Import Competition, Labour Market Regulation, and Firm Outsourcing*

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Abstract

Using unique information on firm level outsourcing of manufacturing jobs by Indian firms, we propose two novel channels as determinants of the fragmentation of production: import competition and labour market regulation. We find that greater import competition from China is associated with a significant increase in outsourcing of manufacturing tasks – a 10-percentage point increase in the import penetration ratio leads to a 0.24–0.63 percentage point increase in the share of outsourcing expenses in total expenses of a firm. This effect is attenuated for firms operating in states with pro-worker labour laws by 0.31–0.48 percentage points. These results are primarily driven by domestic, multi-product firms producing final goods. Outsourcing firms reduce their costs, charge a lower price, and increase output and the number of product varieties they produce in response to import competition. In addition, we find a corresponding increase in the likelihood that informal sector firms, particularly those located in rural areas, engage in an outsourcing contract with other enterprises in states where labour laws are pro-worker.

JEL classifications: F1, F12, F14, F16, J08, J46

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1 Introduction

"We live in an age of outsourcing" (Grossman and Helpman, 2005).

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).[1] Feenstra (1998) cites the production of Barbie dolls as an example to highlight the increase in foreign outsourcing as a result of the spectacular integration of the global economy during the 80s and 90s.[2] Ever since, studies have examined several possible determinants of vertical integration by firms: potential for holdup problems (Grossman and Helpman, 2002, 2005; Ornelas and Turner, 2008), product market competition (Aghion et al., 2005; Hortacsu and Syverson, 2007; McGowan, 2017), prices (Legros and Newman, 2013; Alfaro et al., 2016), offshoring (Bernard et al., 2018), contractibility (Grossman and Helpman, 2005; Alfaro et al., 2019), trade/globalization (McLaren, 2000; Chen et al., 2004; Ornelas and Turner, 2011; Chongvilaivan and Hur, 2012; Buehler and Burghardt, 2015; Stiebale and Vencappa, 2018), and communication technology (Fort, 2017).[3]

In this paper, we propose two new channels that can influence outsourcing of production activity of a firm outside it's boundary: (i) international trade; particularly, import competition from China in the domestic market,[4] and (ii) labour market regulation. From a theoretical point of view, the impact of competition on vertical integration[5] is ambiguous and non-monotonic (Legros and Newman, 2014). Higher degree of product market competition may help increase (Ornelas and Turner, 2008, 2011) or decrease (McLaren, 2000, 2003; Grossman and Helpman, 2002, 2005; Buehler and Burghardt, 2015; McGowan, 2017) a firm's incentives to vertically integrate. Aghion et al. (2006) show a U-shaped relationship between competition and vertical integration.[6] In marked contrast to the impressive body of theoretical work on the link between trade and outsourcing, the empirical evidence is scant. Additionally, to our knowledge, no other study has proposed labour regulation as a channel through which trade can impact outsourcing. We argue that labour regulation that increases the cost of employing in-house labour can incentivize firms to outsource some of their production activity to avail of a lower marginal cost of production, particularly in the face of greater import competition.

[1] The Annual report of the World Trade Organization (1998) details the production of a particular "American" car as follows: "30% of the car's value goes to Korea for assembly, 17.5% to Japan for components and advanced technology, 7.5% to Germany for design, 4% to Taiwan and Singapore for minor parts, 2.5% to the United Kingdom for advertising and marketing services and 1.5% to Ireland and Barbados for data processing. This means that only 37% of the production value is generated in the United States (p. 36)."

[2] According to Feenstra, Mattel procures raw materials (plastic and hair) from Taiwan and Japan, conducts assembly in Indonesia and Malaysia, buys the moulds in the U.S., clothing in China and paints used in decorating the dolls in the U.S.

[3] Most of these studies are theoretical in nature, with a few exceptions.

[4] Rodriguez-Lopez (2014) proposes a theoretical model that looks at how import competition and the interaction between import competition and productivity of firms can lead firms to offshore.

[5] Vertical integration is the opposite of outsourcing.

[6] According to their theory, a small increase in competition reduces producers' incentives to integrate by raising suppliers' investment incentives. For high degrees of competition, the model predicts that producers will have a high incentive to vertically integrate because independent suppliers can capture most of the surplus generated by the producer.

A key contribution of our work is that we bring to bear unique data on outsourcing that, we believe, appropriately captures outsourcing activity at the firm level. Our variable, defined as the share of expenses on outsourcing of manufacturing jobs in total firm expenses, captures all expenses incurred by firms to have their manufacturing requirements fulfilled from outside parties, including firms in the informal sector.[7] However, our outsourcing variable only captures domestic outsourcing and not offshoring.[8] Previous studies analyzing the organization of firms capture vertical integration using industry level input-output (I-O) tables to calculate the proportion of inputs into production produced within a firm (Acemoglu et al., 2009, 2010; Alfaro et al., 2016; Stiebale and Vencappa, 2018; Liu et al., 2019), except for Fort (2017).[9] Such industry level information is subject to caveats. First, the international trade literature has documented substantial heterogeneity across firms within industries on the composition and quality of inputs used in production. Industry level I-O tables may fail to capture this heterogeneity (DeLoecker et al., 2016).[10] 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 activity overcomes these concerns by directly exploiting data on outsourcing expenditure by firms explicitly on manufacturing jobs.[11] It is therefore closest in spirit to Grossman and Helpman's (2005) 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.

Panel A of **Figure 1** presents the average share of expenditure on outsourcing of manufacturing activities by firms before and after 2001. The break in 2001 is intended to capture the impact of China's accession to the WTO.[12] An average firm spent about 0.15% of its total expenses on outsourcing between 1995 and

[7] We compare our measure of outsourcing to traditional measures used previously in the literature and present results in Section 6. We plot our outsourcing measure (outsourcing expenditure on manufacturing jobs) as a share of a broader measure of outsourcing in **Figure B1** (**Appendix B**). The broader measure is defined as: outsourcing of manufacturing jobs + imported intermediates (raw materials) + domestic raw materials + energy costs. 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 5% in 2007, a five fold increase.

[8] Feenstra (1998), Lawrence (1994) and Krugman (1994) argues that focusing solely on international outsourcing, or considering imports of intermediates alone as outsourcing may not reveal the entire picture on outsourcing activity by firms.

[9] Fort (2017) is the only other study to use data on fragmentation of economic activity at the firm level. However, the information used is only 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. However, unlike Fort (2017), we cannot distinguish between international and domestic outsourcing.

[10] 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 C1** (**Appendix C**). We regress input and output tariffs on our outsourcing measure and an extensive margin measure (the probability of engaging in outsourcing). Unlike Stiebale and Vencappa (2018), we do not find any robust effects of tariffs on outsourcing by Indian manufacturing firms.

[11] The dataset also provides information on outsourcing of professional services, but we use that variable for a placebo test. More details in Section 6.

[12] 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 US$ 62 billion to US$ 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 of China 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; Liu, 2010; Autor et al., 2013; Mion and Zhu, 2013; Martin and Meajean, 2014; Bloom et al., 2016), and to a far lesser extent in developing countries (Iacavone et al., 2013 and Utar and Torres-Ruiz, 2013 for Mexico; Medina, 2017 for Peru; and Chakraborty and Henry (2019) for India).

2001, which shot up to 1% between 2002-2007; a jump of about 5.6 times or an increase of 560%. **Panel B** looks at how the incidence of outsourcing activity has changed over time. It shows that the annual average percentage of firms involved in outsourcing was around 8% between 1995 and 2001, which increased to about 27% between 2002 and 2007, an increase of about 350%.

To understand whether international trade is one of the main forces driving this observed, significant change in the way firms organize 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.[13] We argue that using Chinese competition as a proxy for an exogenous increase in import competition is valid for the following reasons. First, China is currently India's largest trading partner. **Figure 2** 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 import penetration ratio, which increased from less than 1 to almost 8% in the same time period.[14]

Table 1 compares India's trade with China and other large trading partners at three different points in time: 1992, 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. India's share of Chinese imports grew by around 9000% between 1992 and 2007.[15] In comparison, imports from ASEAN (another large trading partner), the US and the EU increased by 888%, 230% and 132%, respectively. While in Mexico[16], the Chinese share of manufacturing imports increased by a factor of 8, in the case of India it increased by a factor greater than 90 over the same time period (1992–2007).[17]

Secondly, the growth in Chinese exports to India as a result of accession to the WTO is a result of China's internal reforms to a market-oriented economy. This transition to a market economy from a centrally planned economy resulted in significant productivity growth for Chinese firms, which was further bolstered by a reduction in trade costs as a result of its accession to the WTO. We treat this as a unilateral trade shock and not a mutual trade expansion.[18] Given China's dominance in India's trade and the phenomenal increase in outsourcing activity by firms in the post-2001 period, our question of whether Indian manufacturing firms respond to import competition from China by increasing outsourcing is a pertinent one.

