registered, we reclassify workers employed in such enterprises as formal sector workers.[15]

Our main explanatory variable is the industry level (at 4-digit) import penetration ratio for Chinese imports, IMP^{China}_{jt-1}.[16] $\mathbf{Z}_{jt-1}$ is a vector of variables capturing alternative trade channels (described in section 3), and $\mathbf{X}_{ijst}$ is a vector of worker characteristics that include age, indicators for gender, education, marital status, religious minority, disadvantaged social groups, and residence in rural areas.[17] We control for state $\times$ industry (α_{js}), state $\times$ year (α_{st}), and three-digit industry $\times$ year ($\alpha_{j(3)t}$) fixed effects. We cluster our heteroskedasticity robust standard errors at the industry level which is the level of variation of our treatment variable. Regressions are weighted using sample weights from the survey.

Table 2 reports the results from equation (4) and its variants from OLS (columns 1-3) and IV (columns 4-6) estimations. We present the specification excluding (columns 1 and 4) and including controls for worker characteristics (columns 2 and 5), and their interaction with an indicator variable for the year 2004-2005 to control for changes in worker characteristics between the two sample rounds (columns 3 and 6). The first-stage F-statistics for the IV estimates in columns (4)-(6) are comfortably higher than the threshold values, implying a strong first stage relationship between our instrument and IMP^{China}_{jt-1}. The coefficient on IMP^{China}_{jt-1} is positive and significant in all columns suggesting that increase in Chinese import competition significantly increases the probability of being employed in a

[15] We utilize responses on the firms' registration status, as reported by the workers, to do this reclassification. Specifically, we consider a firm below the size-threshold to be a formal enterprise if the firm is a state-owned factory, a public/private limited company, or a cooperative. Our results are qualitatively similar without this reclassification. These results available upon request.

[16] We use a lagged measure of Chinese import penetration to alleviate endogeneity concerns related to anticipatory employment responses to Chinese import competition, and to ensure that we study employment responses to past changes in import competition.

[17] Educational categories include primary and below, secondary and undergraduate, and higher education. Social group categories in India include the Scheduled Caste, Scheduled Tribes, Other Backward Castes, and Other Castes.

formal enterprise. The coefficient in our preferred specification in column 6 implies that a one percentage point change in Chinese import competition leads to an increase in the probability of being employed in a formal enterprises by 0.47 percentage points. For an industry that experiences a change in IMP equivalent to the average change between the two survey rounds, 0.05, our coefficient translates to an overall increase in formal sector employment by 2.35 percentage points.

These main results could mask considerable heterogeneity based on worker characteristics, because workers may have different adjustment costs based on demographic characteristics (Dix-Carneiro, 2014), and because firms may have differential demand for workers based on these characteristics in response to Chinese import competition. We test for worker heterogeneity based on age, education, and location. Table B1 shows that the overall results are significantly driven by experienced workers (above 40 years of age), and workers in urban areas (shown in column 2 and column 6 respectively). However, we do not find any significant differences in transition to formal sector based on education levels.

4.2 Aggregate Changes in Formal Employment

Next, we aggregate employment data from the NSSO's unorganized sector establishment survey, and the ASI at the state-industry level for years 2000-2001 and 2005-2006, in order to study the aggregate relationship between Chinese import competition and formal share of employment. As noted earlier, while ASI is an annual survey, the NSS unorganized sector survey is held every five years, and we choose the two years that are common across both surveys. We estimate the following specification:

$$Y_{jst} = \beta_1 IMP^{china}_{jt-1} + \mathbf{Z}_{jt-1}\psi + \alpha_{j(3)t} + \alpha_{st} + \alpha_{js} + \nu_{jst} \tag{5}$$

where Y is either the share of formal sector employment in total employment or (log of) total, informal, formal, formal-regular and formal-contract employment. The alternate trade channels and fixed effects are as explained in section 4.1. Regressions are weighted

by the state-industry employment in the year 2000-2001.[18]

Table 3 reports the results. Panel A and B report results from OLS and IV estimation of the specification, respectively. The first stage F statistics continue to be comfortably above the recommended threshold values. In column 1, the coefficient on IMP_{jt-1}^{china} is positive and significant, suggesting that a one percentage point increase in Chinese import competition leads to an increase in formal share of employment by 1.47 percentage points at the state-industry level. The coefficient is statistically significant in the IV regression. Thus, the increase in the likelihood of formal sector employment observed in the worker level surveys is corroborated by the aggregate level results from enterprise surveys, and it is encouraging that our results are qualitatively consistent across two independent data sources.

In columns 2-4, we document the effect of Chinese import competition on the (log of) overall employment, informal, and formal sector employment, respectively. The results indicate that a one percentage point increase in Chinese import competition leads to a decline in overall employment by 8.29%, decline in informal employment by 15.75%, and an increase in formal sector employment by 4.52%. Thus, Chinese import competition induces a large decline in informal sector employment while increasing formal sector employment, leading to increase in formal share in employment. Taken together, these results imply a reallocation of employment from the informal to the formal sector as a result of Chinese import competition.

We further disaggregate formal sector employment into regular (column 5) and contract workers (column 6) to identify the source of increase in formal sector employment observed in column 4. The rise in formal employment is largely driven by contract labor. A one percentage point increase in Chinese import competition leads to an increase in regular employment by 3.53% and contract employment by 10.59%.[19]

[18] Weights could be: (1) total employment in 2000-2001 if the outcome is share of formal employment or total employment; (2) informal employment in 2000-2001 if the outcome is informal employment, and (3) formal employment in 2000-2001 if the outcome is either total formal, regular, or contract employment.

