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Import competition, labor market regulations, and firm outsourcing ☆

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ABSTRACT

Using unique information on firm level domestic outsourcing of manufacturing jobs by Indian firms, we propose two channels and their interaction as determinants of the fragmentation of production: import competition and labor market regulation. We find that greater import competition from China is associated with a significant increase in domestic outsourcing of manufacturing jobs — a 10-percentage point increase in the import penetration ratio leads to a 11%–14% increase in the ratio of outsourcing expenses to the wage bill of a firm. This effect is driven by multi-product firms operating in states with pro-worker labor laws. We find a corresponding increase in the likelihood of sub-contracting among informal sector firms. Our results are consistent with a model where forward-looking firms outsource more in response to an increase in import competition, when there are future firing costs that can be avoided through such outsourcing. We thus are the first to highlight that labor market regulation and its interaction with international trade can determine the organization of production. Our findings have significant development implications that take the form of movement of manufacturing production towards the informal sector (and possible subsequent impoverishment of workers) as a consequence of a major trade shock.

1. Introduction

Fragmentation of production activity has received extensive attention in the literature in recent years. According to Grossman and Helpman (2005), firms now subcontract or outsource a range of activities — jobs related to both manufacturing (such as product design, assembly, research and development) and professional services (marketing, distribution, after-sales service). In this paper, we propose two new channels that influence outsourcing of production activity by a firm outside its boundary: (i) international trade; particularly, import competition and (ii) labor market regulation. We bring to bear unique data on outsourcing by Indian firms for the years 1995–2007, that capture an aspect of outsourcing not explored before. Our variable, expenses on outsourcing of manufacturing jobs by a firm, captures all expenses incurred by firms to have their manufacturing tasks completed by outside parties, including firms in the informal sector. [1]

Previous studies analyzing the organization of firms capture vertical integration using input–output (I–O) tables to calculate the proportions

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[1] We plot our outsourcing measure (outsourcing expenditure on manufacturing jobs) as a share of a broader measure of outsourcing in Figure C1 (Appendix C). The broader measure is defined as: outsourcing of manufacturing jobs + imported intermediates (raw materials) + domestic raw materials. The figure shows that outsourcing of manufacturing jobs as a share of total outsourcing rose significantly between 1995 and 2007; it was less than 1% in 1995, and rose to more than 10% in 2007, a ten fold increase. More on this in Section 7 where we compare our measure of outsourcing to traditional measures used previously in the literature and present results.

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of inputs in output produced within a firm (Acemoglu et al., 2009, 2010; Alfaro et al., 2016; Stiebale and Vencappa, 2018; Liu et al., 2019). A notable exception is Fort (2017), who uses firm level data.[2] Industry level information in this context does not capture the substantial within-sector heterogeneity across firms in the quality and composition of inputs (De Loecker et al., 2016).[3] Second, firms may both produce and outsource production of the same input, as noted by Bernard et al. (2018). We argue that our measure of firm outsourcing overcomes these concerns by directly exploiting data on firm outsourcing expenditure specifically on manufacturing jobs. It is therefore closest in spirit to Grossman and Helpman (2005)'s definition of outsourcing: it is more than just the purchase of raw materials and intermediate goods. It indicates a bilateral relationship(s), where the partner makes a relationship-specific investment to produce goods that fit the firm's particular needs. We note that our outsourcing variable only captures domestic outsourcing and not offshoring.[4] This is one aspect of outsourcing that has largely been ignored in the literature.[5]

To establish a causal relationship between the increase in import competition and the organization of production, we exploit the increase in import competition faced by Indian firms from China post China's accession to the WTO as a quasi-natural experiment.[6] This is a valid exercise given China's dominance as India's trading partner and growth in Chinese exports, post its accession to the WTO, was a result of its internal reforms unrelated to India. To address the concern that domestic technology and demand shocks in India can affect both outsourcing and imports, we use imports from China by other developing countries as an instrument for India's imports from China. Additionally, we include alternative trade channels potentially correlated with our instrument as well as outsourcing, such as tariffs, import competition in India from other (developing and developed) countries, and import competition from China in export markets (developing and developed countries) as control variables. This strategy enables us to rule out the possible alternate trade channels as competing explanations for the effects we observe. Our results remain robust to these estimations.

Next, focusing on a federal democracy like India allows us to delve into the role played by labor regulation in determining the relationship between trade and outsourcing. There is substantial heterogeneity in labor market regulations (and their implementation) across Indian regions, while many other institutions and policies (e.g., trade policy) are at the country level.[7] We follow Besley and Burgess (2004), Gupta et al. (2009), and Chaurey (2015) to classify Indian states as "pro-worker" or "pro-employer" and exploit this variation to understand whether the impacts of import competition on outsourcing are particularly large in pro-worker states, where labor laws act as a larger tax on employing labor in-house. A crucial identifying assumption, that Chinese import competition is exogenous to the labor regime, is met in our case, as a large majority of labor Acts were enacted in the period 1949–1989, with no new amendments to the IDA in the nineties (Ahsan and Pages, 2008).

To guide our empirical investigations and rationalize our empirical findings, we present a framework where firms employ in-house labor or outsource input production at a lower wage (for instance, to the informal sector). Firms are forward-thinking and recognize that they may incur firing costs to retrench or lay-off workers in the next period in case of a negative demand shock. An increase in import competition exerts a pro-competitive effect, inducing low-cost firms to expand output and increase outsourcing (with outsourcing done exclusively by relatively low-cost firms, as confirmed in the data). Firms with monopoly power tend to restrict output to keep prices high. Destruction of this monopoly power, in this case through import competition, results in more competitive behavior of these domestic firms, which pushes them to increase their output. This potentially offsets the impact of the reduction in their market share arising from increased import competition.

In addition, the model also has predictions for differential impacts of import competition on outsourcing in pro-worker and pro-employer states. The increase in output in response to greater import competition is smaller for firms in pro-worker states given that firing costs they may have to incur in the future are higher. This effectively makes their expected marginal cost higher, thereby leading to lower output expansion. We label this the 'scale' channel, since it is driven by differential output expansion. However, the marginal benefit to outsourcing is greater for firms in these states, since a given amount of outsourcing saves a larger amount of firing costs in the future if a negative shock hits and they have to downsize as a result. We label this the 'cost-saving' channel, since it is driven by differential savings in firing costs. If the cost-saving channel dominates, an increase in Chinese import competition will lead to greater outsourcing for expanding firms in pro-worker (relative to pro-employer) states. As a result, firm level cost and markup (and hence, the price charged) decrease along with this increase in outsourcing. We find strong support for these channels in our empirical analysis.

We have three sets of results. First, an increase in Chinese import competition in the product market significantly increases the ratio of expenses on outsourcing of manufacturing jobs to the total wage bill of firms. In particular, a 10 percentage point increase in the Chinese import penetration ratio is associated with an increase in the ratio of outsourcing (of manufacturing jobs) to the total wage bill of a firm by 11%–14%. Second, this increase in outsourcing is completely driven by firms located in Indian states with pro-worker labor laws and is magnified in industries that are imperfectly competitive, where the pro-competitive effect would apply. All our results are robust to the inclusion of a battery of industry, firm and state characteristics, interactions between industry and year fixed effects (industries being alternatively at the 3- and 2-digit levels) and between state and year fixed effects, and alternate econometric estimation strategies.

Finally, we use data on outsourcing activity by manufacturing micro enterprises in the Indian informal sector to examine linkages between

[2] Fort (2017) is one among very few studies to use data on fragmentation of economic activity at the firm level. The data are for two years, 2002 and 2007, and based on a survey. We use a panel, where we observe the pattern of outsourcing at the firm level over a significant period of time.

[3] To show how using a measure based on input–output tables can produce different results, we use the same specification as Stiebale and Vencappa (2018) and examine the impact of India's trade reforms in the early 1990s on firm outsourcing. Results are presented in Table D1 (Appendix D). We regress our outsourcing measure (outsourcing expenditure on manufacturing jobs/total wage bill) on input and output tariffs. Unlike Stiebale and Vencappa (2018), we do not find any effects of tariffs on outsourcing by Indian manufacturing firms.

[4] Our dataset also provides information separately on import of intermediates. Along with our main analysis, we also use this data along with traditional sources of outsourcing to examine other forms of outsourcing.

[5] Lawrence (1994), Krugman (1995), and Feenstra (1998) point out that focusing solely on international outsourcing, or on imports of intermediates may not reveal a complete picture of firm outsourcing activity.

[6] There is precedence in the literature to treat the sharp rise in China's share in total imports of countries (both developed and developing) due to its accession to the WTO in 2001 as a quasi-natural experiment (see, Lu and Yu (2015) and Bloom et al. (2016)).

[7] Labor laws in India are guided by the Industrial Disputes Act of 1947 (hereafter IDA, 1947). The Act sets out the regulations governing employer–employee relations and the legal procedures to be followed in the case of labor disputes in the factory sector and has been identified as increasing the cost of operating in the formal sector in India Chaurey (2018). The IDA was passed by the central government, but has been extensively amended by state governments causing Indian states to differ markedly in their labor laws. Besley and Burgess (2004) codified all state level amendments made to the IDA during 1958–1995 in 16 major Indian states (from Malik (1997)). We discuss this in detail in Section 5.2.

the formal and informal sectors. Like many developing economies, India has a large informal sector consisting of enterprises employing less than ten workers. Firms in the informal sector face lower costs per unit of labor because labor laws, other than the Trade Union Act, do not apply there. We find that greater import competition from China is also associated with an increase in the likelihood of informal enterprises selling their final output to formal enterprises directly, or through a contractor. This finding is consistent with formal manufacturing firms outsourcing production activity to informal firms in response to greater import competition. Indeed, we find that the relationship between import competition and outsourcing among informal enterprises is magnified in states with pro-worker labor regulation. We also find that informal firms engaged in outsourced work expand their output.

We make several contributions in addition to using new and unique data on firm level outsourcing. First, we provide evidence on trade, especially import competition, as a determinant of outsourcing activity by firms. In marked contrast to the impressive body of theoretical work on the link between trade and outsourcing (spawned by papers including, but not restricted to Grossman and Helpman (2005) and Ornelas and Turner (2008)), the empirical evidence highlighting the role of international trade in shaping the organization of firms is scant (Chongvilaivan and Hur, 2012; Alfaro et al., 2016; Stiebale and Vencappa, 2018; Liu et al., 2019).

Our results on the informal sector speak to the literature on trade, the informal sector and economic development (Tybout, 2000; Goldberg and Pavcnik, 2003; Ulyssea, 2018). This is specially relevant in the case of developing countries that are characterized by large informal sectors, where labor laws do not apply and/or are harder to enforce. By increasing the cost of employing workers in-house in a formal setting, rigid labor laws may incentivize firms to adopt alternate strategies. In this context, the margin of employing workers in-house informally, such as through contract labor, has garnered sizeable attention in the literature. This equates to the intensive margin of informality, as discussed by Ulyssea (2018). Instead, we focus on the extensive margin of informality, whereby formal firms outsource activity to informal enterprises, particularly in the face of greater foreign competition. This not only enables formal sector firms to produce output at a lower cost, but also leads informal sector firms to expand.

Our paper is also related to two important papers in the literature, one on the impact of labor regulations in India on the response of employment to demand shocks and another that looks at employment composition in terms of contract and permanent workers. Adhvaryu et al. (2013) find support for the theoretical prediction in the labor economics literature that employment responses to shocks become more muted with greater labor protection. Running district level regressions, they show that rainfall shocks (that lead to changes in agricultural output and incomes, and, therefore, in local demand for manufactured products) lead to changes in industrial employment, with the magnitudes of these changes being smaller in states with more restrictive labor regulations. The second related paper by Chaurey (2015) looks at the impact of demand shocks arising from rainfall shocks on the use of contract labor (versus permanent workers) by firms and finds that firms hire more contract workers in response to positive local demand shocks (with no impact on permanent employment). The difference between this work and ours is that our paper considers import competition, which is distinct from weather-related shocks, such as rainfall shocks. In addition, instead of simply focusing on each firm's employment within its own boundary, our main focus is on the extent of outsourcing by a firm in response to the import competition — in other words, on firm organization. These differences between Adhvaryu et al. (2013) and Chaurey (2015) and our work are reflected in big differences between our respective theoretical frameworks as well as the empirical strategies and the questions we ask.

Finally, our study highlights outsourcing as a new margin of adjustment by firms to import competition. We thus contribute to the large body of empirical evidence demonstrating that import competition, especially from China, significantly affects the dynamics of manufacturing employment, output, product variety, wages, innovation, and productivity. The lion's share of these studies concentrate on developed countries and on displacement of labor into unemployment, public assistance, etc. While these outcomes suit the context of developed countries, we investigate displacement of labor to the informal sector. This is relevant for developing countries, where unemployment or public assistance may not be an option, geographic mobility is limited and the informal sector is a means to survive. The positive association between informality and poverty makes this an important development phenomenon that warrants studying the impact of import competition separately for developing countries. In addition, ex ante, it is not unreasonable to expect different effects of Chinese import competition on developed and developing countries such as India, given the technological similarity between the latter and China (di Giovanni et al., 2014).[8]

The rest of our paper is organized as follows. Section 2 presents our analytical framework with a few empirically testable propositions. We introduce the data and present some stylized facts in Section 3. Section 4 explains our empirical specification and identification strategy. We present our results studying the relationship between import competition and outsourcing, the role of labor regulation, and explaining the mechanisms for our benchmark finding in Section 5. Section 6 exploits data from the informal sector to show similar results. Section 7 extends the analysis to explore other types of outsourcing and Section 8 concludes.

2. Analytical framework

In this section, we provide an intuitive framework to trace the channel by which import competition can impact outsourcing. A more detailed and formal model is outlined in Appendix A. We consider a firm with some monopoly power, operating in the formal sector. Production requires one input that is in turn produced by combining a continuum of tasks. Each task requires one unit of labor in-house in the formal sector. If a task is outsourced, for instance, to the informal sector, it requires $\beta > 1$ units of labor. This assumption captures the idea that labor productivity is higher in the formal sector. The wage in the formal sector is higher than the informal wage, in line with the fact that minimum wage regulations are not enforced in the informal sector in developing countries such as India.[9] Outsourcing incurs a cost, which depends on the fraction of tasks outsourced by the firm. Thus, in deciding to outsource, the firm trades off the cost of outsourcing and the lower labor productivity in the informal sector against the gain from paying a lower informal wage per worker.

The firm is forward-looking and lives for two periods. In period $t = 1$, the firm expects that in period $t = 2$, there may be a positive shock (expansion) with probability $1 - g$ and a negative shock with probability g. A negative shock will require firing workers, while a positive shock will not. Firing workers in the formal sector requires the firm to pay a firing cost of c_f per worker fired. The firm chooses both output and the fraction of tasks to be outsourced in the first period to maximize the value of current profits plus discounted expected future

[8] di Giovanni et al. (2014), in examining the global welfare impact of China's trade integration and technological change, rank ten developing countries in terms of technological similarity to China. Among this group of countries, India is ranked as the country with the closest technological proximity to China; India's technological similarity index being 0.928 to that of China.

[9] The wedge between the cost of employing labor in the formal versus the informal sector can be interpreted more broadly. The cost of compliance around worker safety regulations and provision of benefits in the formal sector, compounded by the imperfect regime around labor inspections, imposes a cost of employing labor in-house for formal sector firms (Sundaram et al., 2017; Chaurey et al., 2022).

Table 1
Productivity of firms and outsourcing of manufacturing jobs.

	Outsourcing intensity		
	All states	Pro-worker states	Pro-employer states
	(1)	(2)	(3)
Qr_1	0.036	0.046	0.014
	(0.026)	(0.030)	(0.026)
Qr_2	0.060*	0.050*	0.095
	(0.037)	(0.030)	(0.078)
Qr_3	0.073***	0.098***	0.025
	(0.018)	(0.023)	(0.030)
Qr_4	0.109***	0.122***	0.079**
	(0.018)	(0.021)	(0.032)
R-Square	0.25	0.24	0.31
N	37,004	26,020	10,894
Firm Controls	Yes	Yes	Yes
Industry FE (4-digit) × Year FE	Yes	Yes	Yes
State FE × Year FE	Yes	Yes	Yes
State FE × Industry FE (4-digit)	Yes	Yes	Yes

Notes: Columns (1)–(3) use a binary variable (whether a firm is outsourcing or not in any given year) as the dependent variable. Qr_i are firm quartiles based on productivity estimates for the pre–2001 period. In particular, a firm belongs to Qr_1 if its average productivity estimate for the years 1995–2001 falls below the 25th percentile of the productivity estimate for its corresponding industry, and so on for Qr_i, where $i = 2, 3, 4$. Productivity is estimated using Ackerberg et al. (2015) method. 'Firm Controls' include age, age squared of a firm, size (assets) and technology adoption (sum of R&D expenditure and Technology Transfer). Both 'Assets' and 'Technology Adoption' are used at period $t-1$ and in real terms. Standard errors in parentheses are clustered at the firm level. Intercepts are not reported. *, **, *** denotes 10%, 5%, and 1% level of significance, respectively.