[13] 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; Bloom et al., 2016).

[14] The Chinese import penetration ratio is calculated as the share of Chinese imports in an industry in total domestic production, including imports and exports. See **Appendix A** for definitions of key variables.

[15] Note that the percentage increase in Chinese imports in the case of India is almost 9 times higher when compared to the US during the same time period; the percentage increase for the US was 1156 during 1991–2007 (Autor et al., 2013).

[16] A large number of studies exploring the impact of Chinese import competition on developing countries focus on Mexico (Iacovone et al., 2013; Utar and Torres-Ruiz, 2013).

[17] We present Chinese imports by India as a share of Indian imports from the world across 2-digit manufacturing industries in **Table C2** (**Appendix C**). Imports from China are largest in labour-intensive industries like textiles and wood and in machinery and transport equipment.

[18] This approach requires that the import demand shock to India, especially after 2001, was not the primary cause of China's export surge. While it seems plausible that China's export growth to India during the 2000s was a result of supply shocks internal to China, we use imports from China by other developing countries (Brazil, Mexico, Indonesia and Malaysia) as an instrument for Chinese imports to India. All approaches yield similar results.

We examine the impact of import competition from China on outsourcing differentially for firms located in states with pro-employer versus pro-worker labour regulation. India is a useful setting for this purpose. There is substantial heterogeneity in labour market regulation across Indian regions.[19] Differences in labour laws across states provide ample variation to understand whether the gains to firms from outsourcing are particularly large when pro-worker labour laws act as a tax on employing labour in-house in the formal sector. Greater import competition may therefore be associated with more outsourcing in regimes with pro-worker labour laws, relative to pro-employer labour regimes. Focusing on a federal democracy like India allows us to delve into the role played by labour regulation in determining the relationship between trade and outsourcing.[20] We follow Gupta et al. (2009) and Adhvaryu et al. (2013)[21] and exploit this variation in labour regimes across Indian states, noting that other institutional factors such as the monetary policy regime are fixed at the country level.

We have three sets of results. First, an increase in Chinese import penetration, particularly in the final product market (and not in intermediate input markets), significantly increases the share of expenses on outsourcing of manufacturing jobs by Indian manufacturing firms. A 10 percentage point increase in the Chinese import penetration ratio is associated with an increase in the outsourcing (of manufacturing jobs) share of total expenses for an Indian manufacturing firm of 0.24–0.63 percentage points. The effect is higher, when we measure it as a share of output: a similar increase in the import competition ratio increases the share of outsourcing to gross value-added of a firm by 1.3–3.5 percentage points. The result is mainly driven by domestic multi-product firms at the top half of the size distribution, producing final goods.

Second, this increase in outsourcing is mitigated for firms in Indian states with pro-employer labour laws by 0.31–0.44 percentage points, suggesting that import competition increases outsourcing relatively more in states with pro-worker labour regulation. This finding is consistent with the idea that pro-worker labour laws magnify the positive relationship between import competition and outsourcing activity by acting as a tax on labour, increasing the costs of using in-house labour in the formal sector. For example, sticky wages in states with pro-worker labour laws can add to overall production cost for a firm if it wants to increase production. Or, if a firm wants to alter the size of its workforce in the short run in response to Chinese competition, labour laws may restrict it from doing so in the presence of hiring and firing regulations.[22] We

[19] Labour 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 labour disputes in the factory sector. The IDA was passed by the central government, but has been extensively amended by state governments causing Indian states to differ markedly in their labour laws. Besley and Burgess (2004) read all state level amendments made to the IDA during 1958-1995 in 16 major Indian states (from Malik, 1997). Each amendment is coded as being either pro-worker, neutral, or pro-employer, depending on whether it lowered, left unchanged or increased an employer's flexibility in hiring and firing factory workers, respectively. Based on the cumulative scores, they classified states as "pro-worker", "pro-employer", and "neutral". We discuss this in detail in Section 4.2.

[20] In order to determine this relationship, a crucial identifying assumption must be met: Chinese import competition should be exogenous to the labour regime. In other words, it should not be caused by changes in outsourcing patterns in the industrial sector across different labour regimes or by other factors that may affect outsourcing. We argue that the identifying assumption is met in our case; a large majority of labour Acts were enacted in the period 1949-1989. In the nineties, the legislative activity came to a halt, with no new amendments in the IDA (Ahsan and Pages, 2009).

[21] The classifications used in these papers are based on Besley and Burgess (2004) and its critique by Bhattacharjea (2006).

[22] Section V-B of the IDA 1947 lays out special provisions that apply only to industrial establishments employing at least one hundred workers. This section is more draconian - it requires that no workers may be laid-off or retrenched without the prior permission of the government.

find that outsourcing firms located in states with pro-worker labour laws lower marginal costs by 30% and prices by about 15% more than firms located in states with pro-employer labour laws in response to Chinese import competition. In addition, these firms produce a higher number of product varieties and increase quantities sold.

Our findings are consistent with a framework where an increase in import competition is associated with an increase in the perceived elasticity of demand for monopolistically competitive firms. The increase in demand elasticity leads to an erosion of market power, increasing the incentive for firms to lower prices and expand output, in line with a pro-competitive effect of trade (Devarajan and Rodrik, 1991). The increase in production makes the lower marginal cost from outsourcing more attractive, inducing the firm to outsource more by incurring a fixed costs of outsourcing.[23] The framework also implies that these impacts vary with firm productivity and the labour regime, which drives the relative cost of in-house production.

All results are robust to controlling for a battery of industry and firm characteristics, industry level import tariffs, availability of cheaper intermediate inputs from China, export market competition, interactions between industry-year fixed effects (at both 3- and 2-digit level), state and year fixed effects, and a host of other checks. We also delve into the relationship between import competition and another traditional measure of outsourcing (combining domestic raw material expenditure, import of intermediates, and energy costs). We find a weaker, albeit positive relationship, ruling out mere substitution by firms between our measure and the traditional measure, while also underscoring the need to include our measure in any analysis of outsourcing. Additionally, we conduct a placebo test, where we examine outsourcing of professional jobs (where labour regulations do not apply) as our outcome of interest. However, we find no evidence that labour regulation plays a role in determining the relationship between import competition and outsourcing.[24]

Finally, we use data on outsourcing activity by manufacturing micro enterprises in the Indian informal sector to check for evidence on the symbiotic relationship between the formal and informal sectors. In other words, to establish the formal-informal supply linkages. 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 labour costs because labour laws are not enforced in this sector. We find that greater import competition from China is associated with an increase in the likelihood of informal enterprises selling their final output to formal sector enterprises directly, or through a contractor. This finding is consistent with formal manufacturing firms outsourcing production activity to informal firms to cut marginal production costs in response to greater import competition. Indeed, we find that the relationship between import competition and outsourcing activity among informal enterprises is mitigated in states with relatively pro-employer labour regulation. Lastly, we find that output per worker increases for informal sector firms that outsource, especially in states with pro-worker labour laws. This particular result expands on McCaig and

[23] Navas and Licandro, 2011 present a similar model where the pro-competitive effect of trade that induces firms to increase production results in investments to innovate and reduce cost.

[24] This test serves as a consistency check to address one crucial concern: the endogeneity of labour regulation. Labour laws under the IDA only apply to factories and hence, to jobs related to manufacturing. If our results reflect the effects of labour regulation and not other related factors at the state level, we should not see import of intermediates and/or outsourcing of professional jobs responding to the import competition shock. This is indeed what we find. More on this in Section 6.

Pavcnik (2018). They show that a positive trade shock following the United States-Vietnam Bilateral Trade Agreement led to more formalization of the economy through the shrinking of the informal sector. We find that the impact of trade on the informal sector can be heterogeneous – firms that sell to or are on contract to sell to formal sector enterprises could gain, but other informal sector firms may not. Our results on the informal sector thus speak to the literature on the informal sector and economic development (Tybout, 2000; Gollin, 2002, 2008; Nataraj, 2011; La Porta and Shleifer, 2008, 2014; Restuccia and Rogerson, 2008; Hsieh and Klenow, 2009; McMillan and Rodrik, 2011).