[19] We obtain qualitatively similar results if we estimate variants of equation 5 at the industry level, rather than at the state-industry level. We report these results in appendix Table B2.

4.3 Heterogeneity Based on Institutions

Competition could reallocate a differential higher share of resources from the informal to the formal sector in contexts that have a large misallocation of resources to begin with. To understand such types of heterogeneous impacts, we focus on two labor institutions in India, namely stringent firing laws and strong unionization. First, the Industrial Disputes Act, 1947 (IDA), stipulates labor firing restrictions for large firms, but not for small firms.[20] Several states have amended the IDA, leading to variation in the level of stringency with which it is applicable. We use a simple bifurcation of states into pro-worker and non-pro-worker categories based on the codification of the amendments to the IDA by Besley and Burgess (2004), and separately estimate equations 4 and 5 with their respective data.[21] Second, a strong union presence can impose a large cost of "dealing" with labor issues for firms. We use the index by Dougherty (2009) of state-level unionization rates, and classify states into high and low union states based on the median value of the index. Again we estimate equations 4 and 5 separately for low and high unionization states.

Results presented in table 4 suggest that Chinese import competition differentially increases the probability of a worker being employed in a formal enterprise in high unionization (column 1) and pro-worker states (column 3), compared to low unionization (column 2) and non pro-worker states (column 4). The results from firm surveys at the state-industry level in columns (5)-(8) corroborate the findings from the worker surveys in columns (1)-(4). Finally, columns (9)-(12) provide strong evidence that the increase in the share of contract employment in total employment is also driven by firms in high unionization (column 9) and pro-worker (column 11) states. The rise in the share of contract workers in these states explains the mechanism through which reallocation happens. Firms choose to hire contract

[20] Two aspects of the Industrial Disputes Act , 1947, are relevant. Under section V-A, in establishments with 50 or more workers, a worker who is retrenched could claim compensation for wages for 15 days for each year of service. If worker is laid-off, they must be provided half of their basic wage and a dearness allowance for each day they are laid off, for a maximum of 45 days. Establishments with 100 or more workers are covered under Section V-B, and requires firms to obtain government permission to lay-off or retrench even a single worker. Prior notification with the government is required if an establishment plans to close down (sixty days for Section V-A or ninety days for Section V-B).

[21] Besley and Burgess (2004) exploited state-level amendments to the IDA to generate state-level scores indicating the stringency of these laws. The larger the value, the higher the firing costs and more "pro-worker" the state is. On the other extreme, negative values indicate low firing costs and a "pro-employer" regime. Zero indicates neutrality. States with a positive score are classified as "pro-worker" states.

workers rather than regular workers because contract workers are not under the ambit of the IDA, and are typically not a part of firm-level unions.

4.4 Within-Firm Employment in the Formal Sector

To explore the effect of Chinese import competition on firm level employment in formal sector firms, we use the establishment level panel dataset from the ASI between 1998-1999 and 2007-2008, to estimate the following specification:

$$Y_{ijst} = \beta_1 IMP^{china}_{j,t-1} + \mathbf{Z}_{jt-1}\psi + \alpha_i + \alpha_{j(3)t} + \alpha_{st} + \nu_{ijst} \tag{6}$$

where i denotes a firm. Y_{ijst}, the outcome variable, could denotes either (log of) total workers, regular workers, contract workers, or the contract worker ratio. In addition to the trade channels and fixed effects in equation 5, we include firm fixed effects, α_i, to control for time invariant firm-level characteristics. Regressions are weighted using sample weights from the ASI.

Table 5 reports results from estimating equation 6. Columns (1)-(4) and (5)-(8) report results from OLS and IV estimations, respectively. The first-stage F-statistics indicate a strong first stage relationship between our instrument and our main explanatory variable. From our preferred IV specification, the coefficient on IMP is positive and significant in column 5 suggesting that Chinese import competition leads to an increase in firm-level employment on average among formal sector firms. The effect on regular workers is negative, but statistically insignificant in the IV specification in column 6. The positive and significant coefficient in columns 3 and 7 (contract workers) and columns 4 and 8 (contract worker ratio) provide strong evidence that the overall increase in within firm employment in the formal sector is driven primarily by the increase in contract employment. The IV coefficients imply that for a one percentage point increase in Chinese import competition, there was an increase in within-firm employment in the formal sector by 0.11% , contract workers by 0.31%, and contract share in employment by 0.048 percentage points.

4.5 Reallocation Within Formal Sector

Our results on the reallocation of employment towards high productivity formal firms from low productivity informal sector firms in response to Chinese import competition are consistent with recent heterogeneous firm models, as in, Melitz (2018). However, reallocation can also occur within the formal sector with high productivity firms expanding at the expense of low productivity firms. To test reallocation within the formal sector along the productivity distribution, we estimate the following regression specification:

$$Y_{ijst} = \beta_1 IMP^{china}_{jt-1} + \sum_{k=2}^{4} \beta_k IMP^{china}_{jt-1} \times Qr_k + \mathbf{Z}_{jt-1}\psi + \alpha_i + \alpha_{j(3)t} + \alpha_{st} + \alpha_{sj} + \nu_{ijst} \quad (7)$$

This specification is the same as equation 6, but with additional interaction terms between IMP^{china}_{jt-1} and indicator variables for the quartile the firm belongs to in the initial productivity distribution (Qr_k). Productivity is computed either using labor productivity or total factor productivity (TFP), and is captured in the first year in which firm appears in the data. Regressions are weighted using sample weights from the ASI.