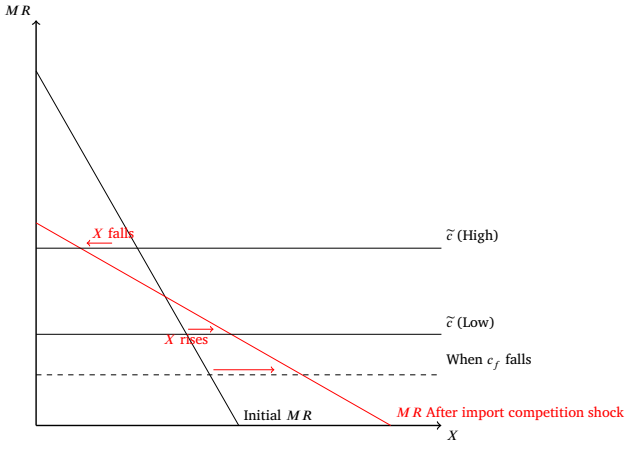
profits. The two first-order conditions for profit maximization yield two conditions. The first condition states that the firm sets output so that marginal revenue equals an augmented marginal cost $\tilde{c}$, which factors in the firing cost that the firm must incur in case of a contraction and the future possibility that it might have to fire workers employed in-house in the event of a bad shock. Note that this augmented marginal cost is decreasing in the fraction of tasks outsourced, since firing costs do not apply to tasks outsourced to the informal sector. The second condition is that the firm sets the fraction of tasks outsourced so that the marginal cost of outsourcing equals to its marginal benefit, which includes the gain from a lower informal sector wage and the savings in firing costs in the event of a future contraction.

We now examine the impact of an increase in import competition. Following Devarajan and Rodrik (1991), we argue that an increase in import competition, and the resulting increase in the elasticity of demand from increased availability of substitutes exerts a pro-competitive effect.[10] Starting with a downward sloping linear demand curve, an increase in import competition results in a more elastic demand curve (a higher own price elasticity of demand at any given price), such that the slope increases and the vertical intercept falls.

The following diagram shows the impact of an increase in import competition resulting from China's accession to the WTO (labeled "import competition shock"). The marginal revenue curve associated with the new demand curve is flatter (and its vertical intercept is smaller). For firms with low enough costs (firms whose marginal costs lie below the point of intersection of the initial and new marginal revenue curves drawn in this figure), this results in an increase in output. Additionally, the lower the firm's cost, the greater the output expansion. From the diagram, we note that it is low-cost, or high-productivity firms that expand output in response to the increase in import competition. High-cost, or low-productivity firms downsize. This highlights firm productivity as an important determinant of firm responses to the import competition shock.

To explore further, in Table 1, we estimate the relationship between firm productivity divided into four quartiles and the likelihood of outsourcing (the dependent variable). Firms are divided into quartiles based on their initial (pre–2001) productivity. We estimate productivity using the Ackerberg et al. (2015) method.[11] We present results for all firms and for firms split across pro-worker and pro-employer states. Results across all columns clearly establish that outsourcing is concentrated among high-productivity firms. In the empirical analysis, we exploit within-firm changes in our variables of interest, and therefore, focus on firms that outsource for two or more years. Our sample is thus restricted to high-productivity (or low-cost) firms that outsource. Drawing upon the insight that high-productivity firms expand output in response to the import competition shock due to a pro-competitive effect, we hereinafter assume that the increase in import competition unambiguously results in an increase in firm output.

The diagram also helps us make an observation about the firing cost a firm faces. Given that the firing cost c_f is a part of overall firm costs, a lower c_f is associated with lower effective marginal cost $\tilde{c}$ (depicted by the dashed line) and hence, greater output expansion.[12]



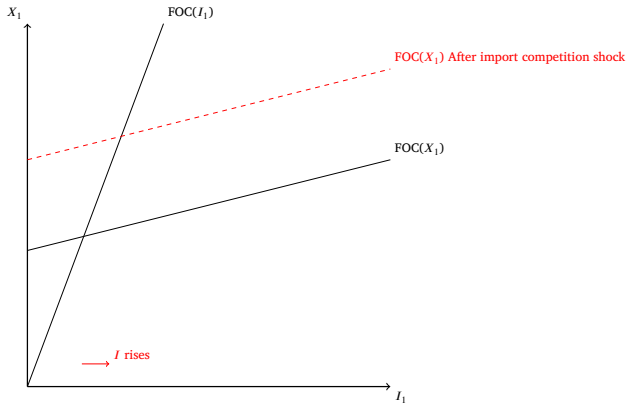
The second diagram below shows the two first-order conditions of a firm and the joint determination of output and outsourcing. $FOC(X_1)$ and $FOC(I_1)$ are the first-order conditions with respect to output X_1 and the fraction of tasks outsourced I_1 in period $t = 1$, respectively. $FOC(X_1)$ is upward sloping, because greater outsourcing pushes down the augmented marginal cost and as a result, increases optimal output. Also, the vertical intercept at $I_1 = 0$ shows optimal output when there is no outsourcing in the model. $FOC(I_1)$ is also upward sloping, since an increase in output leads to greater investment in outsourcing as the returns to outsourcing apply over a larger market size. $FOC(I_1)$ passes through the origin, because when $X_1 = 0$, the optimal choice of the firm is to set $I_1 = 0$. The intersection of the two lines determines optimal

[10] For Cameroon, Devarajan and Rodrik (1991) find that as import competition stiffens, the perceived demand curve for the firm becomes more elastic. The perceived marginal revenue curve is flatter, diminishing the incentive to keep output low and charge a higher price. Greater import competition hence erodes firms' market power, leading them to expand output. In many manufacturing sectors, the authors find that this pro-competitive effect outweighs the inward shift of the demand curve (negative demand shock) due to greater product market competition.

[11] Results are qualitatively similar if we Levinsohn and Petrin (2003) methodology.

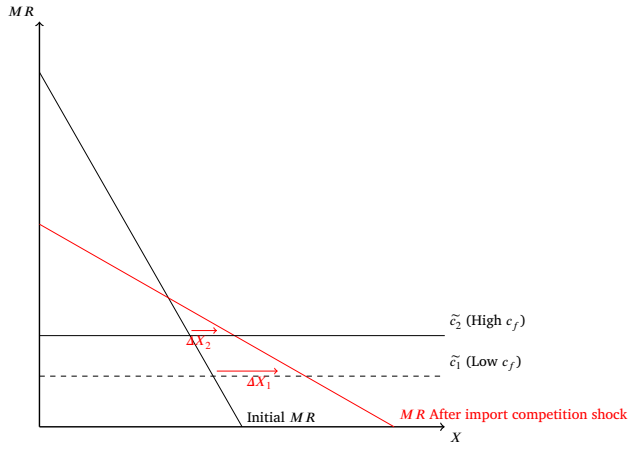
[12] For illustrative purposes, we assume in this figure and in our subsequent discussions that there is an expansion in in-house employment in the first period beyond the firm's initial inherited employment and there is a chance of a negative shock in the second period leading then to a shrinking of employment. Thus, the more workers the firm hires for in-house production in period 1, the more workers it may need to fire in period 2. That cost of firing in the second period gets incorporated in the first period's MC.

output and outsourcing.[13] With an increase in import competition from China, output expands for a given level of outsourcing, resulting in a shift up to a new (dashed) $FOC(X_1)$. Given the positive slope of $FOC(I_1)$, this results in increased optimal output and outsourcing. This leads us to our first proposition.



Proposition 1. *An increase in import competition is associated with an increase in outsourcing.*

Next, we focus on the interaction between import competition and labor regulation. We posit that firing cost, c_f, is higher in pro-worker states. To illustrate, we focus on the case of two expanding firms with equal marginal cost of production c, but one located in a pro-worker state with High c_f (and, thus, leading to a high $\tilde{c}$), and the other located in a pro-employer state with Low c_f (and, thus, leading to a low $\tilde{c}$). An increase in import competition results in a larger output expansion for the firm in a pro-employer state (Low c_f) relative to a firm in a pro-worker state (High c_f). This is depicted in the diagram below.



It follows that in an $FOC(X_1)$-$FOC(I_1)$ diagram $FOC(X_1)$ shifts up more for the Low c_f rather than for the High c_f firm. For the same $FOC(I_1)$, this would imply a larger increase in outsourcing for the Low c_f rather than the High c_f firm. We refer to this as the 'scale' channel, since it is driven by differential output expansion in High c_f versus Low c_f firms. However, the slope of $FOC(I_1)$ is steeper for the Low c_f firm than for the High c_f firm. The intuition here is that when there is expansion in the first period relative to initial employment and firing costs, if any, are all in period $t = 2$, a higher c_f increases the marginal benefit from outsourcing (through expected firing costs saved) because forward-looking firms want to reduce firing costs in the future in case a negative shock hits in period $t = 2$. Hence, the same shift up of $FOC(X_1)$ will result in a smaller increase in outsourcing for the Low c_f firm than for the High c_f firm. We refer to this as the 'cost-saving' channel, since differential savings in firing costs in Low c_f versus High c_f firms underlie it.

Ultimately, whether an increase in import competition results in a larger or smaller increase in outsourcing for the High c_f firm (located in a pro-worker state) relative to the Low c_f firm (in a pro-employer state) depends on the difference in the strengths of the scale channel, which drives the shift up in $FOC(X_1)$ and the cost-saving channel, which drives the differential slope of $FOC(I_1)$, and is ultimately an empirical question. Our second proposition, therefore, is:

Proposition 2. *An increase in import competition is associated with a larger increase in outsourcing in pro-worker, relative to pro-employer states if the cost-saving channel dominates the scale channel.*

Our empirical results indicate that the difference in shifts in $FOC(X_1)$ between High c_f and Low c_f firms is dominated by the cost-saving channel. That is, the difference in output expansion between High c_f and Low c_f firms (at their respective levels of outsourcing), stemming from the pro-competitive effect, is dominated by the difference in their outsourcing responses to any given output expansion. Thus, there is a source of greater marginal benefit to outsourcing for firms in pro-worker states, since a given amount of outsourcing saves a larger amount of firing costs in the future if a negative shock hits and they have to downsize as a result. This is the channel we emphasize in our paper.

We can now summarize the predictions of the model. We propose a framework where firms are forward-thinking and optimize in the current period given that they may have to incur firing costs to let go of workers in the next period if a negative shock hits. An increase in Chinese import competition exerts a pro-competitive effect, inducing firms to expand output and increase outsourcing. Moving to labor regulation, though the model identifies the channels through which its interaction with import competition operate, the predicted effects are ambiguous and empirical analysis is required to establish the impact on outsourcing.

Starting from an expansion in period $t = 1$, while the increase in output in response to greater import competition for given I is smaller for firms in pro-worker states because firing cost is high (scale channel), the marginal benefit to outsourcing is larger (cost-saving channel). This is because firms factor in a larger firing cost in the future that they can save on by outsourcing, if a negative shock were to lead them to downsize. If the cost-saving channel dominates, an increase in Chinese import competition will lead to greater outsourcing for low-cost firms in pro-worker (relative to pro-employer) states. Finally, our framework allows us to derive implications of the above model for a firm's markup and cost. In Appendix A, Propositions 3 and 4 establishes that a firm's markup, cost, and hence, the price charged will also decrease with an increase in outsourcing.

While we assume linear demand for simplicity, the predictions of the model on the relationship between import competition and outsourcing do not depend on linearity of the demand curve. As long as an increase in import competition increases the demand elasticity of import-competing domestic products (or product varieties), domestic firms will behave more competitively. With a CES utility function, this happens as long as the number of varieties is not infinite.[14] For instance, Devarajan and Rodrik (1991) posit a utility function with a CES aggregate defined over domestic and foreign (imported) goods, with perfect substitution assumed across varieties within each of domestic and imported categories, but imperfect substitution between these two

[13] We assume that a unique solution exists and that the slope of $FOC(I_1)$ is greater than the slope of $FOC(X_1)$.

[14] The demand elasticity associated with a CES utility function is constant only when the set of varieties is a continuum and not otherwise (Helpman and Krugman, 1987).

categories (domestic and imported). A drop in the relative price of the foreign good with trade liberalization will increase the demand elasticity for the domestic good, inducing a pro-competitive effect. Other model predictions follow from this pro-competitive effect and can therefore be generalized. We examine support for these predictions in our empirical analysis in Section 5.

3. Data and preliminary analysis

3.1. Firm level data

The dataset we use are drawn from the PROWESS database, constructed by the Centre for Monitoring the Indian Economy (CMIE). The database contains information on approximately 9000 manufacturing firms. We use data for around 5500+firms, for which there is a positive value of outsourcing of manufacturing jobs for more than one year. The dataset is classified according to the 5-digit 2008 National Industrial Classification (NIC). We re-classify it to 4-digit NIC 2004 to facilitate matching with important industry level variables, such as import penetration ratios and import tariffs; hence, all categorizations made throughout the paper are based on the 2004 NIC classification. The dataset spans 105 (4-digit 2004 NIC) disaggregated manufacturing industries that belong to 22 (2-digit 2004 NIC) aggregate ones.

The data are captured from annual income statements and balance sheets of all publicly listed companies. Majority of the firms in the dataset are domestic private Indian firms, whereas a small percentage of firms are either government or foreign-owned. The database covers large companies, firms listed on the major stock exchanges and small enterprises. Data for large companies are worked out from balance sheets, while CMIE periodically surveys smaller companies for their data. However, the database does not cover the unorganized sector. The dataset accounts for more than 70% of economic activity in the organized industrial sector, and 75% (95%) of corporate (excise duty) taxes collected by the Indian Government (Goldberg et al., 2010). We use data on manufacturing firms from 1995 through 2007. On average in any year, the gross value-added of outsourcing firms accounts for about 80% of value-added of all manufacturing firms.

Most importantly, the PROWESS database collects data on outsourcing expenditure incurred by firms. We exploit this unique variable in our empirical analysis. Specifically, we utilize: *information on outsourcing of manufacturing jobs*.

The dataset reports expenses incurred by firms to get their manufacturing tasks completed from outside parties, including from firms in the unregistered or informal sector. It includes labor charges, fabrication charges, processing charges, machining charges, fettling charges, conversion charges, contracted production and sub-contracted production.[15] We use this information to generate our main outsourcing measure, defined as the ratio of expenditure on outsourcing of manufacturing jobs to total wage bill of a firm. We normalize by the total wage bill (payments made to labor used by the firm in-house), because we conceptualize a firm outsourcing manufacturing tasks to outside parties as a substitute to employing in-house labor, as posited in our model. Our outsourcing measure thus captures the intensity of outsourced to in-house labor.

The dataset contains information on other measures of outsourcing used previously in the literature such as raw material expenditure sourced from domestic sources, import of intermediates and energy costs. We also use information on outsourcing activity of professional jobs. These are expenses incurred by firms for engaging external professional services. Such services include: marketing, advertising, distribution, software development fees, IT enabled service charges, cost audit fees, legal charges, auditors' fees, consultancy fees, and other miscellaneous services. Detailed information on variables used in our analysis is presented in Appendix B.

In addition, the dataset also rolls out information on a vast array of firm level characteristics, including total sales, imports, cost, compensation (wages plus incentives), production factors employed, expenditure, gross value-added, assets and other important firm and industry characteristics. Variables are measured in Indian Rupees (INR) million, deflated to 2005 using the industry-specific Wholesale Price Index. CMIE uses an internal product classification that is based on the HS (Harmonized System) and NIC schedules. Around 20% of firms in the dataset belong to chemicals, followed by food products and beverages (12.81%), textiles (10.81%) and basic metals (10.46%).

3.2. Stylized facts: Outsourcing of manufacturing activity

In this section, we present a few stylized facts on outsourcing of manufacturing jobs by Indian firms. **Panel A** of Fig. 1 presents the average ratio of expenditure on outsourcing of manufacturing jobs by Indian manufacturing firms, normalized by the total wage bill of the firm before and after 2001. The break in 2001 is intended to capture the impact of China's accession to the WTO.[16]

An average firm spent about 9% of its total wage bill on outsourcing between 1995 and 2001, which shot up to 35% between 2002–2007; an increase of roughly 300%.[17] **Panel B** of Fig. 1 plots Indian imports from China between 1995 and 2007. The share of manufacturing imports from China as a share of total manufacturing imports skyrocketed from less than 5% in 1995 to almost 25% in 2007 — an increase of 400%. The figure shows that this steep acceleration is particularly visible after China's accession to the WTO in 2001. We observe a similar pattern for the ratio of penetration of imports from China, which increased from less than 1 to almost 8% over the same time period.[18]

Given China's rising dominance in India's trade and the phenomenal increase in outsourcing by firms in the post-2001 period, a natural and important question to ask is whether Indian manufacturing firms respond to import competition from China by increasing outsourcing. **Panel C** of Fig. 1 plots the unconditional relationship between changes in the ratio of penetration of imports from China and changes in outsourcing expenditure on manufacturing jobs as a ratio to total wage bill of a firm. The figure shows a significant positive relationship — a bigger change in Chinese import competition is associated with a bigger change in a firm's outsourcing expenditure.