Our study makes several contributions in addition to using new and unique data on firm level outsourcing. First, we provide strong evidence on trade, especially import competition, as a determinant of outsourcing activity by firms (McLaren, 2000; Buehler and Burghardt, 2015; Stiebale and Vencappa, 2018). We hence highlight the role of international trade in shaping the organization of firms. Second, our study relates to the literature on the role played by labour market rigidity in spurring firms to outsource production activity in response to trade liberalization (Goldberg and Pavcnik, 2003). This is specially relevant in the case of developing countries that are characterized by large informal sectors, where labour laws are harder to enforce. By increasing the cost of employing workers in a formal setting, rigid labour laws may incentivize firms to outsource activity to the informal sector, particularly in the face of greater foreign competition. By studying the role of labour regulation in this context, to the best of our knowledge, we are the first to highlight the labour market implications of international trade and the fragmentation of production (Hummels et al., 2014).[25]

Finally, our study focuses on south-south trade. Whereas trade theory identifies low-wage countries as a likely source of disruption to manufacturing firms in high-wage countries, Krugman (2008) points out that free trade with countries of any income level may affect the dynamics of the domestic market. A large body of empirical evidence demonstrates that import competition, especially from China, significantly affects the dynamics of manufacturing firms; however, the lion's share of these studies concentrate on developed countries. We investigate the effect of the rise in Chinese imports on outsourcing activities of firms in India, another emerging economy.[26] Ex ante, it is not unreasonable to expect different effects of Chinese import competition on developing countries, given the technological similarity between them and China (di Giovanni et al., 2014).[27]

The rest of our paper is organized as follows. Section 2 presents the data and some stylized facts. Section 3 details our empirical specification and identification strategy. Section 4 presents results studying the relationship between import competition and outsourcing and the role of labour regulation. Section 5 discusses results and mechanisms using a simple analytical framework. Section 6 concludes.

[25] A related literature on the impacts of trade on labour markets examines the reverse relationship by studying the impacts of a firm's offshoring decision. This set of studies looks at how the offshoring decision affects a range of variables, including skill premia (Feenstra and Hanson, 1999), shares of skilled workers within a firm (Mion and Zhu, 2013), wages and employment (Hummels et al., 2014), polarization (Harrigan et al., 2020) and trade (Bernard et al., 2018).

[26] Most studies focus on employment, output, product variety, wages, innovation and productivity as outcomes of interest.

[27] 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.

2 Data and Preliminary Analysis

2.1 Firm level Data

Data are drawn from the PROWESS database, constructed by the Centre for Monitoring the Indian Economy (CMIE). The database contains information on approximately 27,400 publicly listed companies, all within the organized sector, of which almost 9000+ are in the manufacturing sector. We use data for around 5,500+ firms, for which there is consolidated data on outsourcing activities. 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 other important industry level variables; 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 data set are either private Indian firms or affiliated to private business groups, 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 all manufacturing firms from 1995 through 2007.

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 done from outside parties, especially from the firms in the unregistered or informal sector. It includes labour charges, fabrication charges, processing charges, machining charges, fettling charges, conversion charges, contracted production and sub-contracted production. We use this as our main outcome of interest.

The dataset also rolls out information on other measures of outsourcing used previously in the literature such as raw material expenditure sourced from domestic sources, import of intermediates, energy costs, etc. 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 A**.

In addition to this, 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 data set belong to chemicals, followed by food products and beverages (12.81%), textiles (10.81%) and basic metals (10.46%).

2.2 Stylized Facts: Outsourcing of Manufacturing Activity

In this section, we present stylized facts on outsourcing of manufacturing jobs by Indian firms. **Table 2** shows key firm characteristics by outsourcing status. We compare summary statistics on sales, total assets, gross value added, total factor productivity, export and import volume, R&D intensity for firms involved in outsourcing of manufacturing jobs to firms not involved in outsourcing. Firm 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 managerial or skilled workers.

Next, we present results by firms located in states with pro-worker versus pro-employer labour laws. We look at outsourcing, its share in total expenses and the percentage of firms involved, averaged over time (both in the aggregate and by state group) in **Table 3**. These patterns echo that outsourcing activity is more prominent in states with pro-worker labour regulation. And, the difference (across the different indicators) ranges between 26–33%. We repeat the exercise by type of industry – final goods versus intermediate goods in **Table 4**. The table suggests that outsourcing activity is more prevalent in the case of final good-producing industries relative to intermediate good-producing industries, particularly in states with relatively pro-worker labour regulation.[28]

Table C4 (Appendix C) presents total outsourcing expenditure, share of outsourcing expenditure and percentage of firms involved in outsourcing by industries at the NIC 2-digit level. The table shows substantial heterogeneity in outsourcing activity across industries.[29] Finally, **Table 5** demonstrates the change in distribution of mean outsourcing share in total expenditure in industries between 1992 – 2001 and 2002 – 2007, before and after Chinese accession to the WTO. Relative to 1992 – 2001, a far greater number of Indian manufacturing industries have firms reporting outsourcing shares greater than 0.5% on average in 2002 – 2007, confirming the increase in outsourcing activity in Indian manufacturing post-2002. Overall, our findings in this section support the idea that increased Chinese import competition is associated with greater outsourcing activity in Indian manufacturing firms. We examine this relationship rigorously in our empirical analysis.

[28] **Table C3 (Appendix C)** shows a more detailed breakdown of outsourcing activity across industries producing basic goods, intermediates, capital goods, consumer durables and non-durables. Outsourcing activity is greatest for consumer durables and non-durables.

[29] Total expenditure on outsourcing in column (1) shows that the expenditure is highest for the automobile industry and lowest for office, accounting and computing machinery. In column (2), we focus on the share of outsourcing expenses in total expenses by a firm; share of outsourcing expenditure is highest in case of labour-intensive industries, such as apparel and tobacco products, where it is over 1%, while accounting and computing machinery shows the lowest at 0.02%. Broadly, more labour-intensive industries show a larger share of outsourcing as a share of total expenses. This is consistent with the idea that outsourcing is motivated by lower labour costs outside of formal manufacturing. Lastly, in column (3), the percentage of firms outsourcing ranges from 21 and 20% of firms in fabricated metal products and machinery and equipment to a mere 3% in office, accounting and computing machinery.

3 Empirical Specification

Our goal is to study the impact of increased import competition from China on outsourcing intensity of manufacturing jobs among Indian firms. This section lays out the strategy we use to investigate the effect of China's rising share of exports in the Indian market on outsourcing expenses as a share of total expenses in manufacturing firms. 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.

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 access 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 is 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.

Notwithstanding the assumptions underlying our empirical strategy, there is one important concern that needs to be addressed: the demand for Chinese goods by India, especially after 2001, may have been due to import demand shocks across industries in India[30]. Failure to address this concern may result in biased coefficient estimates and incorrect inferences drawn from our findings. In order to tackle this issue, we use an empirical strategy similar to Autor et al. (2013) among others. We estimate the following OLS fixed effects equation as our baseline:

$$outsourcing_{ijt} = \beta_1 DComp^{China}_{IN,jt-1} + X_{jt-1} + firmcontrols_{ijt-1} + \mu_i + \gamma_t + \theta^t_j + \eta^t_s + \varepsilon_{ijt} \qquad (1)$$

$outsourcing_{ijt}$ is expenditure on outsourcing of manufacturing jobs as a share of total expenses by firm i in sector j at time t.[31] We define $DComp^{China}_{IN,jt-1}$ as a measure of Chinese 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 match the Indian firm level data with HS six-digit product

[30] 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 an increase in comparative advantage of Chinese goods. Moreover, this increased significantly after 2001.

[31] Given that our key dependent variable is fractional in nature with a large proportion of zeroes, we also present results from a fractional logit model and PPML to show that our results are robust across these specifications.

level, destination-specific data for China on import flows. We thus construct a ratio that reflects the amount of competition faced by a firm i belonging to industry j. We create this index at the NIC 2004 4-digit level using the concordance table by Debroy and Santhanam (1993). It is defined as the share of Chinese imports by India in industry j at time t divided by total domestic production, imports and exports for industry j in 1994. For example, let us consider the Automobile sector (j). Then, $DComp^{China}_{IN,jt-1}$ can be written as:

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

Therefore, $DComp^{China}_{IN,j=Automobile,t-1}$ is the total amount of Automobile imports from China in a given period, relative to the total production ($Y_{j=Automobile,95}$), total imports ($M_{j=Automobile,95}$) and total exports ($X_{j=Automobile,95}$) of automobiles in the base year 1995. Our hypothesis is that $\beta_1 > 0$, or that greater import competition would induce firms to outsource more.