The results are presented in table 6. The results in column 1 indicate that there is a decline in employment in the lowest quartile, and a differential increase in employment among firms in higher quartiles compared to firms in the lowest quartile. The overall effects imply that employment declines for firms with below-median productivity, and employment expands for firms with above-median productivity.[22] Taken together, our results imply that Chinese import competition leads to reallocation within the formal sector, and not just between the informal and formal sectors as seen earlier, and is consistent with the earlier findings in the literature (Bernard et al., 2006; Bloom et al., 2016). Columns (2)-(4) collectively indicate that high-productive firms differentially increase their contract share of employment, suggesting that the reallocation from low to high productivity firms in the formal sector is facilitated through the institution of contract labor.

[22] We find similar results with TFP as measure of productivity. We report these results in table B3.

4.6 Reallocation and Aggregate Labor Productivity

To quantify the aggregate labor productivity gains from Chinese import competition, we need information on the share of workers that are reallocated from informal to formal sector(S_f) and the increase in labor productivity for a worker moving from informal to formal sector ($\Delta\omega_f$). The labor productivity gain from reallocation can then be computed as $\Delta\omega = S_f\Delta\omega_f$. The calculation of S_f is straightforward and we compute it using the coefficient (β) on IMP^{china}_{jt-1} in Table 3. Specifically, $S_f = \sum_{sj} m_{sj}(\beta \times \Delta IMP)$, where m_{sj} is each state-industry's share in overall manufacturing employment and ΔIMP is the industry level change in Chinese import competition between 2000-2001 and 2005-2006. The estimates imply an overall change in formal share of employment by 3.9 percentage points. Obtaining accurate estimates of labor productivity gap between formal and informal sector is more challenging due to measurement issues. We describe the procedure to calculate the labor productivity gap between the two sectors below.

Assuming a Cobb-Douglas production function with labor and capital as factor inputs, competitive markets, and homogeneous labor, the ratio of marginal product of labor between the two sectors equals the wage ratio as well as the ratio of the average product of labor.[23] Thus, the labor productivity gap between formal and informal sector can be calculated using revenue per worker or wages.[24]

We observe wages, number of workers, and revenue in our firm level data-sets for both the informal and formal sectors, and hence are able to calculate the productivity gap using both wages and revenue per worker.[25] Table 7 reports the productivity gap results based on revenue per worker in column 1 and wages in column 2. In the first row, we report the unadjusted raw gap in labor productivity between the formal and informal sector. The gap is well above one in both columns, suggesting potentially large productivity gains from reallocation of workers to the formal sector. The average revenue per worker is 14 times higher in formal sector compared to the informal sector, while this ratio is only 4 with

[23] These assumptions are standard in the development accounting framework (Caselli, 2005)

[24] Gollin et al. (2014) use revenue per worker, while Vollrath (2014) use the wage gap to measure productivity differences between the agricultural and non-agricultural sectors.

[25] Wages are calculated as total wages per worker paid by firms in a given year.

wages. This larger gap in average revenue product of labor compared to wages is consistent with the literature (McCaig and Pavcnik, 2018; Nataraj, 2011).

Next, we adjust the productivity gap for differences in the months of operation because a lot of informal firms do not operate for the whole year. We use information on the number of months in operation for informal firms and adjust our productivity gap. This adjustment lowers the productivity gap by around 40% and is reported in row 2. Another concern with our measured productivity gap is that we may be capturing differences in human capital between the two sectors. Following Gollin et al. (2014), we adjust for human capital differences in the two sectors using data on the level of education reported in the NSSO employment-unemployment surveys. This adjustment reduces the revenue productivity gap in column 1 to 8.23, and wage gap in column 2 to 2.21.

Another concern is that there may be differences in the output elasticity between the formal and the informal sectors. Following Restrepo-Echavarria (2014), we assume that the output elasticity of labor in the formal sector is 1.5 times the output elasticity in the informal sector, and this adjustments reduces the gap in column 1 to 5.49. Finally, we account for the under-reporting of revenues in the informal sector, and following De Mel et al. (2009), assume that revenues were 30% higher than reported, and adjust our productivity gap in column 1 to 3.84.

Using this final adjusted measure of labor productivity gap between the sectors, we estimate the aggregate productivity gains from reallocation in response to Chinese import competition to be 3.28% (based on column 1). Our estimates also suggest a gain in wages of 1.47% for workers transitioning to the formal sector (based on column 2).

A remaining concern is that the large observed wage gap between the sectors (column 2 in table 7) is due to unobserved worker characteristics, besides the years of education. If this is the case, our wage gains may be overestimated. To account for heterogeneity in worker characteristics, we use the NSSO employment-unemployment survey (worker-level) and estimate Mincerian regressions of log wages on an indicator variable for formal sector employment, and worker characteristics such as years of education, location, and socio-demographic characteristics. We also include industry and state fixed effects to control for

industry and state specific unobservables that are correlated with both formal employment and wages. The coefficient on the indicator variable gives us the wage premium associated with working in the formal sector. Table B4 reports the results. We find that there is a wage premium of 17.4% for formal sector workers compared to those in the informal sector (column 7). Thus, even after accounting for worker characteristics, a considerable wage premium remains, suggesting potential aggregate wage gains from reallocation across the two sectors.