[15] Though the charges span a range of activities, evidence from the informal sector suggests that material inputs are also provided by informal firms. Among informal sector firms that reported selling their output to another enterprise through a contractor or middleman in 2000–01, over 95% sold raw materials.

[16] China's membership to the WTO in 2001 was one of the most important episodes in world trade in the last two decades. China's export performance post-1990, and more so since 2001, has been spectacular. Its exports grew from USD 62 billion to USD 1.2 trillion between 1990 and 2007; an average of around 20% per year (Iacovone et al., 2013). In the same period, China's share of GDP more than doubled, from 15.9 to 34.9%. Following this very strong export performance, China became the world's largest exporter in 2009, and the second largest economy in 2010 (Iacovone et al., 2013). Naturally, this meteoric rise to the status of a global exporting giant, particularly of manufactured goods, has prompted economists to examine the effects of import competition from low-wage countries, specifically China, on various firm and industry level outcomes in developed countries (Bernard et al., 2006; Autor et al., 2013; Mion and Zhu, 2013; Martin and Meajean, 2014; Bloom et al., 2016; Utar, 2018), and to a far lesser extent in developing countries (Iacovone et al. (2013) and Utar and Torres-Ruiz (2013) for Mexico; Medina (2017) for Peru; and Chakraborty and Henry (2019) for India).

[17] Figure C2 (Appendix C) looks at how the incidence of outsourcing activity changed over time. It shows that the annual average percentage of firms involved in outsourcing was around 8% between 1995 and 2001, and increased to about 27% between 2002 and 2007, an increase of about 350%.

[18] The Chinese import penetration ratio is calculated as the share of Chinese imports into an industry in total domestic absorption (domestic production + imports – exports). See Appendix B for definitions of key variables.

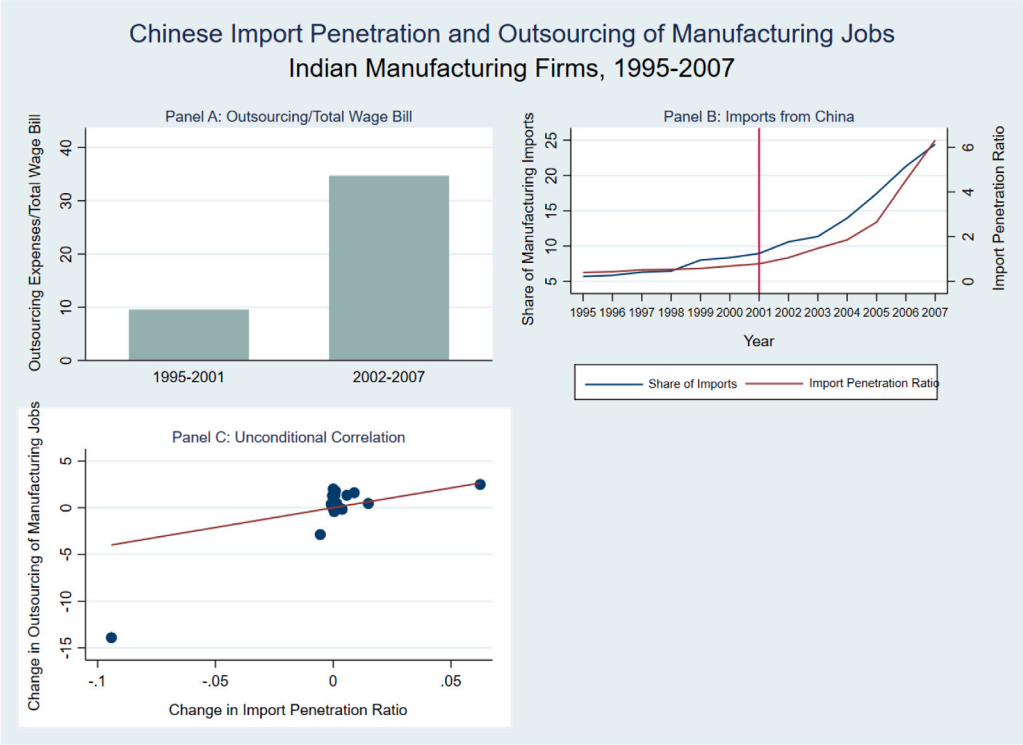


Fig. 1. Chinese import penetration and outsourcing of manufacturing jobs, indian manufacturing Firms, 1995–2007. Notes: Panel A plots the ratio of outsourcing expenses on manufacturing jobs to total wage bill of a firm (expressed in percentage form). Panel B plots share of manufacturing imports from China to total manufacturing imports. The line to the left represents average manufacturing imports from China as a share of total manufacturing imports. The line to the right represents the average of the import penetration ratio. It is the Chinese import penetration ratio in the domestic market of India. It is calculated as the share of Chinese imports in industry j at time t by India divided by total domestic production plus imports minus exports for industry j in 1995 for India. Panel C plots the unconditional correlation between changes (between 1995 and 2007) in the Chinese import penetration ratio and changes in outsourcing expenditure of a firm towards manufacturing jobs as a ratio to total wage bill. The data are divided into 20 bins of each variable.

Table 2 shows key firm characteristics by outsourcing status. We compare mean sales, total assets, gross value-added, total factor productivity, export and import volume, R&D and capital intensity and the total wage bill for firms involved in outsourcing of manufacturing jobs to firms not involved in outsourcing. Firms involved in outsourcing earn significantly more from sales, are larger, have greater value-added, trade more, adopt better technology (proxied by R&D expenditure), employ more capital and pay more wages.

Next, we present key statistics on outsourcing at the aggregate and divided into states with pro-worker versus pro-employer labor laws. In particular, we look at the absolute outsourcing expenditure, its ratio to the wage bill and the percentage of firms involved, averaged over time (both in the aggregate and by state group) in Table 3. On average, a firm spends about 6 Million INR (120,000 USD at 2007 prices) which is about 19% of their total wage bill, and around 15% of firms are involved in outsourcing on average between 1995–2007. These patterns echo with the additional observation that outsourcing activity is more prominent in states with pro-worker labor regulation; the difference (across the different indicators) ranges between 32%–112%.[19]

4. Empirical strategy

Our goal is to study the impact of increased import competition from China on outsourcing of manufacturing jobs among Indian firms. This section lays out the strategy we use to investigate this relationship. To establish causality between greater Chinese import competition and outsourcing by Indian manufacturing firms, we use China's entry to the WTO on December 2001 as a quasi-natural experiment. We believe this is valid for the following reasons.

First, China is currently India's largest trading partner. Table 4 compares India's trade with China and other large trading partners at three different points in time: 1995, 2001 and 2007. It shows that China accounted for the largest increase in India's imports relative to other countries and major regions of the world. Indian imports from China grew by around 2000% between 1995 and 2007. This is much larger than the 1156% increase in Chinese imports for the U.S. between 1991–2007 (Autor et al., 2013). Similarly, the Chinese share of manufacturing imports for Mexico, another developing economy that has drawn significant attention in the literature (Iacovone et al., 2013; Utar and Torres-Ruiz, 2013), increased by a factor of 8 over 1995–2007. This is dwarfed by India, for whom it increased by a factor greater than 20 over the same time period. In comparison, Indian imports from ASEAN (another large trading partner), the US and the EU increased by 391%, 169% and 137%, respectively.[20]

[19] Table D2 (Appendix D) repeats the same exercise, but at the 2-digit industry level. The table shows substantial heterogeneity in outsourcing activity across industries. Total expenditure on outsourcing in column (3) shows that the expenditure is highest for the automobile industry and lowest for office, accounting and computing machinery. In column (4), we focus on the ratio of outsourcing expenses to total wage bill of a firm; the ratio is highest in case of labor-intensive industries, such as furniture, tobacco, textiles and apparel, while accounting and computing machinery shows the lowest at 0.28%. Broadly, more labor-intensive industries show a larger share of outsourcing as a ratio to the total wage bill. This is consistent with the idea that outsourcing is motivated by lower labor costs outside of formal manufacturing. Lastly, in column (5), the percentage of firms outsourcing ranges from 21% and 20% in fabricated metal products and machinery and equipment to a mere 3% in office, accounting and computing machinery.

[20] We present Chinese imports into India as a share of Indian imports from the world across 2-digit manufacturing industries in Table D3 (Appendix D).

Table 2
Firms outsourcing manufacturing jobs vs. firms not outsourcing manufacturing jobs.

	Mean	Std. Dev
	(1)	(2)
Panel A: Firms with reported outsourcing expenditure		
Sales	2554.20	33,799.81
Assets	2524.88	24,395.73
GVA	4.76	1.95
Productivity	0.680	0.387
Exports	394.12	5719.93
Imports	681.32	15,295.97
R&D Intensity	0.013	0.724
Capital Employed	1697.50	16,278.46
Wage Bill	103.35	500.91
Panel B: Firms with no reported outsourcing expenditure		
Sales	1779.06	15,743.4
Assets	783.11	6406.46
GVA	1.75	2.57
Productivity	0.617	0.397
Exports	70.29	1015.42
Imports	139.41	3475.27
R&D Intensity	0.002	0.089
Capital Employed	550.77	4551.88
Wage Bill	87.23	405.28

Notes: All the numbers reported are in INR Millions. Data are for the years 1995–2007. Panel A (B) covers firms that reported positive (zero) expenditure on outsourcing of manufacturing jobs. 'Sales' is the total sales (exports plus domestic sales) of a firm. 'Assets' is the total assets of a firm. 'GVA' is the gross value-added defined as total sales minus total raw material expenditure and is expressed in logarithmic terms. 'Productivity' is measured through Levinshon–Petrin (2003) methodology. 'Exports', 'Imports' are the total exports, imports of a firm, respectively. 'R&D intensity' is the GVA share of R&D expenditure. 'Capital Employed' is the amount of capital employed. 'Wage Bill' is the total wages and salaries paid by a firm (it does not include bonuses). For further information on variables see data Appendix B.

Table 3
Outsourcing of manufacturing jobs — Total expenditure, outsourcing ratio to wage bill, percentage of firms.

	Outsourcing of manufacturing jobs		
	Total	Ratio	% of firms
	(1)	(2)	(3)
Panel A: All states			
Aggregate	5.91	18.95	15.16
Panel B: Dividing into states by labor laws			
States with pro-employer labor laws	4.02	10.62	12.37
States with pro-worker labor laws	6.71	22.49	16.35

Notes: Column (1) calculates the mean outsourcing expenditure by an Indian manufacturing firm. It is expressed in INR Million. Column (2) represents the mean ratio of outsourcing expenditure in total wage bill of a firm multiplied by 100. Column (3) represents mean percentage of firms involved in outsourcing of manufacturing jobs. 'States with pro-employer labor Laws' are: Andhra Pradesh, Karnataka, Rajasthan, Tamil Nadu and Uttar Pradesh. 'States with pro-worker labor Laws' are: Assam, Bihar, Gujarat, Haryana, Kerala, Madhya Pradesh, Maharastra, Orissa, Punjab, and West Bengal. These include neutral states as well. Data are for the years 1995–2007.

Second, China's accession to the WTO was significantly driven by its movement towards a more market-oriented economy. This transition is a result of the following internal factors: (a) significant rural-to-urban migration of workers, (b) firms/industries gaining access to foreign technologies, capital and intermediate goods that boosted productivity growth and (c) multinational firms to operate in the country (Autor et al., 2013). These internal reforms had significant positive effects on China's trade, which eventually led to the country's accession to the WTO.

The economic reforms undertaken by China in the post-1990 period in anticipation of becoming a member of the WTO and integrating into the global economy are an important element of our empirical strategy. Since China's membership to the WTO in 2001 was influenced by factors not related to the activities of Indian firms in their domestic or export markets, it can be interpreted as an exogenous shock from the standpoint of India. Furthermore, there were no trade agreements between India and China in the period prior to accession. It is hence unlikely that Chinese integration into world trade could be confounded with other factors related to the activities of Indian manufacturing firms.

Like in Autor et al. (2013) and Acemoglu et al. (2016), there is an important concern that needs to be addressed in our paper: it is not possible to rule out that the demand for Chinese goods by India, especially after 2001, may have been driven by import demand shocks across industries in India.[21] Failure to address this concern may result in biased coefficient estimates and incorrect inferences. In order to tackle this issue, we use an empirical strategy similar to Autor et al. (2013) and Acemoglu et al. (2016) and instrument for Chinese exports to India by Chinese exports to other similar developing countries.

We begin by estimating the following OLS fixed effects equation as our baseline:

$$outsourcing_{ijt} = \beta DComp^{China}_{IN,jt-1} + X_{jt-1} + firmcontrols_{it-1} + \phi_i + \theta^t_j + \eta^t_s + \mu^j_s + \epsilon_{ijt} \quad (1)$$

where $outsourcing_{ijt}$ is defined as the ratio of expenditure on outsourcing of manufacturing jobs to total wage bill of a firm i in sector j at time t. We use a natural logarithmic version of this ratio. However, to account for firms that are not involved in outsourcing, we add one to the ratio.[22] From Proposition 1, our hypothesis is $\beta > 0$ or greater import competition would induce firms to outsource more.

We define $DComp^{China}_{IN,jt-1}$ as a measure of Chinese import competition that an Indian (IN) industry j faces in its domestic market because of the unilateral liberalization policies pursued by China ($China$). To create the $DComp^{China}_{IN,jt-1}$ index, we utilize HS 6-digit product level data on Indian imports from China. We then create the index at the industry level by matching the product level data to NIC 2004 4-digit industries using the concordance table by Debroy and Santhanam (1993). The resulting ratio reflects the amount of competition faced by a firm i belonging to a NIC 2004 4-digit industry j. It is defined as India's imports from China in industry j at time t divided by total domestic consumption (that equals production plus imports minus exports) for industry j in 1995. For example, let us consider the Automobile sector (j). Then, $DComp^{China}_{IN,jt-1}$ can be written as:

$$DComp^{China}_{Automobile,t-1} = \frac{M^{China}_{Automobile,t-1}}{(Y_{Automobile,95} + M_{Automobile,95} - X_{Automobile,95})} \quad (2)$$

Therefore, $DComp^{China}_{IN,j=Automobile,t-1}$ is the total amount of Automobile imports from China in a given period, relative to total domestic absorption (of that sector).

It is important to emphasize that lagged import penetration as an instrument for the contemporaneous import penetration index cannot tackle the simultaneity or endogeneity problem in our estimation. As mentioned earlier, an increase in the demand for particular products in India or a negative technological shock in those sectors in India after 2001 may trigger a disproportionate increase in imports from China in these product categories and simultaneously impact the corresponding Indian firms (their outsourcing, output and employment levels). This could also be true for unobserved technology shocks common to

Imports from China are largest in labor-intensive industries like textiles and wood and in machinery and transport equipment.

[21] In case of the US, Autor et al. (2013) show that the rise in the Chinese share of imports was not due to import demand shocks in the U.S., but because of changes in comparative advantage of Chinese goods, especially after 2001.

[22] Given that our key dependent variable has zeros, we also present our key result from a PPML specification to show that our benchmark results are robust to this alternate estimation strategy.

Table 4
India's trade with China and others.

	Trade with China		Imports from other countries			
	Imports from China	Exports to China	ASEAN excluding China	US	EU27	World
	(1)	(2)	(3)	(4)	(5)	(6)
1995	9.74	2.76	26.49	40.90	94.80	351.70
2001	17.63	6.65	38.41	31.30	71.75	320.05
2007	212.84	29.40	129.94	109.93	224.37	1193.06
Growth (1995–2007)	2085.22%	965.22%	390.52%	168.78%	136.68%	239.22%

Notes: Numbers represent real trade values (deflated using Wholesale Price Index of the Indian manufacturing sector) in USD Millions.

both countries, like innovation in labor cost-saving technology (Utar and Torres-Ruiz, 2013). Besides, importantly here, these shocks could also be correlated over time, rendering lagged import penetration ineffective as an instrument.