While in principle it is useful to use a lagged independent variable as a proxy for the contemporaneous import penetration index to tackle the simultaneity problem, it could still be endogenous. For example, an increase in the demand for particular products in India after 2001 may trigger a disproportionate increase in Chinese imports in these product categories and simultaneously impact Indian firms producing them. This could also be true for unobserved technology shocks common to both countries, like innovation in labour cost-saving technology (Utar and Torres-Ruiz, 2013). Such endogeneity can bias the estimate of the impact of Chinese import competition on outsourcing.

To overcome the possible endogeneity concern(s), we follow Autor et al. (2013), Acemoglu et al. (2016) in instrumenting for Chinese imports to India by Chinese imports to other similar developing countries. The instrument for (2) is computed as:

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

where $M^{China}_{Others,jt-1}$ is the lagged value of Chinese imports by an industry in Brazil, Indonesia, Malaysia and Mexico. 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, but not by unobserved import demand shocks in developing countries (Autor et al., 2013). The Chinese share of imports by Brazil, Indonesia, Malaysia and Mexico must be exogenous from the perspective of Indian firms as it is expected to be driven by China. In other words, 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 Chinese imports by India. 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 Chinese imports by Malaysia and Indonesia since they are prominent trade partners of India; the results remain the same.

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[32], in our case the US[33], and share of Indian imports from other low-wage countries.

$firmcontrols_{ijt-1}$ 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 $(t-1)$. μ_i, γ_t are firm and year fixed effects that account for unobserved, firm specific time-invariant and year shocks. θ_j^t are either the interactions between industry fixed effects and year trends or industry-year fixed effects. These account for other potential unobserved factors, such as policy changes or dependency on external finance that may affect outsourcing. η_s^t represents interaction of state-year fixed effects. One of our key results is that state level labour institutions play an important role in determining the relation between import competition and outsourcing, therefore η_s^t would control for all other different state level policies (like the presence of an informal sector or interlinkages between the formal and informal sectors, state-level laws favouring outsourcing by firms, the contracting environment in each state and financial development) that can possibly influence is imperative in all of our estimations. Lastly, we cluster standard errors at the industry level.[34]

4 Results: Import Competition and Outsourcing

4.1 Baseline

Table 6 presents our baseline results by estimating Eq.(1) using industry-year trends, 2-digit industry-year fixed effects, 3-digit industry-year fixed effects and state-year fixed effects. We use outsourcing expenditure on manufacturing jobs as a share of total expenses as the dependent variable. Columns (1) – (5) and columns (6) – (10) present the OLS and IV results, respectively. Column (1) regresses lagged import penetration ratio from China controlling for Chinese import competition faced by Indian firms in a third country (the US) ($FComp_{IN,jt-1}^{China}$), firm age, age squared, size, technology adoption of a firm and interactions of industry fixed effects at the 4-digit level and year trends and state-year fixed effects. Both size and technology adoption are at $(t-1)$ and in real terms. We find that competition from China in both the markets led to increase in

[32] We follow the same method as outlined above in constructing the index of competition that Indian firms face in the US from Chinese imports. 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.

[33] Autor et al. (2013) show that Chinese imports in 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.

[34] Note that the observations across different specifications vary as we add control variables.

outsourcing expenditure of Indian manufacturing firms, but the effect from domestic competition is almost 10 times higher than export market. In particular, our coefficient of interest shows that a 10 percentage point increase in import competition from China (in the domestic market) increases the outsourcing share of manufacturing jobs in total expenses by 0.19 percentage points.

Columns (2) and (3) repeat column (1) but by replacing industry-year trends with industry-year fixed effects at 2-digit and 3-digit levels respectively. These industry-year fixed effects control for other demand shocks, industry specific policies favouring (or not) outsourcing, changes in the pattern of products produced (production of some products involves more outsourcing than others, such as automobiles), contractibility 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.[35] Our benchmark estimate remains robust and positively significant, but the effect from export market competition goes away.

In column (4), we additionally include input ($InpTariff_{jt-1}$) and output tariffs ($OutTariff_{jt-1}$) 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) and export market competition. Our estimate remains stable – a 10 percentage point increase in import competition from China now increases the outsourcing share of manufacturing jobs in total expenses by 0.16–0.19 percentage points. Column (5) 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 Chinese imports 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 the competition did not intensify then. Our conjecture turns out to be true; our coefficient of interest is not significant. Overall, our results indicate that import penetration from China significantly affects the intensive margin of outsourcing.[36]

Results from the IV estimations along with their first-stages are presented in columns (6) – (10). Our IV results qualitatively mirror results from columns (1) – (5), but with higher magnitudes for our coefficient of interest.[37] This is possible if unobserved factors driving outsourcing activity by Indian firms and imports from China simultaneously lead to inconsistent estimates of the impact of Chinese import penetration on outsourcing. Columns (6) through (9) present results for 1995–2007 with column (10) presenting results for the time period 1995–2001. Overall, our IV results suggest that a 10 percentage point increase in the Chinese import penetration ratio increases the share of outsourcing in total expenses by 0.24–0.31 percentage points. We continue to find no effect of Chinese import penetration in the pre-2001 period.

[35] 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.

[36] We also check for the effect of an increase in import competition by restricting our sample to firms who are involved in outsourcing. In particular, we use the natural logarithm of outsourcing expenditure of firms as the dependent variable. 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% (results available on request).

[37] Following Chakraborty et al. (2020), we also present our results from a different IV (imports by Latin American countries from China) to control for a common technology or demand shock(s) in **Table C5** (**Appendix C**). The coefficients from the alternate IV estimations turn out to be similar to our main IV estimations.

We conduct a battery of further robustness checks in **Table 7**. All of our estimations control for the export market competition index, input and output tariffs. In addition, we use IV estimation wherever possible. We start by controlling for the lagged dependent variable as one of the independent variables; our benchmark result stays the same. Column (2) additionally controls for import competition from other low-wage countries. Adding this new control does little to our benchmark result.

We now employ a series of different estimation techniques to check whether our results are robust across these different strategies. To do so, we start by using China's WTO accession in 2001 as the quasi-natural experiment and the differential increase in competitive pressure of Chinese imports across manufacturing industries to implement a difference-in-differences estimation strategy. In particular, we exploit the average share of Chinese imports across each 4-digit industry in the pre-WTO accession period (between 1995 and 2001), $AvgM_{IN,j}^{China}$, and then interact it with a WTO_t accession dummy (it takes a value 1 if year is greater than or equal to 2002).[38] This interaction term captures the differential effect of Chinese competition on firms according to their trade exposure from China prior to 2001.[39] Our key estimate shows that after 2001, firms were engaged in approximately 0.30 percentage points more outsourcing than before.[40]

Column (4) employs a first-differenced specification and finds that the outcome remains the same. Another issue that might affect our results is that there is 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 with 2007. We find a significant positive effect of Chinese import competition in the domestic market on outsourcing activity of Indian manufacturing firms. In other words, a rise in Chinese import competition in the Indian domestic market significantly induces Indian firms to outsource more manufacturing jobs in 2007 compared to 1995.

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 Chinese imports in two other primary export markets for Indian firms, namely the EU and ASEAN, with that of the US. We then substitute the original foreign competition index with the composite index based on these three export market destinations in column (6). In other words,

$$FComp_{IN,jt-1}^{China} = \frac{M_{US,jt-1}^{China} + M_{EU,jt-1}^{China} + M_{ASEAN,jt-1}^{China}}{(M_{US,jt-1}^{World} + M_{EU,jt-1}^{World} + M_{ASEAN,jt-1}^{World})} \tag{4}$$

As the coefficients demonstrate, our benchmark results remain the same – we find strong evidence of

[38] This strategy is in line with Guadalupe and Wulf (2010), Chakraborty and Henry (2019), Fromenteau et al. (2019).

[39] The idea here is that competition from China intensified after it joined the WTO. And, it intensified in those industries where the share was high in the pre-2001 period.