4.7 Supporting Results

ASI provides details on product-level quantity and sales for a maximum of 10 largest products produced by each establishment. We divide the sales by quantity to arrive at establishment-product level prices (unit values). To provide further evidence for the reallocation mechanism, we test for the heterogeneity in sales, price, and quantity responses by labor productivity quartiles, due to Chinese import competition. Table B5 reports the result from a firm-product level version of equation 7. The outcome variable is product level log sales (column 1), log price (column 2), and log quantity (column 3). The results suggest that initially high productivity firms differentially reduce prices and increase quantity compared to low productivity firms. Thus high productivity firms expand physical output differentially more compared to low productivity firms, consistent with and parallel to the employment results observed in table 6. However, there is no differential effect on sales as the price decline countervails higher physical production.

5 Conclusion

In this paper, we show that higher Chinese import competition increases the employment share in the formal sector in India. The rise in formal sector employment is entirely driven by formal firms in the top 50% of the productivity distribution. In contrast, informal sector employment shrinks in response to Chinese import competition. To the best of our knowledge, no prior study has found that import competition could lead to an increase

in the employment share in the formal sector, and accrue aggregate productivity gains as a result. On the contrary, previous studies have found an increase in the informal sector employment as a result of competition.

This increase in formal employment is driven by contract workers who are temporarily hired through third-party intermediaries, rather than regular workers. These effects are steered by states that have stringent labor firing laws and those with high levels of unionization, consistent with the fact that misallocation was higher to begin with in these settings (Hsieh and Klenow, 2009). These results are further consistent with the literature that shows that reallocation and job flows are usually limited due to labor market frictions (Boedo and Mukoyama, 2012; Hopenhayn and Rogerson, 1993; Kambourov, 2009), but can be enabled by the usage of contract workers who are cheaper and who do not carry high firing costs and are less likely to be unionized compared to their regular labor counterparts (Autor, 2003; Chaurey, 2015).

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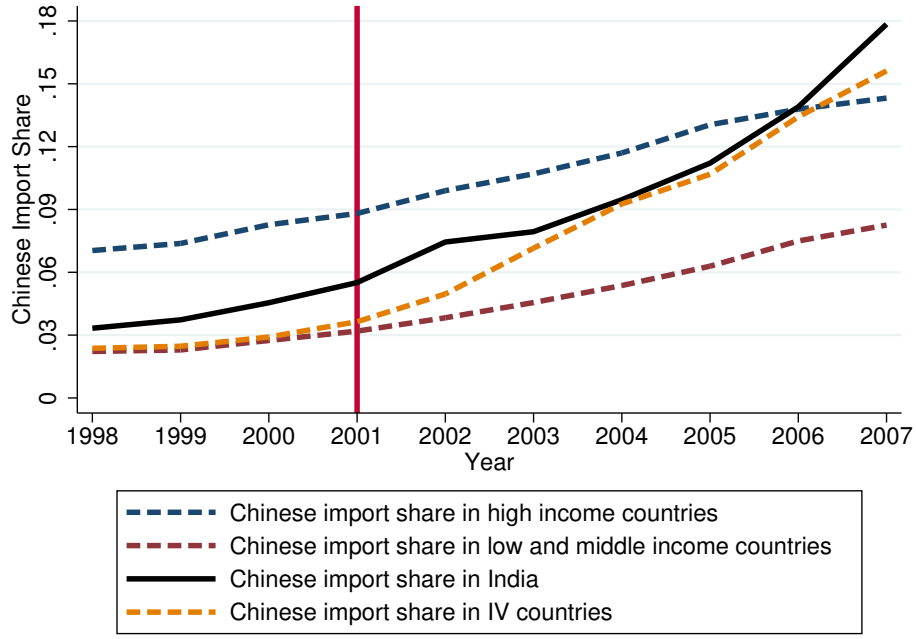
Figure 1: Chinese Import Shares in India and Different Country Groups



Note: Chinese import share to a particular country is the share of imports from China in that country to all imports in that country. Data are sourced from the UN-COMTRADE database.

Table 1: Decomposition of Change in Employment Shares Between 2000-2001 and 2005-2006

	(1)	(2)	(3)
	Total	Within	Between
Formal Share in Employment	0.0294	0.0248	0.0046
Contract Share in Employment	0.0197	0.0175	0.0022
Regular Share in Employment	0.0098	0.0073	0.0024

Notes: The table reports sectoral decomposition of changes in the share of employment of formal workers, contract workers, and regular workers in total employment between 2000-2001 and 2005-2006 using the Annual Survey of Industries, and NSSO's unorganized sector surveys.

Table 2: Chinese Import Competition and Formal Sector Employment: Worker Level Analysis

	Indicator for Employment in Formal Enterprise					
	(1)	(2)	(3)	(4)	(5)	(6)
Chinese Import Competition (IMP)	0.568***	0.570***	0.526***	0.538***	0.517***	0.473**
	(0.168)	(0.149)	(0.163)	(0.196)	(0.178)	(0.190)
Estimation Method	OLS	OLS	OLS	IV	IV	IV
First-stage F-statistic	-	-	-	674.97	675.86	677.04
Worker Characteristics	No	Yes	Yes	No	Yes	Yes
Worker Characteristics × Year=2004	No	No	Yes	No	No	Yes
Alternative Trade Channels	Yes	Yes	Yes	Yes	Yes	Yes
3-digit-industry × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
State × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
State × Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	36,347	36,347	36,340	36,347	36,347	36,340

Note: The NSSO employment-unemployment survey for the years 1999-2000 and 2004-2005 are used for analysis. Worker characteristics include age and its squared, marital status indicator, female indicator, education status, rural residence indicator, religious minority status indicator, and disadvantaged social category indicator. In the IV specifications, Chinese imports to India is instrumented with Chinese imports into a set of 10 Latin American countries. Alternative trade channels include output and input tariffs, access to Chinese inputs, import penetration from high income countries and low and middle income countries separately, Chinese import share in high income countries, Chinese import share in low and middle income countries, and India's export share in the total exports to the set of Latin American countries used to create the instrument. All regressions are weighted using sample weights from the NSSO employment-unemployment survey. Robust standard errors clustered at the 4-digit industry level in parentheses; *** - statistical significance at 1%; **- statistical significance at 5%; *- statistical significance at 10%.