To tackle this endogeneity concern, we instrument our key independent variable using:

$$DComp^{China}_{BIMM,jt-1} = \frac{M^{China}_{BIMM,jt-1}}{(Y_{j,95} + M_{j,95} - X_{j,95})} \tag{3}$$

where $M^{China}_{BIMM,jt-1}$ is the lagged value of industry j imports from China by Brazil (B), Indonesia (I), Malaysia (M), and Mexico (M). This approach assumes that the rise in Chinese manufacturing exports to other developing countries was primarily driven by internal supply shocks and reduced trade costs (Autor et al., 2013). Also, the Chinese share of imports by Brazil, Indonesia, Malaysia and Mexico must be exogenous from the perspective of Indian firms. Hence, Chinese exports to these countries are likely to be correlated with Chinese exports to India, but not with Indian conditions driving Indian imports. We also check our results using an alternate instrument where we only use imports by Latin American countries from China as the instrument for India's imports from China. This is specifically to control for the unobserved demand or technology shocks for particular products or industries in the Indian market which can be correlated with imports from China by Malaysia and Indonesia since they are prominent trade partners of India; the results remain robust.[23]

X_{jt-1} is a set of control variables at the industry level to account for industry specific factors that are related to Chinese import competition and outsourcing intensity jointly. These include: import tariff on the final good produced in sector j or output tariffs, the import tariff on inputs used in sector j (captured by a weighted average of the output tariffs across sectors that supply inputs to j, with input shares as weights) or input tariffs, a measure of import competition from China faced by Indian firms in an export destination,[24] in our case the US,[25] and share of Indian imports from other low-wage countries.

$firmcontrols_{it-1}$ is a vector of variables that includes firm size, age, age squared, and a proxy for the extent of a firm's technology adoption. The extent of technology adoption is measured as the share of R&D expenditure plus royalty payments for technical know-how in gross value-added (GVA) of a firm. This variable captures technological differences between firms, which can potentially affect outsourcing activity (Acemoglu et al., 2010). We use total sales of a firm as its size indicator. All variables are lagged at $(t-1)$. ϕ_i represents firm fixed effect that accounts for unobserved, firm-specific time-invariant characteristics.

θ^t_j are either interactions between industry fixed effects and year trends or industry–year fixed effects.[26] These account for other potential unobserved factors, such as policy changes or dependency on external finance that may affect outsourcing. η^t_s represent interactions of state–year fixed effects. One of our key results is that state level labor institutions play an important role in determining the relationship between import competition and outsourcing, therefore η^t_s control for all other state policies and characteristics (like the relative size of the informal sector or linkages between the formal and informal sectors, state level laws favoring outsourcing by firms, the contracting environment, financial development etc.) that can possibly influence outsourcing. The states that are pro-worker can have regulatory differences across industries that may affect a firm's decision to outsource. For example, tougher regulations on informality or tax breaks for small firms (which can be essentially be a tax on large firms). μ^j_s represents state–industry interactions, which will effectively control for these differential effects across states and industries. Lastly, we cluster standard errors at the industry level.[27]

5. Results: Import competition and outsourcing

5.1. Baseline

Table 5 presents our baseline results by estimating Eq. (1) using industry–year trends, 3-digit industry–year fixed effects, state–year and

[23] Although our IV specification isolates changes in industry level import exposure stemming from domestic productivity growth in China, there could be systematic differences across firms in industries with high and low exposure to Chinese imports, which in turn could lead to differential trends in outsourcing prior to 1995 (which is the base year of our sample). If these differences were further magnified by exposure to import competition, we would incorrectly attribute our key result to differential exposure to Chinese imports across industries. We follow Imbens and Wooldridge (2008) and report balance tests comparing key firm characteristics across high and low exposure sectors in Table D4 (Appendix D). If the absolute value of the normalized difference for any characteristic across the two sectors exceeds 0.25, it would suggest an imbalance across groups. Reassuringly, none of our five key characteristics, outsourcing of manufacturing jobs, the ratio of outsourcing of manufacturing jobs to total wages, total outsourcing, sales, value-added across firms in these two industries have an absolute value of the normalized difference exceeding the threshold of 0.25. This suggests that firm outcomes did not systematically vary prior to the surge in the Chinese share of imports into India.

[24] We follow the same method as outlined above in constructing the index of competition that Indian firms face in the US from China. We use UN-COMTRADE for data on imports by US industries from the world and China at the 4-digit level. We then match US industries to Indian industries using the International Standard Industrial Classification (ISIC) of all economic activities by the UN.

[25] Autor et al. (2013) show that Chinese imports into the US increased significantly after China became a member of the WTO. We also combine US, EU and ASEAN to construct a different version of the export market competition index.

[26] Since our main variable of interest, Chinese import penetration, varies at the 4-digit level the industry–year fixed effects that we employ are at 3-digit level. On the other hand, the industry–year trends vary at 4-digit level.

[27] India undertook a major trade policy reform during the 1990s. Therefore, it is conceivable that the surge in imports from China is correlated with tariff changes across industries. To check whether such is the case, we regress our Chinese import penetration measure from 1990–2001 on input and output tariffs (at the 4-digit industry level) in Table D5 (Appendix D). We do not find a correlation. Results are similar for the 1990–1995 and 1995–2001 time periods.

Table 5
Import competition and outsourcing of manufacturing jobs: Benchmark results.

	Expenditure on outsourcing of manufacturing jobs/total wage bill										
			Without Firm Controls	Control for tariffs	Alternate IV	Year 1995–2001	Multi-product firms	High productivity	Exporting firms	Exporters+ HProductivity	Imperfect competition
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
$DComp^{China}_{IN,jt-1}$	0.327**	1.095***	0.778***	1.101***	0.952***	3.146	−0.735	0.444**	0.768**	0.574	0.379
	(0.145)	(0.208)	(0.175)	(0.254)	(0.237)	(15.167)	(0.600)	(0.117)	(0.211)	(0.412)	(0.363)
$Output\ Tariff_{jt-1}$				−0.004	−0.004	−0.014	0.002	−0.004	−0.004	−0.001	−0.005
				(0.028)	(0.027)	(0.070)	(0.022)	(0.028)	(0.028)	(0.030)	(0.027)
$DComp^{China}_{IN,jt-1} \times MPFirm_i$							1.940***				
							(0.397)				
$DComp^{China}_{IN,jt-1} \times TFP_i$								1.215***		1.325***	
								(0.360)		(0.372)	
$DComp^{China}_{IN,jt-1} \times Exporter_i$									−0.307	0.615	
									(0.747	(0.621)	
$DComp^{China}_{IN,jt-1} \times ImperfectInd_j$											0.901***
											(0.372)
R-Square	0.65	0.65	0.65	0.49	0.51	0.45	0.64	0.64	0.65	0.66	0.65
N	32,105	32,105	43,660	32,105	27,890	14,108	32,105	32,105	32,105	32,105	32,105
Estimation method	OLS	IV	IV	IV	IV	IV	IV	IV	IV	IV	IV
Firm Controls	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other Trade Channels	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE (3-digit) × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE × Industry FE (3-digit)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
		1st stage									
		$DComp^{China}_{IN,jt-1}$									
$DComp^{China}_{BIMM,jt-1}$		0.199***	0.171***	0.200***	0.199***	0.018	0.193***	0.162***	0.199***	0.151***	1.003***
		(0.049)	(0.029)	(0.049)	(0.013)	(0.018)	(0.039)	(0.015)	(0.049)	(0.011)	(0.029)
Kleibergen–Paap F-stat		23.37	41.61	23.41	174.40	5.85	25.03	31.76	31.77	28.16	24.27

Notes: All the regressions are for the years 1995–2007 unless otherwise mentioned. Columns (1)–(11) use the natural log of expenditure on outsourcing of manufacturing jobs as a ratio of total wage bill of a firm as the dependent variable. $DComp^{China}_{IN,jt-1}$ is the Chinese import penetration ratio in the domestic market of India. It is calculated as the share of Chinese imports in industry j at time t by India divided by total domestic production plus imports minus exports for industry j in 1995 for India. We use $DComp^{China}_{BIMM,jt-1}$ as the instrument for $DComp^{China}_{IN,jt-1}$. We measure $DComp^{China}_{BIMM,jt-1}$ using imports from other developing countries such as Brazil (B), Indonesia (I), Malaysia (M), and Mexico (M). We use this as our main instrument for all the columns, except (5). As for column (5), we use $DComp^{China}_{LA,jt-1}$ as the instrument for $DComp^{China}_{IN,jt-1}$. We measure $DComp^{China}_{LA,jt-1}$ using imports from all other Latin American countries such as Brazil, Colombia, Venezuela, Ecuador, Peru, Bolivia, Chile, Paraguay, Argentina and Uruguay. $Output\ Tariff_{jt-1}$ is the natural logarithm of output tariffs faced by Indian industries at 2004 NIC 4-digit level at $t-1$ period. TFP is total factor productivity at firm level estimated using Ackerberg et al. (2015). It takes a value 1 if a firm's productivity is greater than the 75th percentile of productivity of the corresponding industry pre-2001. $Exporter$ takes a value 1 if the average exports of a firm between 1995–2001 is greater than zero. $ImperfectInd$ is a industry level indicator for imperfectly competitive industries. It takes a value 1 if the average markup for an industry is greater than the 75th percentile of the average markup across all the manufacturing industries between 1995–2001. 'Other Trade Channels' use input and output tariffs faced by Indian industries and a measure of foreign import competition faced by Indian firms in an export destination (US). All these are measured at NIC 2004 4-digit level and used at $t-1$. 'Firm Controls' include age, age squared of a firm, size (assets) and technology adoption (sum of R&D expenditure and Technology Transfer). Both 'Assets' and 'Technology Adoption' are used at period $t-1$ and in real terms. Standard errors in parentheses are clustered at the industry level (4-digit). Intercepts are not reported. *, **, *** denotes 10%, 5%, and 1% level of significance, respectively.

state–industry fixed effects. We use outsourcing expenditure on manufacturing jobs as a ratio of the total wage bill of a firm as the outcome of interest. We present OLS results in column (1) and IV results across all other columns (2–12).

Column (1) regresses our outcome of interest on lagged penetration of imports from China, controlling for Chinese import competition faced by Indian firms in a third country (the US), firm age, age squared, size, technology adoption expenses of a firm and interactions of industry (at the 3-digit level) with year fixed effects and state–year fixed effects. Both size and technology adoption expenses are lagged one period (are at $(t-1)$) and in real terms. These industry–year fixed effects control for other demand shocks, industry specific policies favoring (or not) outsourcing, changes in the pattern of products produced (production of some products involves more outsourcing than others, such as automobiles), contractability of these industries, thickness of the domestic market for input suppliers, the relative cost of searching (for an outsourcing partner) or of customizing inputs and dependency on external finance.[28] We find that an increase in import competition from China in the Indian domestic market leads to an increase in outsourcing by Indian manufacturing firms.

Columns (2) and (3) repeat column (1) but employing an instrumental variables (IV) estimation strategy with and without firm controls, respectively. The first-stage estimates are significant with an F-stat significantly above 10 (indicating that the instrument is strong). The point estimates increase significantly with IV regressions. From column (2), which is our preferred specification, a 10 percentage point increase in Chinese import penetration is associated with an 11% increase in the ratio of manufacturing outsourcing expenditure to the wage bill.[29] Note that our IV estimates are larger than OLS estimate. This could be due to

[28] Boehm and Oberfield (2018) show that contract enforcement is a major factor in understanding how firms source inputs and organize production. Firms in states with weaker enforcement appear to be more vertically integrated.

[29] We also check for the effect of an increase in import competition by restricting our sample to firms and years in which outsourcing is strictly greater than zero. We find a strong positive effect of Chinese import competition on the intensive margin of outsourcing; a 10 percentage point increase in import penetration from China increases the outsourcing expenditure towards manufacturing jobs of a firm by 8.6%.

the attenuation bias of OLS due to measurement error in our variable of interest.[30]

In column (4), we additionally include input and output tariffs ($Output\ Tariff_{jt-1}$) to account for trade liberalization undertaken by India in the 1990s. The impact of Chinese import penetration continues to be robust even after controlling for import tariffs (both input and output tariffs). Our estimate remains stable.

Following Chakraborty et al. (2020), we also present our results from a different IV (imports by Latin American countries from China) to control for any common technology or demand shock(s) (between Indonesia or Malaysia with India) in column (5). The coefficients from the alternate IV estimations turn out to be similar to our main IV estimations. Column (6) restricts the sample to years 1995–2001, before Chinese accession to the WTO. We do this as a placebo test, to show that the effect of Chinese import competition on outsourcing comes entirely from the significant increase in imports from China that India witnessed after China joined the WTO in 2001. In other words, we should not find any effect of Chinese import competition on the outsourcing share of manufacturing jobs for Indian firms in the 1990s, as competition did not intensify then. Our conjecture turns out to be true; our coefficient of interest is not significant.

Firms producing multiple products as opposed to a single product may outsource more in response to import competition, as they rationalize their products. We classify firms according to the number of products they produce and divide them into two categories: single- and multi-product firms. We create a dummy indicator, $MPFirm_i$, which takes a value 1 if a firm produces more than one product. We then interact this multi-product firm indicator with our variable of interest to measure the differential effect for the multi-product firms.[31] We find that the entire effect of the increase in outsourcing of manufacturing jobs due to Chinese import competition is driven by multi-product and not single-product firms.

Column (8) checks whether highly productive firms outsource more in response to greater import competition. We calculate total factor productivity of a firm using the (Ackerberg et al., 2015) methodology. We then create a variable TFP_i that equals one if the average productivity of a firm is greater than the 75th percentile of productivity of the corresponding industry (before 2001). We interact TFP_i with our variable of interest, $DComp^{China}_{IN,jt-1}$, and look at the coefficient on the interaction term. Our estimate shows that firms in the top-quartile of the productivity distribution outsource almost four times more as a result of an increase in Chinese import competition in the domestic market.[32] This is consistent with Grossman and Helpman (2004).

Next, we check whether this effect is driven by exporters or non-exporting, domestic firms in column (9). If the effect is driven by exporters, then there is a possibility that export market competition or greater export opportunities in China may have also played a role in changing the outsourcing dynamics of Indian manufacturing firms. We create a binary variable $Exporter_i$ which takes a value of one if a firm's average exports is greater than zero for the years 1995–2000. We then interact $Exporter_i$ with Chinese import penetration to pick up the differential exporter effect. Our point estimates show that the interaction term is not significant, revealing that the increase in outsourcing in response to greater import competition is driven by domestic firms and not by exporters who see changing export-market conditions. Column (10) controls for both export status and the indicator for high-productivity. The result is in line with results from columns (8) and (9).

A key ingredient of the model is the idea that greater import competition from China results in a pro-competitive effect on firms operating in an imperfectly competitive market. In column (11), we investigate whether the impact of Chinese import competition on outsourcing comes from industries that are imperfectly competitive, where the pro-competitive effect will apply. As a first step we estimate firm markups following (De Loecker and Warzynski, 2012). We then calculate the average markup for each industry, and for the entire manufacturing sector pre-2001. If each industry's (at the 4-digit level) average markup is above the 75th percentile of markups for the manufacturing sector, we label the industry as imperfectly competitive, noting that the markup at the 75th percentile is close enough to one. We then interact this indicator with $DComp^{China}_{IN,jt-1}$ and show that the increase in outsourcing is driven by imperfectly competitive industries, where the pro-competitive effect applies.[33]

Before proceeding to conduct robustness tests, we investigate the effects of an increase in Chinese import competition on firm entry and exit. This exercise allows us to ascertain whether results are driven by within-firm changes or by extensive margin effects. We create variables capturing entry (exit) when a firm is first (last) observed in the sample and utilize these as dependent variables in our baseline estimation. Results are presented in Table D7 (Appendix D). We do not find any significant effects on entry and exit of firms from an increase in Chinese import competition.[34]

We conduct a battery of robustness checks in Table 6. All of our estimations control for the export market competition index, input and output tariffs, industry–year, state–year, state–industry fixed effects at the 3-digit level, and use IV estimation (except for PPML). For columns (1)–(9), we employ a series of different estimation techniques to check whether our results are robust across these different strategies.

Different specifications and lag structures: We start by employing our dependent variable without taking logs, interacting industry fixed effects at the 4-digit level with a year trend, and controlling for the lagged dependent variable as one of the independent variables in columns (1), (2), and (3), respectively. Column (4) employs a first-difference specification. Another concern is that of correlation over time in key variables for a given firm. We counter this by running a long difference specification in column (5). We use 1995 as the base year and compare the outcome to 2007. Our baseline result holds across all columns — we find a significant positive effect of Chinese import competition in the domestic market on outsourcing by Indian manufacturing firms.

Large firms: We ensure that our data are robust to the exclusion of the largest firms in our sample. Large firms are likely to have plants in multiple states, which means that their employment and outsourcing decisions might be determined by multiple labor regimes. To address this concern in the absence of data on plants, we drop the largest 25%

[30] Alternatively, domestic productivity shocks could also be positively correlated with domestic outsourcing but negatively correlated with import demand and, in turn, with import penetration. Thus, the error term in our regression equation will be negatively correlated with the right-hand side variable, import penetration, leading to a downward bias in the OLS estimates. Hence, the larger IV estimates we obtain relative to our OLS estimates make perfect sense.