[40] Between 1995 and 2001, the mean Chinese import penetration ratio was 0.6%; this increased to 3% between 2002 and 2007. This implies that a firm in an industry that exhibited this mean level of change in import penetration from China increased its outsourcing expenditure (as a share of total expenses) by (3 – 0.6) x 0.011. We multiply this number by ten to evaluate the impact of a 10 percentage point change in the import penetration ratio.

outsourcing in response to Chinese competition in the domestic market. We continue to find some weak evidence of competitive effects from export market(s) on outsourcing of Indian firms. Next, taking a cue from Burgess and Pande (2005), we use China's joining of the WTO in 2001 as a structural break to estimate a trend break model in column (7) to control for the differential time trends that may affect our outcome variable(s) using the following specification:

$$\begin{aligned} outsourcing_{ijt} &= \beta_1[DComp^{China}_{IN,jt-1} \times (t-2001)] + \beta_2[DComp^{China}_{IN,jt-1} \times (2002-2007)] \\ &\quad + X_{jt-1} + firmcontrols_{ijt-1} + \mu_i + \theta^t_j + \eta^t_s + \varepsilon_{ijt} \end{aligned} \tag{5}$$

Here, $(t-2001)$ is a linear time trend and captures the differential pre- and post-trends of China joining the WTO in 2001, whereas $(2002-2007)$ is a fixed time trend capturing China's membership to the WTO. These terms enter the regression interacted with $DComp^{China}_{IN,jt-1}$. The time trends have a switch in 2001 because of China's membership to the WTO. If China's membership to the WTO in 2001 had significantly influenced outsourcing activity of Indian firms, we expect the interaction term of the $[2002-2007]$ trend and $DComp^{China}_{IN,jt-1}$ to be significantly different from the pre-trend interaction. Our coefficients show such is the case; post-trend is significantly different from the pre-trend. For example, the effect of China's membership to the WTO in 2001 on the share of outsourcing expenditure $DComp^{China}_{IN,jt-1} \times (2002-2007)$, is positive and significant as compared to the pre-trend (where it is negative). In other words, the result supports our hypothesis – an increase in China's imports after 2001 significantly affects manufacturing outsourcing of Indian firms. In column (8), we change our independent variable following Liu and Rosell (2013). Our variable of interest now becomes:

$$DComp^{China}_{IN,jt-1} = \sum_j s_{ijt} \frac{M^{China}_{IN,jt-1}}{(Y_{j,95} + M_{j,95} - X_{j,95})} \tag{6}$$

s_{ijt} is the share of firm i's sales in industry j at time t. $Y_{j,95}$, $M_{j,95}$, and $X_{j,95}$ are as defined before. Multiplying the import penetration ratio with the sales share of an individual firm transforms the ratio to the firm level. As the estimate of interest demonstrates, changing the independent variable does not induce any change in our finding. We continue to find strong effects of import competition from China. 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 (9). 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 share of outsourcing expenses of manufacturing activities in total expenses.

Our result that import competition from China increases outsourcing by Indian firms may be due to overall import competition, including from other destinations. In order to delve into this, we calculate a general import competition index ($World$), and index for high-income countries ($High - Income$). The $High - Income$ or HI includes North American countries and European Union. Result controlling for these indices are presented in column (10). Column (11) controls for import penetration indices from all other possible trade blocks – Latin American countries, least-developed countries, Middle-east and North African countries, and South Asian countries. The coefficient on Chinese import penetration is statistically significant and positive across both these specifications, suggesting 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.

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 by Indian firms (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 (12).[41] We weight the I–O coefficient of each sector (at NIC 4-digit level) that is used as an input by its import share, and then by the Chinese share in imports for that sector. By summing these measures, we arrive at a measure that gives us the average weighted sum of intermediate goods imported from China at a sectoral level, where the weights are given by the coefficients of the 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 (12) 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. It is the due to the product market competition that induces firms to outsource a larger share of their manufacturing activities.[42]

Long-term or Short-term 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

[41] 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 by substituting with the 1993 I-O table and find that the results remain.

[42] **Table C6** (**Appendix C**) explores heterogeneous effects of import competition on outsourcing across firm types. We interact our main Chinese import penetration variable with indicator variables for size categories in column (1), whether the firm is in a final good or intermediate good industry in column (2), if the firm is an exporter or not in column (3) and whether the firm is a foreign or domestic firm in column (4). We find strong evidence of an impact of import competition on outsourcing for the top-half of the size distribution. In addition, we find that the impact of import competition on outsourcing is concentrated among firms in both final and intermediate good industries, firms that are non-exporters and domestic firms. This is likely to be the case if firms that are oriented internationally have to conform to international norms and standards in their technique of production (capital-labour ratios), have to demonstrate adherence to labour standards or are subject to more labour inspections from state officials (Sundaram et al., 2017).

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:

$$outsourcing_{ijt} = \beta_1 DComp^{China}_{IN,jt-n} + X_{jt-1} + firmcontrols_{ijt-1} + \mu_i + \theta^t_j + \eta^t_s + \varepsilon_{ijt} \tag{7}$$

where $n \in [0, 3]$. This specification is equivalent to Eq.(1), but it considers the impact of Chinese import competition over different periods, ranging from its contemporaneous effect ($n = 0$), to its impact in $t - 3$ ($n = 3$). Our focus is on β_1. Yet, given that the sample is more restricted under these specifications, we place greater emphasis on interpreting magnitudes, rather than precision. Results appear in **Table C7** (**Appendix C**). Columns (1) – (4) test the cases of 0, 2, and 3-year lags for the share of outsourcing expenditure as the dependent variable. In all cases, the sign of β_1 is similar to the one estimated in the baseline specification. However, the estimated magnitudes suggest that any potential contemporaneous effects appear to be equivalent to the ones observed in the baseline; conversely, the effects of an increase in import penetration from China in 2- and 3-year lags appear to be significantly greater than those we observe in the baseline, especially for 3-year lag. This suggests that both short and long term changes are applicable to some extent, yet the former is more dominant, given that the effect of the 1-year lag appears stronger and more robust.

Heterogeneous effects across industries and firms **Table C8 (Appendix C)** examines if the increase in outsourcing expenditure of a firm in response to greater import competition is differential across industries based on various industry characteristics. For all our specifications in **Table C8**, we control for state-year and industry-year fixed effects at the 3-digit level.

Column (1) asks if the impact of import competition on outsourcing varies across industries based on skill-intensity. There is considerable debate in recent times on whether international trade has contributed to the declining fortunes of less skilled workers. Feenstra and Hanson (1996) argue that outsourcing (by which they mean import of intermediate inputs) has led to an increase in relative demand for skilled labour in the US because firms may respond to import competition from low-wage countries (such as China) by restructuring production towards skill-intensive activities. This may apply particularly to industries intensive in skills. Our idea in column (1) is to understand whether this applies to the Indian case. We introduce skill-intensity (defined as the ratio of the number of non-production workers to total employees of an industry) for the year 1995 and its interaction with Chinese import penetration as additional variables in the baseline specification. We do not find any evidence that industries that were initially intensive in highly skilled labour are engaged in more or less outsourcing.

Column (2) uses factories (at the initial level) and its interaction with Chinese import competition as additional variables. The idea here is to examine if industries with fewer firms respond differently to import competition relative to industries with a large number of firms. We find no evidence that this is the case.

Column (3) checks whether highly productive firms outsource more in response to greater import competition. We calculate total factor productivity of a firm using the Levinshon-Petrin (2003) methodology and use the initial level of productivity of a firm (the first time the firm appears in the sample) and its interaction with Chinese import penetration as the variable of interest. Our estimate shows our conjecture to be true – initially productive firms outsource more as a result of Chinese competition in the domestic market. This is consistent with Grossman and Helpman (2004).

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 in column (4). We create a dummy variable $MPFirm_i$ which takes a value 1 if a firm is a multi-product firm [43]. We interact $MPFirm_i$ with $DComp^{China}_{IN,jt-1}$ and show that the impact of import competition is magnified for multi-product firms.[44]

Next, Grossman and Helpman (2004) argue that managerial incentives may be positively correlated with outsourcing. Managers who oversee outsourcing of production and assembly activities are offered high-powered incentives in order to facilitate outsourcing in an efficient manner. We find strong evidence for this in columns (6) – (10). Column (6) uses total managerial compensation (it is defined as wages plus incentives) of a firm, whereas column (7) uses total managerial wages interacted with Chinese import penetration as additional variables. We do not find any evidence that firms paying either higher compensation or wages react differently to import competition. Columns (8) – (10) use interactions with total managerial incentives and incentives divided into top management (executives) and middle management levels (non-executives or other managers). The latter two comprise the managers' group. Executives (non-executives) are defined as managers with (without) executive powers. Executives include, for instance, the CEO, CFO and Chairman, whereas other managers may cover positions such as Divisional Managers. We find that with greater import competition from China, outsourcing increases by more in firms paying higher managerial incentives.[45]

Using an alternate outcome variable: Outsourcing/GVA We also ask if our results hold when using outsourcing expenses as a share of gross value-added of a firm as a dependent variable in **Panel A** of **Table C9** (**Appendix C**). We present both OLS and IV results controlling for all possible trade channels, industry-year, and state-year fixed effects. The effect of Chinese import competition on outsourcing expenses of a firm continues to remain positive; however, the estimates increase significantly, especially IV estimates. A 10 percentage point increase in import competition from China increases the share of outsourcing expenses (on account of manufacturing jobs) in total output produced by 1.4–3.5 percentage points.