Table 3: Chinese Import Competition and Employment: State-Year Level Analysis

	Share in total employment	Log Employment				
		Total	Informal	Formal		
	Formal			Total	Regular	Contract
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: OLS						
Chinese Import Competition (IMP)	1.165	–7.275*	–14.17**	4.685**	3.335*	10.63***
	(0.754)	(3.835)	(6.437)	(1.961)	(1.799)	(3.584)
Panel B: IV						
Chinese Import Competition (IMP)	1.469**	–8.286**	–15.75**	4.515**	3.534*	10.59***
	(0.688)	(4.080)	(6.285)	(2.249)	(2.090)	(3.763)
IV First-stage F-stat	268.81	268.81	403.17	223.01	223.01	223.01
Alternative Trade Channels	Yes	Yes	Yes	Yes	Yes	Yes
State × Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
3-digit-industry × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
State × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,702	3,702	3,182	2,912	2,912	2,912

Note: Analysis is conducted at the 4-digit state-industry-year level. We use Annual Survey of Industries (ASI) to measure formal employment and the NSSO's unorganized sector surveys to measure informal employment. We use surveys conducted in 2000-2001 and 2005-2006. In the IV specifications, Chinese imports to India is instrumented with Chinese imports into a set of 10 Latin American countries. Alternative trade channels include output and input tariffs, access to Chinese inputs, import penetration from high income countries and low and middle income countries separately, Chinese import share in high income countries, Chinese import share in low and middle income countries, and India's export share in the total exports to the set of Latin American countries used to create the instrument. Regressions are weighted by total employment (column 1 and 2), informal employment (column 3), and formal employment (columns 4, 5, and 6) in the state-industry in the year 2000-2001. Robust standard errors clustered at the 4-digit industry level in parentheses. ***, **, * is statistical significance at 1%, 5%, and 10%, respectively.

Table 4: The Role of Institutions

	Indicator for Employment in Formal Enterprise				Formal Share in Total Employment				Contract Share in Total Employment			
	Unionization		Labor Laws		Unionization		Labor Laws		Unionization		Labor Laws	
	High	Low	PW==1	PW==0	High	Low	PW==1	PW==0	High	Low	PW==1	PW==0
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Chinese Import Competition (IMP)	0.788***	0.179	1.285***	0.153	3.301***	0.303	2.812***	1.478*	2.025***	-0.310	1.869***	0.346
	(0.272)	(0.281)	(0.459)	(0.177)	(0.695)	(0.765)	(0.789)	(0.801)	(0.437)	(0.561)	(0.628)	(0.583)
Estimation Method	IV	IV	IV	IV	IV	IV	IV	IV	IV	IV	IV	IV
First-State F-stat	845.67	829.45	1048.47	812.82	399.16	89.36	186.87	224.89	399.16	89.36	186.87	224.89
Worker Characteristics	Yes	Yes	Yes	Yes	-	-	-	-	-	-	-	-
Alternative Trade Channels	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3-digit-industry × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State × Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,141	16,062	7,916	24,836	1,590	1,174	472	2,024	1,590	1,174	472	2,024

Note: The outcome variable in columns (1)-(4) is an indicator variable for employment in a formal enterprise based on the worker-level NSSO unemployment-employment survey data (years 1999-2000 and 2004-2005). The outcome variable in columns (5)-(8) and columns (9)-(12) is the share of formal and contract employment in total employment, respectively, and are based on the Annual Survey of Industries (ASI) and NSSO's unorganized sector surveys (years 2000-2001 and 2005-2006). Worker characteristics include age and its squared, marital status indicator, female indicator, education status, rural residence indicator, religious minority status indicator, and disadvantaged social category indicator. Chinese imports to India is instrumented with Chinese imports into a set of 10 Latin American countries. Alternative trade channels include output and input tariffs, access to Chinese inputs, import penetration from high income countries and low and middle income countries separately, Chinese import share in high income countries, Chinese import share in low and middle income countries, and India's export share in the total exports to the set of Latin American countries used to create the instrument. Regressions are weighted by the sample weights from NSSO employment-unemployment survey in columns 1-4, by total employment in the state-industry in columns 5-12. High unionization states and low unionization states are defined respectively based on the unionization index defined by Dougherty (2009), and are classified based on above- and below- median values of the index, respectively. PW = 1 indicates pro-worker states, and PW = 0 indicates non-pro-worker states as per the definition by Besley and Burgess (2004). Robust standard errors clustered at the 4-digit industry level in parentheses; *** - statistical significance at 1%; **- statistical significance at 5%; *- statistical significance at 10%.