[31] Though the PROWESS database contains information on products produced by firms, outsourcing expenditure is not available at the product level. Hence, we are unable to conduct our analysis at the firm–product level, or to ascertain if firms outsource tasks related to their core or peripheral products.

[32] Cutting the data at the median instead of at the top quartile yields similar results.

[33] Table D6 (Appendix D) explores additional heterogeneous effects of import competition on outsourcing across firm types. We interact our main Chinese import penetration variable with indicator variables for size categories (we use Quartile 1 as the excluded category) in column (1), whether the firm is in a final good or intermediate good industry in column (2), and whether the firm is a foreign or domestic firm in column (3). We find strong evidence of an impact of import competition on outsourcing across the size distribution with effects higher for top-half of the size distribution. In addition, we find that the impact of import competition on outsourcing is concentrated among firms producing intermediate goods, and domestic firms.

[34] We caveat these results by noting that PROWESS may not be well suited to study firm entry and exit, see for example Goldberg et al. (2010).

Table 6
Import competition and outsourcing of manufacturing jobs: Robustness checks.

Panel A:	Expenditure on outsourcing of manufacturing jobs/total wage bill						
	Without log	Industry FE (4-digit) × Year trends	Lagged DV	First Diff	Long Diff	Drop large firms	PPML
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$DComp^{China}_{IN,jt-1}$	1.607**	0.466**	0.552***	0.278***	0.265**	0.907**	0.996***
	(0.755)	(0.211)	(0.102)	(0.092)	(0.114)	(0.380)	(0.135)
$(OutManJobs/WageBill)_{it-1}$			0.470***				
			(0.014)				
Estimation method	IV	IV	IV	IV	IV	IV	OLS
R-Square	0.79	0.58	0.73	0.06	0.19	0.65	n/a
N	32,105	32,105	32,105	29,692	5645	19,068	32,105
Industry FE (3-digit) × Year FE	Yes	No	Yes	Yes	Yes	Yes	Yes
Industry FE (4-digit) × Year Trend	No	Yes	No	No	No	No	No
Panel B:	Long-term effects		FComp US, EU, ASEAN	Low wage countries	All other regions	Intermediate inputs	Developed country IV
	(8)	(9)	(10)	(11)	(12)	(13)	(14)
$DComp^{China}_{IN,jt-1}$			1.090***	1.316***	1.365**	2.900**	1.026***
			(0.189)	(0.103)	(0.394)	(1.412)	(0.203)
$DComp^{China}_{IN,jt-2}$	1.883***						
	(0.275)						
$DComp^{China}_{IN,jt-3}$		2.175***					
		(0.709)					
$InputsDComp^{China}_{IN,jt-1}$						−2.625	
						(2.730)	
Estimation method	IV	IV	IV	IV	IV	IV	IV
R-Square	0.68	0.70	0.65	0.48	0.49	0.52	0.40
N	29,100	26,729	30,798	30,581	30,126	27,330	27,890
Industry FE (3-digit) × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other Trade Channels	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE × Industry FE (3-digit)	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: All the regressions are for the years 1995–2007 unless otherwise mentioned. Column (1) uses a simple ratio of expenditure on outsourcing of manufacturing jobs to total wage bill of a firm as the dependent variable. Columns (2)–(14) use the natural log of expenditure on outsourcing of manufacturing jobs as a ratio of total wage bill of a firm as the dependent variable. $DComp^{China}_{IN,jt-1}$ is the Chinese import penetration ratio in the domestic market of India. It is calculated as the share of Chinese imports in industry j at time t by India divided by total domestic production plus imports minus exports for industry j in 1995 for India. We use $DComp^{China}_{BIMM,jt-1}$ as the instrument for $DComp^{China}_{IN,jt-1}$. We measure $DComp^{China}_{BIMM,jt-1}$ using imports from other developing countries such as Brazil (B), Indonesia (I), Malaysia (M) and Mexico (M). $(OutManJobs/WageBill)_{it-1}$ is the lagged dependent variable in column (3). Column (10) controls for competition faced by Indian firms not just in the US, but also in the EU and ASEAN as third-country markets; column (11) controls for the share of imports from all other low-wage countries; column (12) controls for import competition from all other possible regions: High-income countries, Latin American countries, Middle East and North African countries, Other Least Developed countries, and South Asian countries; column (13) controls for Chinese import penetration in the intermediate input market ($InputsDComp^{China}_{IN,jt-1}$). We use the 1999 I–O table to calculate input coefficients and then multiply them with $DComp^{China}_{IN,jt-1}$ to construct this measure. Column (14) employs an alternate instrument using imports from high-income countries. Observation numbers vary across columns due to the addition of different control variables. 'Other Trade Channels' use input and output tariffs faced by Indian industries and a measure of foreign import competition faced by Indian firms in an export destination (US) (except for column (10) where it is replaced with US + EU + ASEAN). All these are measured at NIC 2004 4-digit level. Standard errors in parentheses are clustered at the industry level (4-digit). Intercepts are not reported. First-stage results are not reported due to the space constraints (these are available on request). *, **, *** denotes 10%, 5%, and 1% level of significance, respectively.

firms, which are most likely to be the multi-plant firms. We present results in column (6) and show that they remain robust.

Poisson Pseudo Maximum Likelihood (PPML) estimator: Since our dependent variable is a ratio, estimating zero-valued variables with OLS may produce biased estimates. Hence, we use a PPML estimation in column (7). This method estimates the coefficients in terms of percentage changes and the dependent variable does not need to follow a Poisson distribution or be integer-valued (it can be continuous). As the point estimates demonstrate, the Chinese import penetration ratio continues to significantly increase the ratio of outsourcing expenses of manufacturing activities in total wage bill and the point estimate is similar.

Long run effects: Our analysis focuses primarily on the 1-year lagged, short-run effects of import competition from China. This suggests that the observed impact may be an outcome of changes that occur within relatively short time frames. Nonetheless, import competition may also affect the share of outsourcing via changes that are expected to occur over longer time frames, such as general equilibrium adjustments of prices, outputs, or even opportunities for more outsourcing. To examine the role of dynamics, we estimate the following model:

$$outsourcing_{ijt} = \beta DComp^{China}_{IN,jt-n} + X_{jt-1} + firmcontrols_{it-1} + \phi_i + \theta^t_j + \eta^t_s + \mu^j_s + \epsilon_{ijt} \quad (4)$$

where $n = 2$ or 3. This specification is equivalent to Eq. (1), but it considers the impact of Chinese import competition over different periods, specifically ranging from its impact in $t-2$ ($n = 2$) and $t-3$ ($n = 3$) in columns (8) and (9). Our focus is on β. Yet, given that the sample is more restricted under these specifications, we place greater emphasis on interpreting magnitudes, rather than precision. In both the cases, the sign of β is similar to the one estimated in the baseline specification. In fact, the estimated magnitudes suggest that the effects of an increase in 2- and 3-year lagged values of import penetration from China are significantly greater than those we observe in the baseline. This is especially true for the 3-year lag. This suggests that both short and long term effects exist.

Import competition from and in other markets: In columns (10)–(12), we control for different types of import competition or import competition from different sources. Looking solely at Chinese imports by the US as a proxy for export market competition may not reveal the

true competitive effect faced by Indian firms in export market(s). To address this possible shortcoming, we construct an index that aggregates the shares of imports from China into two other primary export markets for Indian firms, namely the EU and ASEAN, with that into the US. We then substitute the original index of competition in export markets with the composite index based on these three export market destinations in column (10). In other words,

$$FComp^{China}_{IN,jt-1} = \frac{M^{China}_{US,jt-1} + M^{China}_{EU,jt-1} + M^{China}_{ASEAN,jt-1}}{(M^{World}_{US,jt-1} + M^{World}_{EU,jt-1} + M^{World}_{ASEAN,jt-1})} \quad (5)$$

Column (11) additionally controls for import competition from other low-wage countries. Our result that import competition from China increases outsourcing by Indian firms may be due to overall import competition, including from other countries. In order to delve into this, we include indices of import penetration from all other possible trade blocks — high-income countries, Latin American countries, least-developed countries, Middle-east and North African countries, and South Asian countries in column (12). Across all columns, the coefficient on Chinese import penetration continues to be statistically significant and positive. This suggests that it is not import competition per se, but import competition from China that is associated with more outsourcing of manufacturing jobs by Indian firms.

Accounting for intermediate inputs: Another factor that might affect our findings significantly is the way we define/use total imports in our estimations; in other words, it includes imports of intermediate inputs (Iacovone et al., 2013). For example, imported intermediate inputs from China may be cheaper and of higher quality than locally sourced inputs, lowering production costs of the firm and allowing it to outsource more. To account for this possibility, we generate a measure of the share of imported inputs from China by Indian firms using Indian I–O tables in column (13).[35] For each NIC 4-digit industry, we calculate a weighted sum of imports from China as a share of output across intermediate input sectors. The input weights are obtained from India's I–O table. If Chinese import competition in upstream industries is correlated with import penetration in the final goods sector, then our coefficient of interest might be inconsistently estimated. Estimates from column (13) show that our main result remains robust to the addition of this control variable. We do not find any effect of imported intermediate goods from China.[36]

Technological Similarity: A potential issue with our instrumental variable strategy is that Chinese import penetration in Brazil, Malaysia, Indonesia, and Mexico may be influenced by industry-specific technology shocks common to these countries and India because of similarities in their level of industrial development and technological sophistication. This may also be the case with Chinese import penetration in Latin America. To address this, in column (14) we use Chinese import penetration into high-income countries as an alternate instrument under the assumption that it is less influenced by technology shocks common across developing countries. High-income countries are defined by the World Bank and exclude the US (as we use Chinese import penetration in the US market to capture export market competition). Our point estimate does not differ significantly in terms of its magnitude or significance.

[35] We use the 1999 I–O table to choose input coefficients for each of the 2004 NIC 4-digit sectors. We additionally test for robustness of this result by substituting the 1999 I–O table with 1993 I–O table and find that the results remain the same.

[36] We have also employ a firm level independent variable following (Liu and Rosell, 2013); changing the independent variable results in no change in our finding (results available on request). We retain the industry level variable as our main independent variable, given the concern that firm–product composition and sales shares may be endogeneous to unobservable firm characteristics correlated with outsourcing behavior.

5.2. The role of labor market regulation

India is a federal democracy and under the Indian Constitution of 1949, industrial relations is a concurrent subject. This implies that central and state governments have joint jurisdiction over labor legislation. The key piece of central legislation is the IDA 1947, which sets out the conciliation, arbitration and adjudication procedures to be followed in the case of an industrial dispute. The Act was designed to offer workers in the organized sector some protection against exploitation by employers (for details, see Besley and Burgess (2004)).[37] It has been extensively amended by state governments during the post-Independence period. Besley and Burgess (2004) code all 113 such amendments since the Act was passed and designate them as being either "neutral", "pro-worker", or "pro-employer" to investigate how labor regulation impacts economic performance at the state level.[38]

The most controversial laws deal with the conditions for hiring and retrenching of workers and with the closure of establishments. For example, a 1976 amendment to the IDA 1947 made layoff, retrenchment and closure illegal except with the previous permission of the appropriated government for all firms with more than 300 workers. This coverage was subsequently extended in 1982 to all firms with more than 100 employees.[39] A large literature has emphasized the role played by rigid labor markets and stringent labor market regulation in pushing up implicit labor costs in developing countries (Besley and Burgess, 2004), particularly in the formal sector, where labor laws are enforced.[40]

We exploit the variation in IDA amendments across Indian states to ask if import competition impacts outsourcing differentially for firms located in pro-worker, as opposed to pro-employer states, with neutral states coded as pro-worker. We posit that restrictions on hiring and retrenchment of workers, shift work and closing down of factories act as an implicit tax on employing labor in-house in the formal sector.

Classifying states by their labor regime using a binary index is not without its caveats. Bhattacharjea (2019) questions whether a classification of states as "pro-worker" or "pro-employer" actually measures 'flexibility' in the labor market the way it is generally understood. He argues that the (Besley and Burgess, 2004) index erroneously codifies "procedures for resolution of industrial disputes" as "employment protection laws" (EPL). This critique builds on earlier work in Bhattacharjea (2006), which spawned a substantial literature to refine the original index. Ahsan and Pages (2008) and Gupta et al. (2009) rectify codes assigned to a few state amendments in light of the observations made by Bhattacharjea (2006). In particular, Ahsan and Pages (2008) distinguish EPL-relevant amendments from Industrial Disputes. Further, Gupta et al. (2009) draw heavily from Ahsan and Pages (2008) to create a composite index based on the following: (a) the original (Besley and Burgess, 2004) index; (b) corrections based on Bhattacharjea (2006); and (c) the OECD (2007) index that is survey-based.[41]

[37] The Act is comprised of seven chapters and forty sections, specifying the powers of government, courts and tribunals, unions and workers and the exact procedures that have to be followed in resolving industrial disputes.

[38] Although all states have the same starting point, they diverge from one another over time.

[39] In addition, some states further amended Chapter Vb above and beyond what is specified in the central Act. For instance in 1980, West Bengal extended Chapter Vb to firms hiring 50 or more workers.

[40] This strand of literature has mainly found negative economic impacts of amending the IDA regulations on output, employment, investment, productivity, etc. in formal manufacturing (Besley and Burgess, 2004; Aghion et al., 2008; Ahsan and Pages, 2008).

[41] The OECD (2007) index is based on a survey of state government officials and other stakeholders regarding changes in a much broader set of labor regulations and their implementation across states. The scores (Gupta et al., 2009) assign to classify a state into "pro-employer" or "pro-worker" based on

Table 7
Balance tests: Pro-worker and pro-employer states.

	Pro-employer states		Pro-worker states		Normalized difference
	Median	Std. Dev	Median	Std. Dev	
	(1)	(2)	(3)	(4)	(5)
Firm and industry characteristics					
Outsourcing of manufacturing jobs	0.145	3.229	0.180	5.775	−0.015
Outsourcing of manufacturing jobs/total wages	0.014	0.275	0.017	0.559	−0.005
Total outsourcing	10.30	63.863	14.596	67.168	−0.030
Sales	345.707	2644.471	357.783	2088.880	−0.087
Value-added	266.891	734.183	252.826	765.681	−0.042
Share of Chinese imports	0.022	0.056	0.026	0.072	−0.070

Notes: Table reports median and standard deviation for 1990–1995. Values are expressed in INR Millions, except for Outsourcing of Manufacturing Jobs/Total Wages and Share of Chinese Imports, which are in ratios. Column (5) shows the normalized difference between the two groups. Following Imbens and Wooldridge (2008), an absolute value above 0.25 suggests an imbalance between the two groups.

We employ the index in Gupta et al. (2009), which has lately been used by other authors. In recent studies, Adhvaryu et al. (2013) and Chaurey (2015) use the same classification to investigate the effect of demand shocks on total industrial employment and employment of contract labor, respectively, and find that in response to demand shocks, firms in states with pro-worker labor regulation react differently. Nevertheless, we acknowledge that any classification of states based on rigidity of labor regulation is potentially subject to certain shortcomings, particularly in the Indian context where enforcement is also imperfect (Nagaraj, 2002). That said, as pointed out by Bhattacharjea (2019), any measurement error associated with such a classification should not affect the sign of the coefficient, but its magnitude and significance. Our qualitative findings, therefore should hold.

Before proceeding to the estimations, we test for two crucial identifying assumptions.

(a) We compare outsourcing of firms across these two types of states before China joined the WTO in 2001 and show that there were no prior differential time trends. Fig. 2 plots the share of expenditure on outsourcing of manufacturing jobs in total wage bill of a firm for both states with pro-employer labor laws and those with pro-worker (and neutral) labor laws. The plot shows that there is no clear differential trend in outsourcing (although there are obvious differences) between these states before 2001 — the difference starts to grow significantly along with the increase in import competition from China. Firms located in states with pro-worker labor laws start to outsource more than firms in states with pro-employer labor laws after 2001. For example, the average difference in the ratio before 2001 between pro-worker and pro-employer states is around 38%, which increased to 120% between 2002–2007.

(b) We conduct balance tests for the years 1990–1995 using (Imbens and Wooldridge, 2008) in Table 7 across the two types of states for the following firm and industry characteristics: (i) outsourcing of manufacturing jobs by a firm, (ii) ratio of outsourcing of manufacturing jobs to total labor compensation of a firm, (iii) total outsourcing (outsourcing of manufacturing jobs + outsourcing of professional jobs) of a firm, (iv) sales of a firm, (v) value-added of a firm, and (vi) share of Chinese imports at the industry level. Across all characteristics, evidence shows that the samples are balanced since the absolute value of the test statistic never exceeds the critical value of 0.25.