[43] 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 conuduct our analysis at the firm-product level, or to ascertain if firms outsource the tasks related to their core or peripheral products.

[44] In an extended analysis, we find that a significant, positive relationship also exists between import competition and outsourcing for single-product firms, but only for firms which are exporters and produce final goods.

[45] An increase in competition may force managers to improve the gains of a firm in order to ensure survival. One way to maximize the gains is to outsource so that firms can produce at lower cost. Another explanation that could be put forward is about managers' x-inefficiencies: managers only try to cut costs when there are competitive pressures from import competition.

Extensive Margin: Outsourcing Intensity We now replace our dependent variable with a binary indicator that equals one if the firm reports a positive amount of outsourcing expenses and zero otherwise in **Table C10** (**Appendix C**). We do this for couple of reasons: (a) to check whether our results hold irrespective of the kind of outsourcing indicator we use, and (b) to check whether import competition from China also affects the extensive margin of outsourcing. Also, such a binary variable might be less vulnerable to measurement error relative to our main variable.

Columns (1) – (5) present results for both OLS, IV, first difference, and trend break analyses. Overall, the change of dependent variable does not alter our benchmark finding – our results show a strong positive relationship between Chinese import competition and outsourcing of manufacturing activity by Indian manufacturing firms, though the effect is less robust across all specifications relative to intensive margin results.

4.2 Role of Labour 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 labour 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).[46] 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 labour regulation impacts economic performance at the state-level.[47]

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.[48]

We exploit this variation across Indian states to ask if import competition impacts outsourcing differentially for firms located in states with pro-worker, as opposed to pro-employer labour regulation, 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 labour in-house in the formal sector. A large literature has emphasized the role played by rigid labour markets and stringent labour market regulation in pushing up implicit labour costs in developing countries (Besley and Burgess, 2004), particularly in the

[46] 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.

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

[48] 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.

formal sector, where labour laws are enforced.[49] In a couple of 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 labour, respectively, and find that in response to demand shocks, firms in states with pro-worker labour regulation react differently.

However, before proceeding to the estimations, we test for one crucial identifying assumption – we compare firm outsourcing across these two states before China joined the WTO in 2001 and show that there were no prior differential time trends. **Figure 3** plots the normalized share of expenditure on outsourcing of manufacturing jobs in total expenses of a firm for both states with pro-employer and pro-worker (and neutral) labour laws. The plot shows that there is no clear differential pattern of outsourcing between these states before 2001 – the difference starts to grow along with the increase in import competition from China. Firms located in states with pro-worker labour laws start to outsource more than firms in states with pro-employer labour laws after 2001.

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

$$\begin{aligned} outsourcing_{ijt} &= \beta_1 DComp^{China}_{IN,jt-1} + \beta_2 (DComp^{China}_{IN,jt-1} * LMktR_s) \\ &\quad + X_{jt-1} + firmcontrols_{ijt-1} + \mu_i + \gamma_t + \theta^t_j + \eta^t_s + \varepsilon_{ijt} \end{aligned} \tag{8}$$

$LMktR_s$ is a dummy variable that equals one if labour laws in a state in which firms' are registered are pro-employer. $LMktR_s = 1$, when s = Andhra Pradesh, Karnataka, Rajasthan, Tamil Nadu, and Uttar Pradesh.[50] On the other hand, $LMktR_s = 0$, when s = Gujarat, Maharastra, Orissa, and West Bengal and for neutral states Assam, Bihar, Haryana, Jammu and Kashmir, Punjab, Kerala and Madhya Pradesh. All other variables remain the same as in equation (1), except for X_{jt-1}. We also include interaction terms of all other controls with $LMktR_s$. **Table C11** in **Appendix C** lists the names of states according to their labour regime.

Our main variable of interest now is β_2 – the coefficient on the interaction between $LMktR_s$ and $DComp^{China}_{IN,jt-1}$. It captures the differential effect of Chinese import competition on firms in states with pro-employer labour 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 labour laws to increase their outsourcing

[49] One strand of literature has found negative economic impacts of amending the IDA regulations that make it harder to fire workers—lower output, employment, investment, and productivity in formal manufacturing (Besley and Burgess, 2004; Aghion et al., 2008; Ahsan and Pages, 2009). On other hand, other scholars have questioned whether amendments made to the IDA have indeed increased flexibility in firing (Bhattacharjea, 2006) or whether these regulations have even been enforced (Nagaraj, 2002).

[50] 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, Kerela, Madhya Pradesh, Rajasthan, and Tamil Nadu.

expenditure more than firms located in other states; vice-versa for $\beta_2 < 0$. We expect β_2 to be negative. In other words, if costs imposed by labour regulation(s) spur firms to outsource manufacturing activity, we expect the interaction term between Chinese import penetration and the indicator for states with pro-employer labour regulation to be negative.

Results, both OLS and IV (where we instrument for Chinese import competition), are reported in **Table 8**. Overall, we find that compared to firms in pro-employer labour regimes, those in restrictive labour 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 $LMktR_s$ controlling for industry-year trends at the 4-digit level an state-year fixed effects. Our results show that a 10 percentage point increase in the share of import penetration from China increases outsourcing share by 0.26 (or 0.31 for IV estimate) percentage points. Importantly, this effect is attenuated by 0.31 (or 0.41 for the IV estimate) percentage points for firms in states with pro-employer labour laws. In other words, there is no evidence that increased import competition is associated with more outsourcing in pro-employer states. Columns (2) and (3) additionally introduce interactions between industry-year fixed effects at 2-digit and 3-digit level to control for unobservables at the industry level, respectively. Using these additional fixed effects does not alter our finding – labour regulation acts as an important channel in determining the relationship between trade and outsourcing. Firms operating in states with pro-worker labour laws outsource more, potentially in order to circumvent them.

Like for our results in **Table 7**, we drop any firm-year observation greater than 2001 in column (4). Our benchmark result along with the effect of labour regulation vanishes. This further strenghtens our benchmark finding and show that the labour regulation effect only works when the import competition intensified. Columns (5) and (6) divide the sample of firms into single- and multi-product firms, respectively. The coefficients show that the aggregate effect continues to driven by multi-product firms operating in states with pro-worker labour regulation.

One concern with the interpretation of our coefficients could be that labour regulation is correlated with other factors 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 penetration shocks may vary by their capital intensity, and labour 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 the main variable of interest. We follow a similar strategy and control for the interaction of baseline characteristics of states with $DComp^{China}_{IN,jt-1}$, including the ratio of production workers, per capita salary of production workers, 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 (7) presents our results, which continue to be robust to the inclusion of state level characteristics. In fact, our coefficient estimates increase significantly.[51]

[51] **Panel B** of **Table C9** (**Appendix C**) checks for the robustness using outsourcing expenditure as a share of GVA as the dependent variable. The finding remains the same, with the coefficients being significantly higher.

Lastly, 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):

$$\begin{aligned} outsourcing_{ijt} &= \beta_1 DComp^{China}_{IN,jt-1} + \beta_2 (DComp^{China}_{IN,jt-1} * pro - wor\,\text{ker}) \\ &\quad + \beta_3 (DComp^{China}_{IN,jt-1} * neutral) + X_{jt-1} + \\ &\quad firmcontrols_{ijt-1} + \mu_i + \theta^t_j + \eta^t_s + \varepsilon_{ijt} \end{aligned} \tag{9}$$

In this case, $pro - wor\,\text{ker}$ 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 $pro - wor\,\text{ker}$ and *neutral* states, respectively, relative to $pro - employer$ states. Our primary coefficient of interest is β_2. We now expect β_2 to be positive and significant. For example, suppose that the average effect of Chinese imports 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 $pro - wor\,\text{ker}$ states. For β_3, it could be positive, but should be less than β_2. Column (8) estimates the above equation. We find our hypothesis to be true – the increase in aggregate outsourcing is driven by states with pro-worker labour 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 change in the import penetration ratio increases outsourcing by 0.33 (or 0.48 for IV estimate) percentage points more in states with pro-worker labour regulations relative to states with pro-employer labour regulations.