Table 5: Chinese Import Competition and Formal Employment: Firm Level Analysis

	Log Total workers	Log Regular workers	Log Contract workers	Contract worker ratio	Log Total workers	Log Regular workers	Log Contract workers	Contract worker ratio
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Chinese Import Competition (IMP)	0.038	-0.086**	0.187**	0.043***	0.110**	-0.009	0.308***	0.048***
	(0.052)	(0.038)	(0.087)	(0.013)	(0.055)	(0.054)	(0.094)	(0.018)
Estimation Method	OLS	OLS	OLS	OLS	IV	IV	IV	IV
First-stage F-stat					17.49	17.49	17.49	17.49
Alternative Trade Channels	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Factory FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3-digit Industry × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State × Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	226,553	226,553	226,553	226,553	226,553	226,553	226,553	226,553

Note: Analysis uses the Annual Survey of Industries (formal sector survey) at the establishment level for the years 1998-1999 to 2007-2008. In the IV specifications, Chinese imports to India is instrumented with Chinese imports into a set of 10 Latin American countries. Alternative trade channels include output and input tariffs, access to Chinese inputs, import penetration from high income countries and low and middle income countries separately, Chinese import share in high income countries, Chinese import share in low and middle income countries, and India's export share in the total exports to the set of Latin American countries used to create the instrument. All regressions are weighted by the sample weights in the ASI survey. Robust standard errors clustered at the 4-digit industry level in parentheses; *** - statistical significance at 1%; **- statistical significance at 5%; *- statistical significance at 10%.

Table 6: Chinese Import Competition and Reallocation of Workers by Labor Productivity Quartiles: Firm-Level Analysis

	Labor Productivity			
	Log Total workers	Log Regular workers	Log Contract workers	Contract worker ratio
	(1)	(2)	(3)	(4)
Chinese Import Competition (IMP)	–0.597***	–0.465**	–0.432**	–0.068
	(0.171)	(0.187)	(0.176)	(0.041)
IMP × Qr_2	0.312**	0.196	0.270	0.049
	(0.125)	(0.270)	(0.166)	(0.056)
IMP × Qr_3	0.734***	0.544***	0.564***	0.085**
	(0.173)	(0.131)	(0.175)	(0.036)
IMP × Qr_4	1.473***	0.881***	1.805***	0.279***
	(0.335)	(0.276)	(0.339)	(0.061)
Estimation Method	IV	IV	IV	IV
First-stage F-stat (IMP)	87.37	87.37	87.37	87.37
First-stage F-stat ($IMP \times Q_{r2}$)	239.01	239.01	239.01	239.01
First-stage F-stat ($IMP \times Q_{r3}$)	432.90	432.90	432.90	432.90
First-stage F-stat ($IMP \times Q_{r4}$)	220.57	220.57	220.57	220.57
Alternative Trade Channels	Yes	Yes	Yes	Yes
Factory FE	Yes	Yes	Yes	Yes
3-digit Industry × Year FE	Yes	Yes	Yes	Yes
State × Year FE	Yes	Yes	Yes	Yes
State × Industry FE	Yes	Yes	Yes	Yes
Observations	226,553	226,553	226,553	226,553

Note: Analysis uses the ASI data (formal sector firms) at the establishment level for the years 1998-1999 to 2007-2008. Qr_i is an indicator variable equal to 1 if the firm belongs to the i^{th} quartile of the labor productivity distribution when it first enters our sample. Chinese imports to India, and its interaction with the quartile indicator variables are instrumented with Chinese imports into a set of 10 Latin American countries and their corresponding interaction with quartiles. Alternative trade channels include output and input tariffs, access to Chinese inputs, import penetration from high income countries and low and middle income countries separately, Chinese import share in high income countries, Chinese import share in low and middle income countries, and India's export share in the total exports to the set of Latin American countries used to create the instrument. All regressions are weighted by the sample weights in the ASI survey. Robust standard errors clustered at the 4-digit industry level in parentheses; *** - statistical significance at 1%; **- statistical significance at 5%; *- statistical significance at 10%.

Table 7: Productivity Gap Between Formal and Informal Enterprises

	Revenue Productivity Gap	Wage Gap
	(1)	(2)
A. Unadjusted	14.22	4.13
B. Adjusted for:		
(1) Months in Operation	11.72	3.15
(2) (1)+Human Capital Differences	8.23	2.21
(3) (2)+Difference in Output Elasticity	5.49	-
(4) (3)+Measurement Error in Revenue	3.84	-

Note: Column 1 reports the labor productivity gap between formal and informal enterprises, where labor productivity is measured by average revenue per worker. Column 2 reports the labor productivity gap between formal and informal enterprises, where labor productivity is measured by earnings per worker. These calculations use data from the Annual Survey of Industries for the formal sector, and data from the NSSO's unorganized enterprises survey for the informal sector for the years 2000-2001 and 2005-2006.

Appendix A

Imported inputs is defined as follows:

$$INP_{jt}^{China} = \sum_{s} \alpha_{js} \cdot IMP_{st}^{China} \tag{8}$$

where α_{js} is the share of input s in the total output for industry j, and IMP_{st}^{China} is the import penetration ratio for input s. To obtain a measure of imported inputs from China in each industry, we used the input-output (IO) mapping table for India for the year 1993-94 (Ministry of Statistics and Programme Implementation, 2000). Input s in equation (8) refers to a sector in this IO table. This input-output table is an $n \times n$ matrix of IO sectors. For each IO sector s in each row, the columns give the share of other IO sectors which are used as inputs, which are represented by α_{js} in equation (8). Using IMP_{jt}^{China} for industry j from (2), we use a simple mapping between industries (j) and the IO sectors (s), to obtain a measure of IMP_{st}^{China} for each IO sector s. This then feeds into equation (8). We also instrument for access to imported inputs from China, INP_{jt}^{China}, which is given by:

$$IVINP_{jt}^{China} = \sum_{s} \alpha_{js} \cdot IV_{st}^{China} \tag{9}$$

where the instrument is the weighted average of the instrument for import penetration ratio calculated for the input sector s similar to (5) above. IV_{st}^{China} is the instrumental variable for import penetration ratio defined in equation 3.