Using the classification by Gupta et al. (2009) and/or Adhvaryu et al. (2013), we test whether firms in pro-worker labor regimes outsource more in response to Chinese import competition. We estimate:

$$outsourcing_{ijt} = \beta_1 DComp^{China}_{IN,jt-1} + \beta_2 \left[DComp^{China}_{IN,jt-1} \times Labor\ Law_s \right] + X_{jt-1} + firmcontrols_{it-1} + \phi_i + \theta^t_j + \eta^t_s + \mu^j_s + \epsilon_{ijt} \quad (6)$$

where $Labor\ Law_s$ is a dummy variable that equals one if labor laws (and their implementation) in the state in which the firm is registered are pro-employer. $Labor\ Law_s = 1$, when s = Andhra Pradesh, Karnataka, Rajasthan, Tamil Nadu, or Uttar Pradesh.[42] On the other hand, $Labor\ Law_s = 0$, when s = a pro-employee state, such as Gujarat, Maharastra, Orissa, or West Bengal or a neutral state, such as Assam, Bihar, Haryana, Jammu and Kashmir, Punjab, Kerala or Madhya Pradesh. All other variables remain the same as in Eq. (1), except for clustering of standard errors. Following Abadie et al. (2023) we cluster standard errors using two-way clustering at the state–industry level, as our main interaction variable varies at the state–industry level. We also include interaction terms of all other controls with $Labor\ Law_s$. Table D8 in Appendix D lists states and their classification according to labor regime.

Our main coefficient of interest now is β_2 — the coefficient on the interaction between $Labor\ Law_s$ and $DComp^{China}_{IN,jt-1}$. It captures the differential effect of Chinese import competition on firms in states with pro-employer labor laws relative to other states. A positive β_2 would imply that an increase in Chinese import competition induces firms located in states with pro-employer labor laws to increase their outsourcing expenditure more than firms located in other states; vice-versa for $\beta_2 < 0$. From Proposition 2, we expect β_2 to be negative if the increase in the marginal benefit of outsourcing (from avoiding future firing costs) as a result of an increase in Chinese import competition outweighs the smaller expansion of output in pro-worker states, where firing costs are higher.

Results (only IV estimations) are reported in Table 8.[43] Overall, we find that compared to firms in pro-employer labor regimes, those in restrictive labor regimes engage in more outsourcing in response to Chinese import penetration. Column (1) regresses the share of outsourcing of manufacturing jobs on $DComp^{China}_{IN,jt-1}$ and its interaction with $Labor\ Law_s$ controlling for firm, industry–year fixed effects at the 3-digit level, state–industry, and state–year fixed effects. Our results show that a 10 percentage point increase in the share of import penetration from China increases the outsourcing ratio by 12.7 percent in pro-worker states. Importantly, this effect is attenuated by 11.9 percentage points (in fact, completely attenuated) for firms in states with pro-employer labor laws. Column (2) drops the vector of firm controls; this makes very little change to our primary findings.

Like in the case of our results in Table 6, we drop any firm–year observations beyond the year 2001 in column (3). Our benchmark

the OECD (2007) index depend on the position of states in the top, middle, or bottom terciles of the OECD scores. In particular, states that are classified as "pro-worker" by this procedure are those that lagged behind on implementing pro-employer reforms, not only those that implemented pro-worker changes. Therefore, the scores are based on relative assessments of the EPL.

[42] This is the classification by Gupta et al. (2009). We also check our results using the classification by Adhvaryu et al. (2013), where the "pro-employer" states are — Andhra Pradesh, Karnataka, Kerala, Madhya Pradesh, Rajasthan, and Tamil Nadu.

[43] OLS results are similar to IV (available on request).

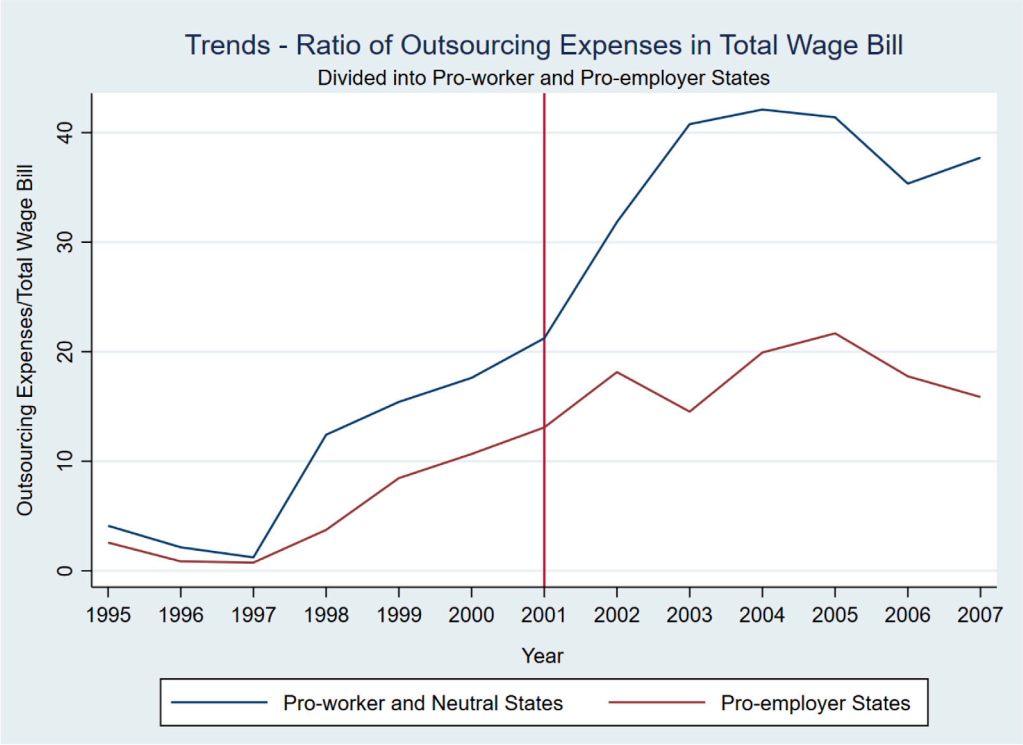


Fig. 2. Trends in ratio of outsourcing expenditure on manufacturing jobs to total wage bill, pro-worker and pro-employer states, 1995–2007. Notes: Figure plots the ratio of outsourcing expenses of manufacturing jobs in total wage bill multiplied by 100. 'States with Pro-employer labor Laws': Andhra Pradesh, Karnataka, Rajasthan, Tamil Nadu and Uttar Pradesh. 'States with Pro-worker and Neutral labor Laws': Assam, Bihar, Gujarat, Haryana, Kerala, Madhya Pradesh, Maharastra, Orissa, Punjab, and West Bengal. The average difference in the ratio before 2001 between pro-worker and pro-employer states is around 38%, which increased to 120% between 2002–2007.

result along with the effect of labor regulation vanishes. This shows that the labor regulation effect only kicks in when import competition intensified. Column (4) divide the sample of firms into single- and multi-product firms. Our double and triple interaction terms show that the aggregate effect continues to be driven by multi-product firms operating in states with pro-worker labor regulation.

One concern with the interpretation of our coefficients could be that labor regulation is correlated with other state characteristics that determine how firms respond to greater import competition. For example, if workers lobby for pro-worker regulations, states with more manufacturing (or a large blue-collar lobby) may have enacted more pro-worker legislation. Or, firm responses to import competition shocks may vary by their capital intensity, and labor laws may be correlated with the average capital intensity of firms. Jayachandran (2006) and Adhvaryu et al. (2013) address such concerns by including relevant area characteristics and their interactions with a year trend. We follow a similar strategy and control for the interaction of baseline characteristics of states with a year trend, including the per capita NSDP (Net State Domestic Product), total tax revenue, total grants received by the state government from the federal government, total expenditure, total expenditure on development and headcount ratios. Column (5) presents our results, which continue to be robust to the inclusion of state level characteristics.[44]

Column (6) controls for the output/sales of a firm and its interaction with $Labor\ Law_s$. If our results still hold, then for a given level of output, Chinese import competition causes more outsourcing in pro-worker states, thereby establishing that the impact of high firing costs in pro-worker states on a firm's decision to outsource dominates the fact that the increase in output from greater import competition is smaller in such states. In other words, the result in column (6) is consistent with the dominance of the firing cost channel identified in the model.

We next interact industry fixed effects at the 4-digit level with year fixed effects to ensure that our benchmark result on the differential effect of import competition on outsourcing across pro-worker and other states holds under this most stringent specification. Results are presented in column (7). The $DComp^{China}_{IN,jt-1}$ term drops out as it varies over time at the 4-digit level. The interaction term between import competition and $Labor\ Law_s$ that picks up the differential effect of interest continues to be negative and statistically significant.

Further, we test for the robustness of our main finding by using the classification and following the empirical strategy of Adhvaryu et al. (2013) and/or Chaurey (2015):

$$\begin{aligned} outsourcing_{ijt} = & \beta_1 DComp^{China}_{IN,jt-1} + \beta_2[DComp^{China}_{IN,jt-1} \times Pro-worker_s] \\ & + \beta_3[DComp^{China}_{IN,jt-1} \times Neutral_s] \\ & + X_{jt-1} + firmcontrols_{it-1} + \phi_i + \theta^t_j + \eta^t_s + \mu^j_s + \epsilon_{it} \end{aligned} \tag{7}$$

In this case, pro-worker states are Gujarat, Maharastra, Orissa, and West Bengal. The neutral states are Assam, Bihar, Haryana, Jammu and Kashmir, Punjab and Uttar Pradesh. And, the pro-employer states are Andhra Pradesh, Karnataka, Kerala, Madhya Pradesh, Rajasthan and Tamil Nadu are treated as the omitted category. Thus, β_2 and β_3 measure the effect of Chinese import penetration in pro-worker and neutral states, respectively, relative to pro-employer states. Our primary coefficient of interest is β_2. Given our result in column (1), we expect β_2 to be positive and significant. For example, suppose that the effect of Chinese import competition in pro-employer states is positive, or $\beta_1 > 0$, then a positive estimate of β_2 would imply that relative to pro-employer states, the increase in $outsourcing_{ijt}$ due to higher import penetration is greater in pro-worker states. For β_3, it could be positive, but should be less than β_2.

[44] In addition, we interact $DComp^{China}_{IN,jt-1}$ with baseline state characteristics in column (1) of Table D9 (Appendix D). Our results retain their qualitative flavor. Particularly, the interaction term continues to be significant and negative.

Table 8
Import competition and outsourcing of manufacturing jobs: The role of labor market regulation.

	Expenditure on outsourcing of manufacturing jobs/total wage bill							
	Gupta et al. (2009)							Adhvaryu et al. (2013)
		Without Firm Controls	Year 1995–2001	Multi-Product Firms	Control for State Characters	Control for Output	Industry FE (4-digit) × Year	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$DComp^{China}_{IN,jt-1}$	1.249***	1.090***	−6.618	−0.719*	1.618***	0.991***		0.167
	(0.321)	(0.209)	(11.451)	(0.376)	(0.482)	(0.353)		(0.604)
$DComp^{China}_{IN,jt-1} \times Labor\ Law_s$	−1.082**	−0.925***	9.666	0.652	−1.029**	−0.732*	−1.154**	
	(0.539)	(0.340)	(10.191)	(0.782)	(0.525)	(0.443)	(0.549)	
$DComp^{China}_{IN,jt-1} \times MPFirm_i$				2.010***				
				(0.310)				
$DComp^{China}_{IN,jt-1} \times MPFirm_i \times Labor\ Law_s$				−1.499**				
				(0.686)				
$DComp^{China}_{IN,jt-1} \times Pro-worker$								1.452***
								(0.540)
$DComp^{China}_{IN,jt-1} \times Neutral$								0.799**
								(0.340)
R-Square	0.41	0.48	0.57	0.64	0.70	0.71	0.54	0.65
N	32,105	43,660	14,108	32,105	27,602	28,873	32,078	32,105
Estimation method	IV	IV	IV	IV	IV	IV	IV	IV
Firm Controls	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE (3-digit) × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Industry FE (4-digit) × Year FE	No	No	No	No	No	No	Yes	No
	1st stage							
$DComp^{China}_{BIMM,jt-1}$	0.198***	0.167***	0.013	0.193***	0.159***	0.198***		0.201***
	(0.025)	(0.012)	(0.008)	(0.020)	(0.009)	(0.024)		(0.026)
$DComp^{China}_{BIMM,jt-1} \times Labor\ Law_s$	0.152***	0.146***	0.024	0.160***	0.154***	0.156***	0.150***	
	(0.016)	(0.004)	(0.029)	(0.008)	(0.013)	(0.019)	(0.014)	
$DComp^{China}_{BIMM,jt-1} \times MPFirm_i$				0.149***				
				(0.016)				
$DComp^{China}_{BIMM,jt-1} \times MPFirm_i \times Labor\ Law_s$				0.147***				
				(0.018)				
$DComp^{China}_{BIMM,jt-1} \times Pro-worker$								0.156***
								(0.016)
$DComp^{China}_{BIMM,jt-1} \times Neutral$								0.132***
								(0.013)
Kleibergen–Paap F-stat	40.94	70.34	21.40	70.34	102.73	81.70	79.72	83.61

Notes: All the regressions are for the years 1995–2007 unless otherwise mentioned. All regressions include controls for other trade channels, firm, state–year, state–(3-digit industry) fixed effects. Columns (1)–(8) use the natural log of expenditure on outsourcing of manufacturing jobs as a ratio of total wage bill of a firm as the dependent variable. Column (5) controls for interactions of state level baseline characteristics with year trends for states where data are available. $DComp^{China}_{IN,jt-1}$ is the Chinese import penetration ratio in the domestic market of India. It is calculated as the share of Chinese imports in industry j at time t by India divided by total domestic production plus imports minus exports for industry j in 1995 for India. We use $DComp^{China}_{BIMM,jt-1}$ as the instrument for $DComp^{China}_{IN,jt-1}$. We measure $DComp^{China}_{BIMM,jt-1}$ using imports from other developing countries such as Brazil (B), Indonesia (I), Malaysia (M), and Mexico (M). $Labor\ Law_s$ is an indicator for labor market regulation. It takes a value 1 if a state has 'pro-employer' labor market laws and 0 otherwise. In case of column (8), 'pro-worker' takes a value 1 if a state = Gujarat, Maharastra, Orissa, and West Bengal. 'neutral' takes a value 1 if a state = Assam, Bihar, Haryana, Jammu and Kashmir, Punjab, and Uttar Pradesh. We use 'pro-employer' as the excluded category of states. 'Other Trade Channels' use input and output tariffs faced by Indian industries and a measure of foreign import competition faced by Indian firms in an export destination (US). All these are measured at NIC 2004 4-digit level. Since we instrument for multiple endogenous variables in each column, the estimation involves multiple first stage regressions. Due to space constraints, we only report coefficients for each endogenous variable from the first stage regression specific to it (all results are available on request). 'Firm Controls' include age, age squared of a firm, size (assets) and technology adoption (sum of R&D expenditure and Technology Transfer). Both 'Assets' and 'Technology Adoption' are used at period $t-1$ and in real terms. Standard errors in parentheses are clustered two-way at the industry (4-digit) and state level. Intercepts are not reported. *, **, *** denotes 10%, 5%, and 1% level of significance, respectively.

Column (7) estimates the above equation. We find our hypothesis to be true — the increase in aggregate outsourcing is driven by states with pro-worker labor laws and the increase in outsourcing in "neutral" states is greater than in pro-employer states, but less than in pro-worker states. A 10 percentage point increase in the import penetration ratio increases outsourcing by 16% in states with pro-worker labor regulation.[45]

Lastly, it is possible that our measure of pro-worker labor laws is picking up other institutional characteristics that vary across states. For example, legal institutions may change in batches to match particular conditions (see for instance Breinlich et al. (2022), who find clauses in trade agreements that are unrelated often occurring together for historical reasons). To explore this threat to our empirical strategy, we run two placebo tests in Table 9. The idea is to look for differential effects of an increase in Chinese import competition across states that differ along dimensions unrelated to labor markets or manufacturing

[45] We conduct additional robustness tests in columns (2) and (3) of Table D9 (Appendix D). First, Adhvaryu et al. (2013) argue that the most stringent firing restrictions apply to firms above a size threshold. We divide firms by size (based on their initial assets; we use Quartile 1 as the excluded category) and test whether firms potentially outside the purview of labor laws given their small size exhibit a differential response to Chinese import penetration across pro-worker and pro-employer states. We find that the smallest firms neither exhibit an overall increase in outsourcing, nor differential effects across pro-worker and pro-employer states. Lastly, as discussed previously, the PROWESS database does not include data on factory location. Since labor laws apply at the plant level and our data are at the firm level, we might attribute the firm's address and state to all its plants, leading to erroneous allocation of the type of labor regime under which a plant operates. To address this concern, we restrict our sample to single-product firms in column (3) under the assumption that single-product firms are more likely to have their operations in a single plant. We lost almost 92% of our observations, but our result still holds at the 10% level.