Columns (6) – (8) of **Table C10** (**Appendix C**) check for the role of labour market regulation in determining the impact of import competition on the extensive margin of outsourcing. We find an interesting and new result – import competition from China significantly impacts the extensive margin of outsourcing or leads new firms to engage in outsourcing only in states with pro-worker labour laws compared to states with pro-employer labour laws, as evidenced by the positive and significant coefficient on $DComp^{China}_{IN,jt-1} * pro - wor\,\text{ker}$ in Column (8). This is backed up qualitatively in Columns (6) and (7). The interaction term between $DComp^{China}_{IN,jt-1} * LMktR_s$ is negative and highly significant. In the next section, we present an analytical framework to interpret our benchmark results and test its implications empirically.

4.3 Discussion of Results

To summarize, we find that an increase in import competition, particularly a higher degree of import penetration from China increases a firm's share of expenses on outsourcing of manufacturing jobs in total expenses. This result is persistent, economically meaningful, robust to a myriad of tests, and relatively dominant in the short run. Digging deeper, the analysis also points out that labour regulation plays a crucial role in

mediating the relationship between trade and outsourcing. Firms that operate in pro-worker labour regimes drive the patterns observed including new firms engaging in outsourcing. Lastly, these findings are primarily driven by multi-product firms.

We now present a conceptual framework that proposes one mechanism whereby greater import competition leads to greater outsourcing by manufacturing firms, particularly when employing in-house labour is costly. We argue intuitively in this section, while **Appendix D** presents an analytical framework with numerical examples illustrating the impacts of greater import competition. Drawing inspiration from 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. 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. In our setting, an increase in quantity produced makes the lower marginal cost from outsourcing more attractive, inducing the firm to outsource more by incurring a higher fixed costs of outsourcing. An increase in import competition is hence associated with more outsourcing and lower marginal costs, prices and quantities produced. A similar idea is fleshed out in Navas and Licandro (2011), who show a pro-competitive effect of trade on innovation. In their setting, trade openness makes markets more competitive, reducing prices and increasing quantities. Firms undertake cost-reducing innovations that involve investments in research and development and the increase in production spurs firms to innovate more.

We note (and show in our analytical framework) that the impacts of an increase in import competition are heterogeneous across firms with varying productivities and states with pro-worker versus pro-employer labour regulation, with attenuated impacts for low productivity firms and firms in states with pro-employer labour regulation.

We acknowledge that an increase in import competition from China is also likely to act as a negative demand shock for Indian firms. This can be associated with more outsourcing if firms want to cut costs of production. However, from a theoretical point of view, it raises the question of why profit-maximizing firms did not take this step prior to the import competition shock in order to reduce costs. One possibility is an x-efficiency argument whereby managers acquire an incentive to improve efficiency in the face of an exogenous increase in product market competition. However, our empirical results show an increase in the number of product varieties produced and quantities sold for firms in pro-worker states involved in outsourcing, which is more in line with a pro-competitive effect of trade that, in turn, increases the incentive to reduce marginal costs of production by outsourcing. Alternative strategies may be to let go of workers by substituting to capital-intensive production techniques or employ in-house labour under flexible or fixed-term contracts, both of which are more difficult to adopt in states with pro-worker labour regulation.

Empirical Testing We now compare the impact of Chinese import competition on costs, prices, markups, total number of varieties produced, quantities sold, and total sales of firms engaged in outsourcing and not, differentially in states with pro-worker versus pro-employer labour laws. Our hypothesis is that import competition would induce a firm to lower prices and expand output, thereby incentivizing them to incur the fixed costs of outsourcing production to avail of lower marginal costs. Hence, greater import competition should be associated with a decrease in costs and price and an increase in the number of varieties produced and quantities sold, more so for firms that are engaged in outsourcing and located in states with pro-worker labour regimes.

Results are presented in **Table 9**. Columns (1) – (4) of **Panel A** use marginal costs, whereas Columns (5) – (8) of **Panel A** present results for the price charged by firms, respectively for firms in states with pro-worker and pro-employer labour regimes that outsource and do not outsource.[52] Results are consistent with our conceptual framework. Chinese import penetration is negatively associated with a firm's marginal costs. This effect is larger and more significant for firms that outsource and are in states with pro-worker labour regulation. Firms located in states with pro-worker labour regulation experience approximately a 30% larger drop in their costs as a result of outsourcing, compared to firms located in states with pro-employer labour regulation. The same applies for prices. Firms involved in outsourcing charge lower prices, but the decrease is 20% more in states with pro-worker labour regulation. Additionally, results show that firms do not drop their prices to the extent of the reduction in their costs, pointing to an incomplete pass through of cost reductions. Next, we use markups as the outcome variable in Columns (1) – (4) of **Panel B**. We control for marginal costs in all regressions, given that our idea is to explore pro-competitive effects. Broadly, we find that Chinese import competition leads to a drop in markups, but the impact is only statistically significant for firms involved in outsourcing and in states with pro-employer laws.

Columns (5) – (8) of **Panel B** and Columns (1) – (4) of **Panel C** look at the number of product varieties produced and total quantities sold by firms, respectively. We find that firms involved in outsourcing, especially in states with pro-worker labour regulation, experience an increase in the number of product varieties produced and total quantities sold. Lastly, we use the total sales of a firm as a dependent variable in Columns (5) – (8) of **Panel C**. In theory, the effect on total sales revenue is ambiguous, given that prices drop and quantities sold increase; our estimates show the same.

These findings can shed light on central issues related to firm level impacts of import competition; specifically, those related to effects on a firm's boundary, strategy, efficiency, productivity, and growth. This is suggested by a growing body of literature that links vertical integration and outsourcing to firm productivity, performance, and growth. Some studies that provide evidence for this include Grossman and Helpman (2002), Antras and Helpman (2004), Chen et al. (2004), Acemoglu et al. (2010), Hart and Holmstrom (2010), Chongvilaivan and Hur (2012), Legros and Newman (2013), Alfaro et al. (2016), and

[52] To estimate prices, costs, and markups, we follow the methodology by De Loecker et al. (2016). In our framework, the cost of outsourcing is a fixed cost. Using this assumption, we use the estimates of the production function to calculate markups and marginal costs at the firm-product level. The main advantages of using this method are: (i) allows to estimate the production functions for multi-product firms; (ii) uses information on quantities of products to overcome the bias in revenue based production function estimates; (iii) also accounts for unobserved input allocations and firm specific input prices.

Boehm and Oberfield (2018). For instance, Alfaro et al. (2016) examine the impact of tariffs on firm boundaries. The empirical results provide strong support for the view that higher output prices generate more vertical integration. Boehm and Oberfield (2018) document that in industries that tend to rely more heavily on relationship-specific intermediate inputs, plants in states with more congested courts shift their expenditures away from intermediate inputs and appear to be more vertically integrated. While our paper looks at similar issues, we show a new channel that is relatively understudied – import competition and its interaction with labour regulation.

5 Informal Sector

A common feature of developing countries in Africa, Latin America and South Asia, is the presence of a large informal sector.[53] According to an estimate by Charmes (2012), the informal sector in India contributed around 46% of non-agricultural GVA and 38% of total GDP in India. In terms of employment, according to a recent report by ILO (2018), close to 81% of all employed persons in India make a living by working in the informal sector. 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, misallocation of resources and TFP 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 labour laws. This suggests that rigid labour 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 labour 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 rounds 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

[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.

firms in the formal sector 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 on a value of 1 if (i) a micro-enterprise in the informal sector is on contract to sell a large proportion of 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 10 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) runs estimates a linear probability model. A 10 percentage point increase in Chinese import penetration leads to an increase of 12 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 labour market regulation, $DComp^{China}_{IN,jt} * LMktR_s$, in Columns (4) – (6). We find similar effects as before – impacts are attenuated for informal sector enterprises located in states with pro-employer labour regulation. Effects are significantly higher for informal sector enterprises located in rural rather than urban areas – by about 3 times. Results are consistent with our hypothesis that costs imposed by stringent labour 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 robust to using alternate indicators.