We proxy for Chinese import competition in foreign markets by Chinese import share in these markets given by the following equation:

$$IS_{jt}^{China,F} = \frac{M_{jt}^{China,F}}{M_{jt}^{World,F}} \tag{10}$$

where $IS_{jt}^{China,F}$, $M_{jt}^{China,F}$, and $M_{jt}^{World,F}$ are Chinese import share in the foreign market, imports from China to the foreign market, and total imports to the foreign markets in industry j and time t respectively. Foreign market, F, is either the set of low and middle income economies except China or the set of high income countries.

We compute the import penetration from other countries into India using equation (2), where we replace Chinese imports with imports from the set of low and middle income countries or the high income countries. Finally, we use Indian exports to the set of IV countries as a share of total exports from India as a control variable.

Appendix B

Table B1: Chinese Import Competition and Formal Sector Employment: Heterogeneity Based on Worker Characteristics

	Indicator for Employment in Formal Enterprise					
	Age<=40	Age>40	Primary Education	Higher Education	Rural	Urban
	(1)	(2)	(3)	(4)	(5)	(6)
Chinese Import Competition (IMP)	0.309 (0.215)	1.158*** (0.310)	0.476 (0.467)	0.256 (0.290)	0.0001 (0.429)	0.941*** (0.316)
Estimation Method	IV	IV	IV	IV	IV	IV
First-stage F-stat	763.29	632.77	1806.13	483.85	1178.50	299.71
Worker Characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Alternative Trade Channels	Yes	Yes	Yes	Yes	Yes	Yes
3-digit-industry × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
State × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
State × Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	25,646	9,981	18,903	16,753	15,927	19,741

Note: The NSSO employment-unemployment survey for the years 1999-2000 and 2004-2005 are used for analysis. Worker characteristics include age and its squared, marital status indicator, female indicator, education status, rural residence indicator, religious minority status indicator, and disadvantaged social category indicator. Chinese imports to India is instrumented with Chinese imports into a set of 10 Latin American countries. Alternative trade channels include output and input tariffs, access to Chinese inputs, import penetration from high income countries and low and middle income countries separately, Chinese import share in high income countries, Chinese import share in low and middle income countries, and India's export share in the total exports to the set of Latin American countries used to create the instrument. All regressions are weighted by the sample weights in the NSS survey. Robust standard errors clustered at the 4-digit industry level in parentheses; *** - statistical significance at 1%; **- statistical significance at 5%; *- statistical significance at 10%.

Table B2: Chinese Import Competition, Employment, and Employment Shares : Industry Level Analysis

	Share in total employment	Log Employment				
		Total	Informal	Formal		
	Formal			Total	Regular	Contract
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: OLS						
Chinese Import Competition (IMP)	3.186***	–5.822	–13.34**	3.782*	2.201	8.091***
	(0.717)	(3.800)	(5.183)	(2.019)	(1.889)	(2.948)
Panel B: IV						
Chinese Import Competition (IMP)	3.255***	–6.021	–13.94**	3.954	2.252	8.183**
	(0.736)	(4.091)	(5.463)	(2.399)	(2.042)	(3.885)
First-stage F-stat	177.42	177.42	259.12	144.97	144.97	144.97
Alternative Trade Channels	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
3-digit-industry × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	110	110	110	110	110	110

Note: Analysis is conducted at the 4-digit industry-year level. We use Annual Survey of Industries (ASI) to measure formal employment, and the NSSO's unorganized sector surveys to measure informal employment. We use surveys conducted in 2000-2001 and 2005-2006. Chinese imports to India is instrumented with Chinese imports into a set of 10 Latin American countries. Alternative trade channels include output and input tariffs, access to Chinese inputs, import penetration from high income countries and low and middle income countries separately, Chinese import share in high income countries, Chinese import share in low and middle income countries, and India's export share in the total exports to the set of Latin American countries used to create the instrument. All regressions are weighted by the industry employment in the year 2000-2001. Robust standard errors clustered at the 4-digit industry level in parentheses; *** - statistical significance at 1%; **- statistical significance at 5%; *- statistical significance at 10%.