Table 9
Import competition, labor market regulation, and outsourcing of manufacturing jobs: Using other state characteristics as placebo.

	Expenditure on outsourcing of manufacturing jobs/total wage bill	
	Land reform	Wheat vs. Rice
	(1)	(2)
$DComp^{China}_{IN,jt-1}$	0.799***	1.242***
	(0.209)	(0.370)
$DComp^{China}_{IN,jt-1} \times Land\ Reform_s$	−0.270	
	(0.398)	
$DComp^{China}_{IN,jt-1} \times Staple\ Food_s$		0.698
		(3.689)
R-Square	0.54	0.54
N	31,228	32,105
Estimation method	IV	IV
Firm Controls	Yes	Yes
Other Trade Channels	Yes	Yes
Firm FE	Yes	Yes
Industry FE (3-digit) × Year FE	Yes	Yes
State FE × Year FE	Yes	Yes
State FE × Industry FE (3-digit)	Yes	Yes
	1st stage	
$DComp^{China}_{BIMM,jt-1}$	0.169***	0.199***
	(0.014)	(0.027)
$DComp^{China}_{BIMM,jt-1} \times Land\ Reform_s$	0.145***	
	(0.012)	
$DComp^{China}_{BIMM,jt-1} \times Staple\ Food_s$		0.156***
		(0.009)
Kleibergen–Paap F-stat	37.57	50.35

Notes: All the regressions are for the years 1995–2007. Columns (1)–(2) use the natural log of expenditure on outsourcing of manufacturing jobs as a ratio of total wage bill of a firm as the dependent variable. $DComp^{China}_{IN,jt-1}$ is the Chinese import penetration ratio in the domestic market of India. It is calculated as the share of Chinese imports in industry j at time t by India divided by total domestic production plus imports minus exports for industry j in 1995 for India. We use $DComp^{China}_{BIMM,jt-1}$ as the instrument for $DComp^{China}_{IN,jt-1}$. We measure $DComp^{China}_{BIMM,jt-1}$ using imports from other developing countries such as Brazil (B), Indonesia (I), Malaysia (M), and Mexico (M). $Land\ Reform_s$ is a binary indicator. It takes a value 1 for states that underwent reforms related to land and 0 otherwise. $Staple\ Food_s$ takes a value of 1 if the state is primarily a wheat-eating states and 0 otherwise. 'Other Trade Channels' use input and output tariffs faced by Indian industries and a measure of foreign import competition faced by Indian firms in an export destination (US). All these are measured at NIC 2004 4-digit level and used at $t-1$. 'Firm Controls' include age, age squared of a firm, size (assets) and technology adoption (sum of R&D expenditure and Technology Transfer). Both 'Assets' and 'Technology Adoption' are used at period $t-1$ and in real terms. Standard errors in parentheses are clustered two-way at the industry (4-digit) and state level. Intercepts are not reported. *, **, *** denotes 10%, 5%, and 1% level of significance, respectively.

in general. If we find differential effects along these dimensions, we cannot be confident that the effect we tease out using our labor law measure is indeed related to labor regulation.

Column (1) classifies states according to land reforms. India is an important case study for land reform. It has (a) a large agricultural sector that is home to a significant fraction of the poor in the developing world, and (b) in the post-independence period, India was subjected to the largest body of land reform legislation ever to have been passed in so short a period of time in any country (Thorner, 1976). We follow Besley and Burgess (2000) and classify states according to land reform legislation passed between 1953 to 1992, given that state governments have jurisdiction over land reform legislation. Each state that has passed a significant land reform legislation is assigned a value 1. For example, Andhra Pradesh (Telangana Area) passed a Land Revenue (Amendment) Act in 1990 to amend and consolidate the orders and regulations relating to land revenue. Punjab in 1990 passed The Punjab Land Prevention Act to provide for the conservation of subsoil water and/or prevention of erosion. We interact our land reform variable, $Land\ Reform$, with the $DComp^{China}_{IN,jt-1}$ to estimate the differential effect of land reform on outsourcing of firms. Our interaction term is negative but not significant.

A major difference across Indian states is the preference over eating wheat (bread) versus rice as a staple food, largely driven by cultural factors and often unrelated to agricultural output. We utilize the 68th National Sample Survey (NSS), conducted in 2011–12 by the Ministry of Statistics & Programme Implementation (MoSPI), to identify states as demonstrating a preference towards eating bread (which is made out of wheat) versus rice as their primary staple food. The NSS uses the following methodology to create a score between –100 to +100 to identify a state as preferring wheat to rice: first, it calculates per capita consumption of rice and wheat as a weighted sum of urban and rural per capita consumption, using urbanization as a weight. Next, it arrives at the difference in consumption (in Kgs) mapped to the range of –100 to +100 to arrive at a preference score. The more negative the value, the greater the preference towards wheat or bread. We create a variable $Staple\ Food$ which takes on a value 1 if state s has a preference towards wheat and 0 otherwise. We interact this term with our import penetration measure to look for a differential effect on outsourcing. Like in the case of land reform, we find no evidence of a differential effect. Interestingly, in both cases, the absolute effect of $DComp^{China}_{IN,jt-1}$ on outsourcing continues to hold.

To summarize, we find that an increase in import competition, measured by a higher degree of import penetration from China, increases firm outsourcing of manufacturing jobs. This result is persistent, economically meaningful, robust to a myriad of tests, and relatively higher in magnitude in the long run. Digging deeper, the analysis shows that labor regulation plays a crucial role in mediating the relationship between trade and outsourcing. Firms that operate in pro-worker labor regimes drive the effects observed. Lastly, these findings are primarily driven by multi-product firms.

5.3. Exploring further empirical support for the model

In this section, we show empirical support for the remaining propositions of our analytical framework. We posit that increased outsourcing resulting from an increase in Chinese import competition should be accompanied by an increase in output sold and decrease in markups and unit costs of a firm. And, these impacts should be magnified for firms involved in outsourcing (relative to non-outsourcing ones) and located in pro-worker states. We cannot rule out the possibility that similar relationships between these outcome variables and Chinese import competition may arise through unknown channels, that are unrelated to outsourcing. Nevertheless, if the outsourcing-related channels we have described actually exist and are active, they should make these relationships stronger for firms involved in outsourcing relative to others (unless the unrelated channels or mechanisms are negatively correlated with outsourcing related ones in our data).

To test for these predictions, we utilize a unique feature of the PROWESS database. It reports detailed information on quantity and sales of each product manufactured by a firm. In particular, we use information on firm–product level quantity and sales to compute unit values and its underlying components, such as markups and marginal costs following De Loecker and Warzynski (2012).[46] We then estimate Eq. (6) with these as outcome variables.

Results are presented in Table 10.[47] We present results separately for firms involved in outsourcing in columns (1), (3) and (5) and for those not involved in outsourcing in columns (2), (4) and (6). Columns (1)–(2), (3)–(4) and (5)–(6) focus on the markup, marginal cost and product-level sales, respectively.

[46] For details on the estimation method, please see De Loecker and Warzynski (2012).

[47] Our estimation strategy remains the same except that we substitute firm fixed effects with firm–product fixed effects in all our regressions.

Table 10
Import competition and outsourcing of manufacturing jobs: Mechanisms.

	Markup		Marginal Costs		Product Level Sales	
	Outsourcing firms	Non-outsourcing firms	Outsourcing firms	Non-outsourcing firms	Outsourcing firms	Non-outsourcing firms
	(1)	(2)	(3)	(4)	(5)	(6)
$DComp^{China}_{IN,jt-1}$	–3.865***	–1.496**	–4.557***	–2.164***	1.587**	2.108
	(1.354)	(0.421)	(1.142)	(0.358)	(0.629)	(2.028)
$DComp^{China}_{IN,jt-1} \times Labor\ Law_s$	2.982**	3.765	5.719***	2.673	–3.448***	–4.530
	(0.750)	(4.051)	(1.007)	(3.503)	(1.242)	(2.900)
R-Square	0.84	0.84	0.96	0.96	0.52	0.63
N	21,027	23,224	21,027	23,224	21,636	20,666
Estimation method	IV	IV	IV	IV	IV	IV
Other Trade Channels	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Product FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE (3-digit) × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
State FE × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
State FE × Industry FE (3-digit)	Yes	Yes	Yes	Yes	Yes	Yes

Notes: All the regressions are for the years 1995–2007. Observations are at the firm–product level and thus larger than in the baseline firm level estimation. Columns (1) and (2) uses Markup; columns (3) and (4) uses marginal costs; columns (5) and (6) uses product-level sales of a firm as the dependent variable, respectively. Markup and marginal cost of a firm are calculated using De Loecker and Warzynski (2012). Product level sales in the value of sales per product sold by a firm. $DComp^{China}_{IN,jt-1}$ is the Chinese import penetration ratio in the domestic market of India. It is calculated as the share of Chinese imports in industry j at time t by India divided by total domestic production plus imports minus exports for industry j in 1995 for India. We use $DComp^{China}_{BIMM,jt-1}$ as the instrument for $DComp^{China}_{IN,jt-1}$. We measure $DComp^{China}_{BIMM,jt-1}$ using imports from other developing countries such as Brazil (B), Indonesia (I), Malaysia (M), and Mexico (M). $Labor\ Law_s$ is an indicator for labor market regulation. It takes a value 1 if a state has 'pro-employer' labor market laws and 0 otherwise. 'Other Trade Channels' use input and output tariffs faced by Indian industries and a measure of foreign import competition faced by Indian firms in an export destination (US). All these are measured at NIC 2004 4-digit level. 'Firm Controls' include age, age squared of a firm, size (assets) and technology adoption (sum of R&D expenditure and Technology Transfer). Both 'Assets' and 'Technology Adoption' are used at period $t-1$ and in real terms. Standard errors in parentheses are clustered two-way at the industry (4-digit) and state level. Intercepts are not reported. First-stage results are not reported due to the space constraints (available on request). *, **, *** denotes 10%, 5%, and 1% level of significance, respectively.

We find results remarkably consistent with the model. First, focusing on outsourcing firms in columns (1), (3) and (5), we find that the coefficient on Chinese import competition is positive for sales, and is negative for markup and cost.[48] It is statistically significant in all cases. The signs are consistent with the pro-competitive effect of import competition.[49] The coefficients on the interaction term between import competition and the indicator for a pro-employer state in columns (1) and (3) suggest that results are magnified for firms in pro-worker states. This is highlighted in Proposition 4 in Appendix A.[50]

From column (5), we see that while an increase in import competition is associated with greater output (as measured by sales) in both pro-worker and pro-employer states, the effect again is magnified in pro-worker states. The intuition behind this result is that while the effective marginal cost increases with firing costs (a direct effect), it decreases with outsourcing (indirect effect). The indirect effect is greater in firms faced with greater firing costs (those located in relatively pro-worker states). If the second effect dominates, it is possible for the output expansion resulting from an increase in import competition to be greater in pro-worker states than in pro-employer states. In Appendix A, we present a graphical depiction of such a scenario.[51]

Columns (2), (4), and (6) show that the effect of Chinese import competition is significantly attenuated across all outcome variables for non-outsourcing firms, especially in pro-worker states. In fact, the disappearance of the statistical significance of the interaction between import competition and labor-market regulation for non-outsourcing firms could be indicative of a lack of a differential effect for non-outsourcing firms in pro-employer states relative to such firms in pro-worker states. This is not surprising since, based on our theory, this differential effect is driven by outsourcing. These findings indicate that the mechanisms related to outsourcing activity in case of import competition are consistent with our analytical framework. Broadly, our results from this table offer strong support for the arguments in our analytical framework.

We conclude this section by briefly comparing our results from Table 10 with De Loecker et al. (2016). De Loecker et al. (2016) studies the impacts of India's trade liberalization in the 1990s on markups, costs, and prices in Indian manufacturing firms. They find standard pro-competitive effects of a reduction in output tariffs, whereby a lower output tariff is associated with lower prices and firm markups. Additionally, Indian firms are able to raise their markups in response to a decline in input tariffs (the tariff on intermediate inputs) and thereby, in marginal cost. Thus, there is imperfect pass through of tariff cuts on inputs to the price of the final good.

Table D12 (Appendix D) systematically compares our results on firm markups with those in De Loecker et al. (2016). Note that our sample period differs substantially from that in De Loecker et al. (2016). Their results span India's trade liberalization in the early nineties. Our sample period is 1995–2007, which, importantly, includes China's WTO accession in 2001 (and is, thus, quite different). In columns (1), (2) and (3), we present results for our time period. Column (1) includes output and input tariffs as independent variables and is intended to replicate (De Loecker et al., 2016). Columns (2) and (3) add Chinese import competition in the industry of the final good produced by the

[48] Proposition 3 and Proposition 4 in Appendix A discuss the markup and cost.

[49] We reiterate that the outsourcing firms in our study turn out to be those productive enough to cross the threshold productivity for output expansion in response to an increase in import competition.

[50] The interpretation of the estimated mean of the impact of import competition on our outcome variables of interest could be complicated by the presence of the interaction between import competition and labor regulation. Table D10 (Appendix D) presents results for outcomes of interest, where the estimation equation only includes the $DComp^{China}_{IN,jt-1}$ term. Results are in line with our propositions. Overall, import competition is associated with a fall in markups and costs for outsourcing firms, and this fall is significantly larger than for firms not engaged in outsourcing. On the other hand, it is associated with an increase in sales with a similar difference in magnitude for outsourcing and non-outsourcing firms.

[51] We also explore the effects of an increase in import competition on total sales and total quantity sold by a firm in Table D11 (Appendix D). An increase in Chinese import competition has a strong positive effect on total sales and total quantity sold, and this is predominantly driven by firms engaged in outsourcing.

firm, and in industries used as inputs in the final good produced by the firm averaged using input weights, respectively. Overall, we find that for our time period, in the presence of the Chinese import competition controls, there is no statistically significant relationship between tariffs and markups. In fact, not controlling for Chinese import competition can erroneously attribute its effect to the output tariff. This result is not surprising, since the largest tariff cuts occurred between 1994–1999, while the predominant source of competition between 2001–2007 was from Chinese imports.

In columns (4)–(6), we replicate columns (1)–(3), but for the time period in our sample that overlaps with that in De Loecker et al. (2016). We focus on 1995–2000, before Chinese accession to the WTO. As expected, we are now able to qualitatively replicate results in De Loecker et al. (2016). Even after the Chinese import competition controls, we find that a fall in the output tariff is associated with a decrease in markups (a pro-competitive effect of tariff reform) and a fall in the input tariff is associated with an increase in markups (though this is not as precisely estimated), indicating incomplete pass through of input tariff reductions.[52]

Thus, an increase in import competition through both the tariff reform and a rise in Chinese imports had a pro-competitive effect on Indian manufacturing in relevant time periods, providing further support to our conceptual framework. Furthermore, in this paper we contribute to the literature by establishing that this pro-competitive effect resulted in greater domestic outsourcing in the presence of rigid labor regulation.

6. The informal sector

A common feature of developing countries in Africa, Latin America and South Asia, is the presence of a large informal sector.[53] The informal sector in India accounted for more than 90% of employment in manufacturing in 2004–05 (Sengupta, 2007). Ulyssea (2018) points out that the presence of an informal sector has two contrasting implications: on the one hand, it can lead to widespread evasion of taxes and misallocation of resources, and, on the other, it can be beneficial to growth as it can provide flexibility for firms that may be constrained by strict regulations. Our previous results show that in response to import competition, formal sector firms outsource more, especially in states with pro-worker labor laws. This suggests that rigid labor regulation that increases the relative cost of producing in-house is a key factor in driving firms to outsource in response to greater import competition. Given that labor laws are not enforced in the informal sector, we delve into whether import competition is associated with more outsourcing to the informal sector by formal firms. Though we are unable to directly link formal sector firms to informal firms, we can look at informal sector enterprises to probe further. Understanding how import competition affects the informal sector is one of the central questions of our paper to support our previous results.

To do so, we exploit a dataset that contains detailed information on informal (unorganized) sector manufacturing enterprises (micro) from the National Sample Survey Organization (NSSO), India. Our data comprises of two repeated cross-sections of a nationally representative survey of informal enterprises that employ fewer than ten workers for the years 1999–00 and 2004–05.[54] The survey asks these enterprises two relevant questions that we exploit for our purpose. First, if enterprises are primarily on contract to sell their product to another enterprise (formal sector) or to a middleman/contractor. Second, if the destination of their final product is another enterprise (as opposed to the consumer). To reiterate, formal sector firms in our data are most likely to outsource manufacturing tasks to firms in the informal sector if their primary motivation is to reduce marginal cost when faced with competition from China. If this is true, we should see a corresponding increase in the likelihood of informal sector firms writing/engaging in a contract or selling their output to other enterprises in response to greater Chinese import competition.