Table B3: Chinese Import Competition and Reallocation of Workers by TFP quartiles: Firm level Analysis

	Log Total workers	Log Regular workers	Log Contract workers	Contract worker ratio
	(1)	(2)	(3)	(4)
Chinese Import Competition (IMP)	0.104	0.110	0.201	–0.005
	(0.101)	(0.104)	(0.139)	(0.024)
IMP × Qr_2	–0.022	–0.111	0.052	0.040
	(0.108)	(0.116)	(0.142)	(0.030)
IMP × Qr_3	0.215	–0.042	0.339*	0.111**
	(0.169)	(0.193)	(0.201)	(0.050)
IMP × Qr_4	0.258*	–0.020	0.291	0.107***
	(0.131)	(0.115)	(0.178)	(0.032)
Estimation Method	IV	IV	IV	IV
First-stage F-stat (IMP)	72.38	72.38	72.38	72.38
First-stage F-stat ($IMP \times Q_{r2}$)	42.15	42.15	42.15	42.15
First-stage F-stat ($IMP \times Q_{r3}$)	40.15	40.15	40.15	40.15
First-stage F-stat ($IMP \times Q_{r4}$)	33.08	33.08	33.08	33.08
Alternative Trade Channels	Yes	Yes	Yes	Yes
Factory FE	Yes	Yes	Yes	Yes
3-digit Industry × Year FE	Yes	Yes	Yes	Yes
State × Year FE	Yes	Yes	Yes	Yes
State × Industry FE	Yes	Yes	Yes	Yes
Observations	196.966	196.966	196.966	196.966

Note: Analysis uses the Annual Survey of Industries (formal sector firms) at the establishment level for the years 1998-1999 to 2007-2008. Qr_i is an indicator variable which is equal to 1 if a firm belongs to the i^{th} quartile of the productivity distribution (total) when it first enters our sample. We calculate productivity using the methodology of Ackerberg et al. (2015). To obtain values in real terms, we use output and input deflators from Allcott et al. (2016) and capital deflators from Reserve Bank of India (RBI) publications. Chinese imports to India, and its interaction with the quartile indicator variables are instrumented with Chinese imports into a set of 10 Latin American countries and their corresponding interaction with quartiles. Alternative trade channels include output and input tariffs, access to Chinese inputs, import penetration from high income countries and low and middle income countries separately, Chinese import share in high income countries, Chinese import share in low and middle income countries, and India's export share in the total exports to the set of Latin American countries used to create the instrument. Robust standard errors clustered at the 4-digit industry level in parentheses. ***, **, * are statistical significance at 1%, 5%, and 10%.

Table B4: Wage Difference Between Formal and Informal Workers: Worker-Level Analysis

	Log(wages)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Indicator for Formal Employment	0.314***	0.273***	0.221***	0.245***	0.293***	0.209***	0.174***
	(0.0419)	(0.0387)	(0.0386)	(0.0305)	(0.0405)	(0.0296)	(0.0291)
Controls:							
Years of Education	-	Yes	-	-	-	Yes	-
Education Categories	-	-	Yes	-	-	-	Yes
Demographic Characteristics	-	-	-	Yes	-	Yes	Yes
Location	-	-	-	-	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	-	-	-	-	Yes	Yes	Yes
Observations	8,888	8,888	8,888	8,888	8,888	8,888	8,888

Note: The analysis uses the NSSO's employment-unemployment survey at the worker-level for the years 1999-2000 and 2004-2005. Daily wages, the outcome variable are reported by the workers based on a 7-day recall period, and are calculated based on earnings in the last week and the number of half-days worked in the last week. Education categories include primary (omitted), secondary, graduation. Years of education for a worker is derived from the standard number of years taken to complete each level of education. Demographic characteristics for workers include age and its squared, marital status indicator, female indicator, rural residence indicator, religious minority status indicator, and disadvantaged social category indicator. All regressions are weighted by the sample weights in the NSSO survey. Robust standard errors clustered at the 4-digit industry level in parentheses; *** - statistical significance at 1%; **- statistical significance at 5%; *- statistical significance at 10%.

Table B5: Chinese Import Competition, Sales, Price, and Production: Establishment-Product level Analysis

	Log Sales	Log Price	Log Quantity
	(1)	(2)	(3)
Chinese Import Competition (IMP)	0.912	–1.049	1.972
	(1.464)	(1.296)	(1.943)
IMP × Qr_2	–0.223	–1.270**	1.107*
	(0.286)	(0.517)	(0.638)
IMP × Qr_3	0.323	–0.659**	1.018***
	(0.234)	(0.276)	(0.369)
IMP × Qr_4	0.175	–1.052***	1.264***
	(0.384)	(0.298)	(0.469)
Estimation Method	IV	IV	IV
First-stage F-stat (IMP)	222.42	222.42	222.42
First-stage F-stat ($IMP \times Q_{r2}$)	199.45	199.45	199.45
First-stage F-stat ($IMP \times Q_{r3}$)	434.18	434.18	434.18
First-stage F-stat ($IMP \times Q_{r4}$)	281.43	281.43	281.43
Alternative Trade Channels	Yes	Yes	Yes
Factory FE	Yes	Yes	Yes
3-digit Industry × Year FE	Yes	Yes	Yes
State × Year FE	Yes	Yes	Yes
State × Industry FE	Yes	Yes	Yes
Observations	316,343	316,342	318,782

Note: Analysis uses the Annual Survey of Industries (formal sector firms) at the establishment-product level for the years 1998-1999 to 2007-2008. Qr_i is an indicator variable which is equal to 1 if a firm belongs to the i^{th} quartile of the labour productivity distribution when it first enters our sample. Chinese imports to India, and its interaction with the quartile indicator variables are instrumented with Chinese imports into a set of 10 Latin American countries and their corresponding interaction with quartiles. Alternative trade channels include output and input tariffs, access to Chinese inputs, import penetration from high income countries and low and middle income countries separately, Chinese import share in high income countries, Chinese import share in low and middle income countries, and India's export share in the total exports to the set of Latin American countries used to create the instrument. All regressions are weighted by the sample weights in the ASI survey. Robust standard errors clustered at the 4-digit industry level in parentheses; ***, **, * are statistical significance at 1%, 5%, and 10%.