Using answers from these survey questions, we construct three alternate indicators of outsourcing activity for informal sector firms that take a value 1 if (i) a micro-enterprise in the informal sector is on contract to sell most of its output to another firm or a middleman/contractor; (ii) the enterprise reports selling most of its output to other enterprises (as opposed to the government or private households); and (iii) a combination of the first two, such that the indicator equals one if either the first or the second indicator equals one. We use the latter as our preferred indicator.

Table 11, **Panel A** presents our results. We compare the likelihood of an informal sector enterprise either entering into a contract with another enterprise or selling a large proportion of its output to them between the years 1999–00 and 2004–05. Columns (1)–(6) use an indicator which takes a value one if an informal enterprise answers 'Yes' to either question. All regressions include interactions of industry–year fixed effects at 3-digit level and state–year fixed effects. Overall, our results show a strong, statistically significant and positive relationship between Chinese import competition and the likelihood of engaging in outsourcing.

Column (1) estimates a linear probability model. A 10 percentage point increase in Chinese import penetration leads to an increase of 14 percentage points in the likelihood of outsourcing. Columns (2) and (3) check for robustness by using probit and logit methods. The coefficient of interest remains qualitatively the same. We include the interaction between the import penetration ratio and labor market regulation, $DComp^{China}_{IN,jt} \times Labor\ Law_s$, in columns (4)–(6). We find similar effects as before — impacts are attenuated for informal sector enterprises located in states with pro-employer labor regulation. We do not find any effects for firms located in urban areas of the pro-worker states — the effect for the differential result for pro-worker states is driven by firms located in rural areas. In case of the average effect, firms located in rural rather than urban areas increase their outsourcing by about two times. Results are consistent with our hypothesis that costs imposed by stringent labor regulation induce formal sector firms to outsource manufacturing tasks to the informal sector. Columns (7) and (8) divide the composite indicator and show that the result is qualitatively robust to using alternate indicators.

One important implication of these results is that higher outsourcing to informal sector enterprises might increase the size of this sector and impact its performance through greater investment, learning and economies of scale. If it does so, we could then possibly argue that outsourcing is a potential channel through which greater import competition can lead to gains across different sectors of the economy, i.e., the gains are inclusive. To understand whether such is the case, we use output per worker as the outcome of interest in columns (1)–(4) of **Panel B**.[55]

We also divide firms by their size. Firms which have GVA greater than the median GVA of their corresponding industry are classified as big firms, otherwise small. Overall, we find that Chinese import competition significantly increases output per worker of informal firms that are engaged in outsourced work. This result is magnified particularly for states with pro-worker labor regulation and for informal firms that

[52] The coefficient on the input tariff is not statistically significant, but this lines up with results in De Loecker et al. (2016) Table IX, where the authors report statistical significance at the 11.3 percent level.

[53] In Brazil, nearly two-thirds of businesses, 40% of GDP, and 35% of employees, in Colombia 50% of workers and 41.9% of GDP and in Mexico 60% of workers and 31.9% of GDP are informal (Ulyssea, 2018).

[54] This dataset is available every five years. We do not include the 2009–10 round in our analysis since it could capture some of the impacts of the financial crisis.

[55] We use total employment as an alternative outcome of interest — the direction of results remains unchanged.

Table 11
Import competition and outsourcing of manufacturing jobs: Using data from the informal sector.

Panel A								
	Outsource = 1						Outsource = 1	Outsource = 1
	A firm is on contract or sells its output to other enterprises						Sells to other enterprises	On contract
		Probit	Logit		Urban	Rural		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$DComp^{China}_{IN,jt-1}$	1.348***	0.795**	0.793**	1.562***	1.184***	2.097***	1.478***	1.490***
	(0.287)	(0.333)	(0.344)	(0.220)	(0.281)	(0.261)	(0.221)	(0.203)
$DComp^{China}_{IN,jt-1} \times Labor\ Law_s$				–0.468**	–0.436	–1.491***	–0.540**	–0.597*
				(0.165)	(0.326)	(0.371)	(0.273)	(0.332)
R-Square	0.49	0.36	0.36	0.49	0.42	0.61	0.47	0.43
N	188,202	182,509	182,509	188,202	106,170	82,032	188,202	188,202
Estimation method	IV	OLS	OLS	IV	IV	IV	IV	IV

Panel B				
	Output per worker			
	Outsource = 1		Outsource = 0	
	Big firm (1)	Small firm (2)	Big firm (3)	Small firm (4)
$DComp^{China}_{IN,jt-1}$	1.488***	0.604***	0.739	–0.362*
	(0.478)	(0.296)	(0.682)	(0.214)
$DComp^{China}_{IN,jt-1} \times Labor\ Law_s$	–0.959**	–0.910***	–1.322	0.147
	(0.402)	(0.362)	(0.874)	(0.234)
R-Square	0.70	0.48	0.65	0.31
N	73,461	43,061	28,669	43,006
Estimation method	IV	IV	IV	IV

Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other Trade Channels	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE (3-digit) × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE × Industry FE (3-digit)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Regressions are for the years 1999–00 and 2004–05. In Panel A, columns (1)–(6) use an outsourcing indicator variable which takes a value 1 if a firm sells or is on contract to sell to another private enterprise or to a contractor/middleman as the dependent variable; column (7) uses an outsourcing indicator variable which takes a value 1 when a firm sells most of its output to another firm; column (8) uses an outsourcing indicator variable which takes a value 1 if a firm is on contract to sell to another firm or middleman. Columns (2) and (3) estimate probit and logit models, respectively and observations without switches within an industry–year or state–year are dropped. In Panel B, columns (1)–(4) use logarithm of gross value-added per worker as the dependent variable. $DComp^{China}_{IN,jt-1}$ is the Chinese import penetration ratio in the domestic market of India. It is calculated as the share of Chinese imports in industry j at time t by India divided by total domestic production plus imports minus exports for industry j in 1995 for India. We use $DComp^{China}_{BIMM,jt-1}$ as the instrument for $DComp^{China}_{IN,jt-1}$. We measure $DComp^{China}_{BIMM,jt-1}$ using imports from other developing countries such as Brazil (B), Indonesia (I), Malaysia (M), and Mexico (M). $Labor\ Law_s$ is an indicator for labor market regulation. It takes a value 1 if a state has pro-employer labor market laws and 0 otherwise. 'Other Trade Channels' use input and output tariffs faced by Indian industries and a measure of foreign import competition faced by Indian firms in an export destination (US). All these are measured at NIC 2004 4-digit level. 'Firm Controls' include assets (size) and GVA in real terms. In Panel A: for columns (1)–(3), standard errors in the parentheses are clustered at the industry level (4-digit); for columns (4)–(8) standard errors in the parentheses are clustered two-way at the industry (4-digit) and state level. In Panel B: for columns (1)–(4), standard errors in the parentheses are clustered two-way at the industry (4-digit) and state level. Intercepts are not reported. First-stage results are not reported due to the space constraints (available on request). *, **, *** denotes 10%, 5%, and 1% level of significance, respectively.

are both big and small — with the effect more than double for big firms. Our results complement the work by McCaig and Pavcnik (2018), who show that a positive trade shock following the United States–Vietnam Bilateral Trade Agreement led to more formalization of the economy through shrinking of the informal sector.[56] To summarize, our findings suggest that the impact of trade on informality can be heterogeneous, with informal sector firms that engage in sub-contracting experiencing a boost relative to other firms.[57]

7. Extensions

A salient contribution of our paper is our measure of outsourcing. We now compare our benchmark results to results from using more traditional measures from the literature, such as imports and expenditure on domestic intermediates. We start by exploring whether our benchmark results hold when using a different denominator — outsourcing expenses as a share of gross value-added of a firm as a dependent variable in **Panel A** of column (1) in Table 12. **Panel B** presents results exploring the role of labor market regulation in corresponding columns. Our benchmark result continues to hold — firms increase their outsourcing expenditure as a share of GVA, and from **Panel B**, column (1), firms located in pro-worker states outsource more than firms in pro-employer states.[58]

[56] Ulyssea (2010) finds that a decline in entry cost in the formal sector reduces the size of the informal sector and improves overall labor market performance.

[57] An alternate interpretation of our findings is that with greater import competition, informal firms that are in sub-contracting relationships with the formal sector survive. It is also possible that these survivors are the more productive informal firms with larger GVA per worker. Since our estimates are based on repeated cross-sections of the informal sector, we cannot distinguish this channel of selective exit from one where there is an increase in sub-contracting among existing informal firms. Nevertheless, our results underscore the increased relevance of sub-contracting activity for informal sector firms with greater import competition.

[58] We present other results/specifications with GVA in Table D13 (Appendix D). The effect of Chinese import competition on outsourcing expenses of a firm continues to remain positive. A 10 percentage point increase in import competition from China increases the share of outsourcing expenses (on manufacturing jobs) in a firms' GVA by 3%–11% with firms located in pro-worker states outsourcing more.

Table 12
Import competition and other types of outsourcing.

	Expenditure on outsourcing of manufacturing jobs/GVA					
	Our measure	Traditional + our measure	Traditional measure	Intermediate inputs		Professional jobs
				Domestic	Import	Audit, consultancy, ITES advertising, marketing, distribution
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Aggregate						
$DComp^{China}_{IN,jt-1}$	0.575***	0.390*	0.252	0.280	0.215**	0.102***
	(0.066)	(0.231)	(0.213)	(0.247)	(0.097)	(0.022)
R-Square	0.58	0.63	0.64	0.67	0.70	0.37
Panel B: Role of labor market regulation						
$DComp^{China}_{IN,jt-1}$	0.646***	0.335	0.181	0.205	0.110	0.071
	(0.242)	(0.940)	(0.930)	(0.482)	(0.275)	(0.114)
$DComp^{China}_{IN,jt-1} \times Labor\ Law_s$	–0.465***	0.451	0.554	0.573	0.709	0.212
	(0.161)	(1.481)	(1.470)	(0.811)	(0.462)	(0.191)
R-Square	0.58	0.63	0.64	0.67	0.70	0.37
N	32,105	32,105	32,105	32,105	32,105	33,405
Estimation method	IV	IV	IV	IV	IV	IV
Other Trade Channels	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE (3-digit) × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
State FE × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
State FE × Industry FE (3-digit)	Yes	Yes	Yes	Yes	Yes	Yes

Notes: All the regressions are for the years 1995–2007. Column (1) uses our measure of outsourcing expenditure on manufacturing; column (2) utilizes total outsourcing expenditure (we define total outsourcing as the sum of outsourcing of manufacturing jobs, import of raw materials, and domestic raw material expenditure); column (3) uses total traditional outsourcing (domestic plus imported raw material expenditure); columns (4) and (5) decompose traditional outsourcing into domestic and import of intermediate inputs, respectively; and column (6) uses expenditure on outsourcing of professional services (we sum audit, consultancy, IT/ITES, advertising, marketing, and distributional expenses) of a firm as the dependent variable. All these are expressed as a ratio of gross value-added (GVA) of a firm and in natural logs. $DComp^{China}_{IN,jt-1}$ is the Chinese import penetration ratio in the domestic market of India. It is calculated as the share of Chinese imports in industry j at time t by India divided by total domestic production, imports, and exports for industry j in 1995 for India. We use $DComp^{China}_{BIMM,jt-1}$ as the instrument for $DComp^{China}_{IN,jt-1}$ for the IV regressions. $DComp^{China}_{BIMM,jt-1}$ using imports from other developing countries such as Brazil (B), Indonesia (I), Malaysia (M), and Mexico (M). 'Other Trade Channels' use input and output tariffs faced by Indian industries and a measure of foreign import competition faced by Indian firms in an export destination (US). All these are measured at NIC 2004 4-digit level. $Labor\ Law_s$ is an indicator for labor market regulation. It takes a value 1 if a state has pro-employer labor market laws and 0 otherwise. 'Firm Controls' include age, age squared of a firm, size (assets) and technology adoption (sum of R&D expenditure and Technology Transfer). Both 'Assets' and 'Technology Adoption' are used at period $t-1$ and in real terms. For Panel A: standard errors in parentheses are clustered at the industry level (4-digit); For Panel B: standard errors in the parentheses are clustered two-way at the industry (4-digit) and state level. Intercepts are not reported. First-stage results are not reported due to the space constraints (available on request). *, **, *** denotes 10%, 5%, and 1% level of significance, respectively.

Next, we look at total outsourcing, which includes our measure and the traditional measures. This allows us to enquire if firms simply substitute away from spending on intermediates to outsourcing their production, such that total outsourcing remains unaffected. Column (2) uses total outsourcing expenditure of a firm (our measure plus domestic and imported intermediates) as a proportion of GVA as the dependent variable. We find a much weaker increase in this newly-defined measure of outsourcing expenditure as a result of Chinese import competition. Next, in column (3), we drop our measure from total outsourcing expenditure and focus solely on the traditional measure. Here, we find no effect of Chinese import competition on outsourcing, underscoring that our baseline measure of outsourcing captures a unique aspect of firm organization.

Columns (4) and (5) decompose individual components of the traditional outsourcing measure — column (4) uses expenditure on domestic intermediates and column (5) import of intermediates, respectively. On segregating the traditional measure, we find that the import of intermediates increases in response to greater Chinese import competition. However, the magnitude of the coefficient on Chinese import penetration is smaller and statistically different from the coefficient on our baseline measure.

Put together, these results indicate that an increase in Chinese import competition is associated with heterogeneous effects on outsourcing of tasks. Further, they reiterate that ignoring the outsourcing of manufacturing tasks captured by our measure would underestimate the impact of an increase in import competition on outsourcing. Corresponding columns in **Panel B** reveal no differential effects of Chinese import competition on traditional measures across pro-employer and pro-worker states, consistent with the idea that labor regulations matter primarily for our measure of outsourcing, which is driven by differences between employing labor in-house versus in the informal sector.

Lastly, in column (6), we use professional services as the outcome of interest. Professional services include audit, consultancy, IT/ITES, marketing, advertising, and distribution expenses of a firm. We find that an increase in import competition from China also significantly increases professional services outsourcing. However, from column (6) in **Panel B**, we find that this increase is not different for firms in pro-employer states, as compared to pro-worker states. In other words, there is no differential effect of an increase in import competition on outsourcing of professional jobs for firms located in pro-worker states. This is not surprising, given that labor laws apply primarily to manufacturing (on the factory floor) and are irrelevant for professional workers. Indeed, the fact that we do not pick up a differential effect across states with varying labor regimes for professional jobs reassures us that we are indeed isolating the role of labor regulation in determining the relationship between import competition and outsourcing.

8. Conclusion

Understanding the effects of globalization on a firm's boundary is of first-order importance. Previous research indicates that trade can induce firms to vertical integrate. However, the literature overlooks the role of labor regulation in determining how firm outsourcing responds to trade shocks. This is particularly relevant in light of the emerging literature on the link between trade liberalization and firm organization, and its effects on productivity, growth and jobs, especially in developing economies. This paper attempts to fill this gap.

Focusing on the case of India, we ask if import competition affects outsourcing. We explore the differential effects of import competition on outsourcing across firms located in states with pro-worker versus pro-employer labor regimes. Using a rich firm level dataset that uniquely reports expenses incurred by firms on outsourcing of manufacturing activities in the Indian manufacturing sector, we exploit China's accession to the WTO in 2001 as a quasi-natural experiment to establish a causal link between import competition and outsourcing by firms. In addition, we exploit the variation in Indian labor laws across states to establish that import competition is associated with greater outsourcing in states with pro-worker labor regulation that potentially increases the relative cost of employing labor in-house in the formal sector.

We also show that firms involved in outsourcing reduce their cost and charge a lower price and markup. Further evidence from the informal sector supports the idea that greater import competition is associated with sub-contracting of manufacturing activity to the informal sector, especially in states with pro-worker labor regulation, among small firms and firms located in rural areas. Lastly, we show some evidence that these firms also experience an increase in their output per worker. We thereby underscore the interaction between trade and labor market institutions in determining the fragmentation of production activity.

CRediT authorship contribution statement

Pavel Chakraborty: Conceptualization, Data curation, Investigation, Methodology, Writing – original draft, Writing – review & editing, Software. **Devashish Mitra:** Conceptualization, Formal analysis, Methodology, Validation, Writing – review & editing. **Asha Sundaram:** Conceptualization, Formal analysis, Methodology, Validation, Writing – original draft, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The authors do not have permission to share data.

Declaration of Generative AI and AI-assisted technologies in the writing process

During the preparation of this work none of the authors used any Generative AI or AI-assisted technologies in the writing process or any other aspects of the paper. The authors take full responsibility for the content of the publication.

Appendix A. Supplementary data

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.jdeveco.2024.103272.

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