One important implication of these results is that higher outsourcing to informal sector enterprises might increase the size of the sector and impact its performance. 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, especially a developing one. 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 the 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 outsourcing. This result is magnified particularly for states with pro-worker labour market regulation and for firms which are small. In other words, small informal firms located in states with pro-worker labour regulation engage in outsourcing with formal sector firms and expand their output. Our results complement the work by McCaig and Pavcnik (2018), who show that an export market shock can lead to a reallocation of workers from the informal to formal sector leading to a contraction of the informal sector.[56] To summarize, our findings suggest that the impact of trade on

[55] We use total employment as an alternative outcome of interest – the result remains the same.

[56] Ulyssea (2010) also finds that a decline in entry cost in the formal sector reduces the size of the informal sector and improves

informality can be heterogeneous across informal sector firms, with those that engage in sub-contracting experiencing a boost relative to other firms.

6 Other Types of Outsourcing and a Placebo Test

A salient contribution of our paper is the new measure of outsourcing. We compare our benchmark results to results from using more traditional measures from the literature, such as import of intermediates (raw materials), expenditure on the use of domestic raw materials and energy costs of a firm.[57] First, 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 raw materials to outsourcing their production, such that total outsourcing remains unaffected. Results are reported in **Panel A** of **Table 11**. Column (1) uses total outsourcing expenditure of a firm as a share of total expenses as the dependent variable. We find that Chinese import competition significantly increases the share of outsourcing expenditure. However, this aggregate effect could be driven by the increase in our measure (outsourcing of manufacturing jobs) and not by other types of outsourcing. In order to examine whether such is the case or not, Column (2) drops our measure from total outsourcing expenditure. Our estimation shows that traditional measures of outsourcing also increase in response to Chinese import competition – a 10 percentage point increase in the import penetration ratio increases the share of traditional outsourcing expenses of a firm by around 1 percentage point.

Columns (3) – (5) decompose individual components of the traditional outsourcing measure; column (3) uses domestic raw material expenditure, column (4) import of intermediates, and column (5) energy costs. We find that the increase in the composite, traditional measure of outsourcing is completely driven by an increase in domestic raw material expenditure. Put together, these results indicate that an increase in Chinese import competition is associated with an increase in outsourcing more broadly. More importantly, ignoring the outsourcing of manufacturing tasks captured by our measure would underestimate the impact of an increase in import competition on outsourcing.

The next concern we address is that the differential effects of an increase in import competition on outsourcing across states with varying labour regimes might simply be driven by state-specific confounding factors other than labour regulation. To address this concern, we estimate a placebo regression following equation (8), with outsourcing of professional services as the outcome of interest. We present results in Column (6). Professional services include audit, consultancy, IT/ITES, marketing, advertising, and distribution expenses of a firm. Labour laws under the IDA only apply in case of manufacturing jobs and do not apply to other types of outsourcing jobs, such as professional jobs that involve skilled tasks. If the differential effects we estimate can indeed be attributed to labour regulation, we should not pick them up for outsourcing of professional jobs. From Column (6), we find no effect of an increase in Chinese import competition on outsourcing of professional services by a firm. This reassures us that labour regulation is a plausible determinant

overall labour market performance.

[57] All of these measures are used as share of total expenses of a firm.

of outsourcing responses. Finally, the coefficients on $DComp^{China}_{IN,jt-1} \times LMktR_s$ across columns employing traditional outsourcing measures as dependent variables show no differential relationship between Chinese import competition and outsourcing across states with varying labour regulation regimes. Combined, our results provide strong support for the idea that an increase in import competition is associated with an increase in outsourcing of manufacturing jobs, particularly under stringent labour regimes that drive up the relative cost of operating in the formal sector in developing countries.

7 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 effects of import competition and how labour market regulation can play a role in determining how firm outsourcing responds to trade shocks. This may be prominent in light of the emerging literature on the link between trade liberalization and firm organization, and its effects on productivity and growth, especially in developing economies. This paper attempts to fill this gap.

Adopting the case of India, we ask if import competition affects outsourcing. We explore the differential effect of trade on outsourcing across firms located in pro-worker versus pro-employer labour 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 labour laws across states to establish that import competition is associated with greater outsourcing in states with pro-worker labour regulation that potentially increases the relative cost of employing labour in-house in the formal sector. In addition, we show that firms involved in outsourcing reduce their costs, charge a lower price, and increase the quantities sold and product varieties produced. 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 labour regulation, among small firms and firms located in rural areas. These firms also experience an increase in their output per worker. We thereby underscore the interaction between trade and labour market institutions in determining the fragmentation of production activity.

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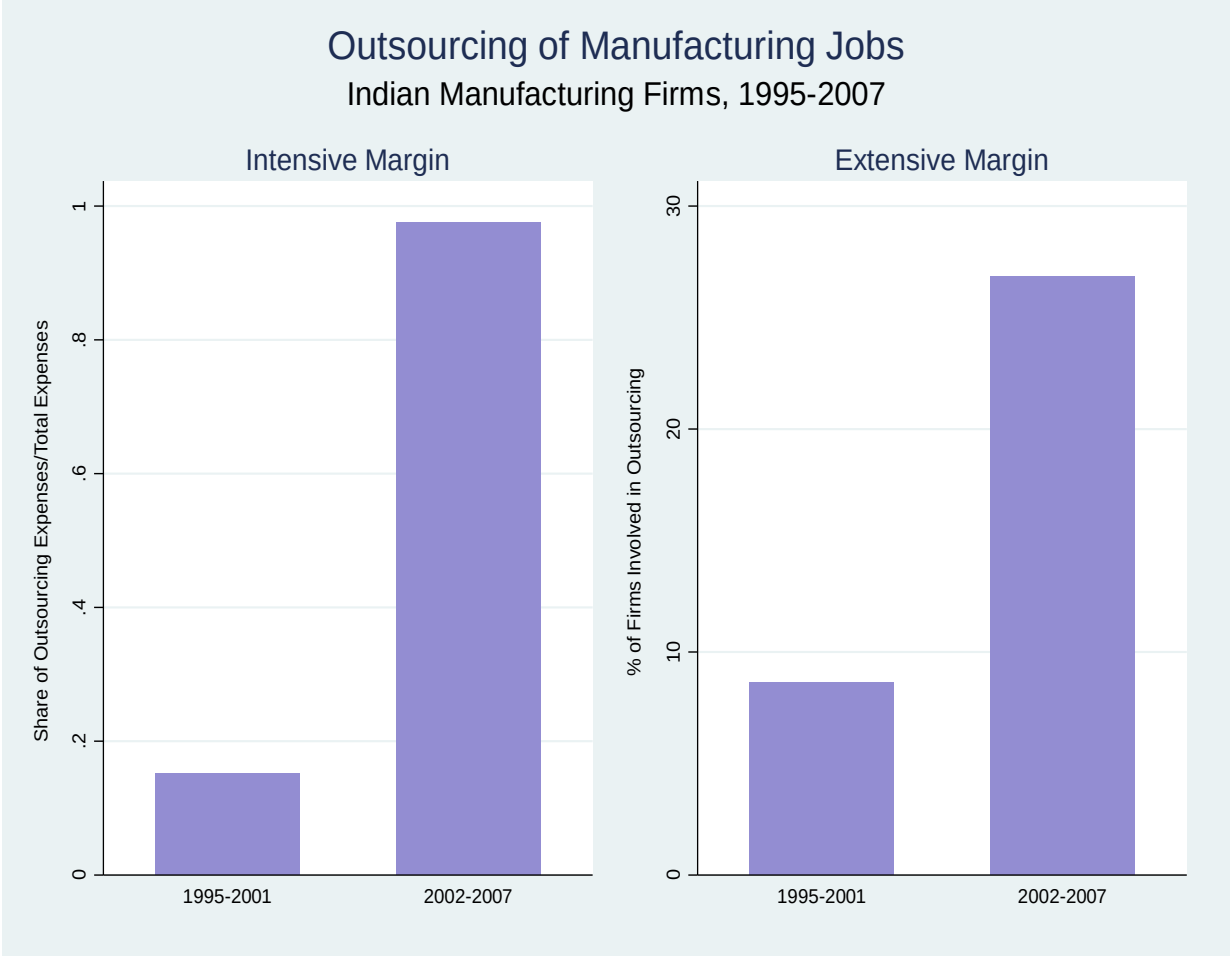


Figure 1: Outsourcing of Manufacturing Jobs, Indian Manufacturing Firms, 1995-2007

Notes: Panel A plots the share of outsourcing expenses on manufacturing jobs in total expenses. Panel B plots percentage of firms involved in outsourcing.

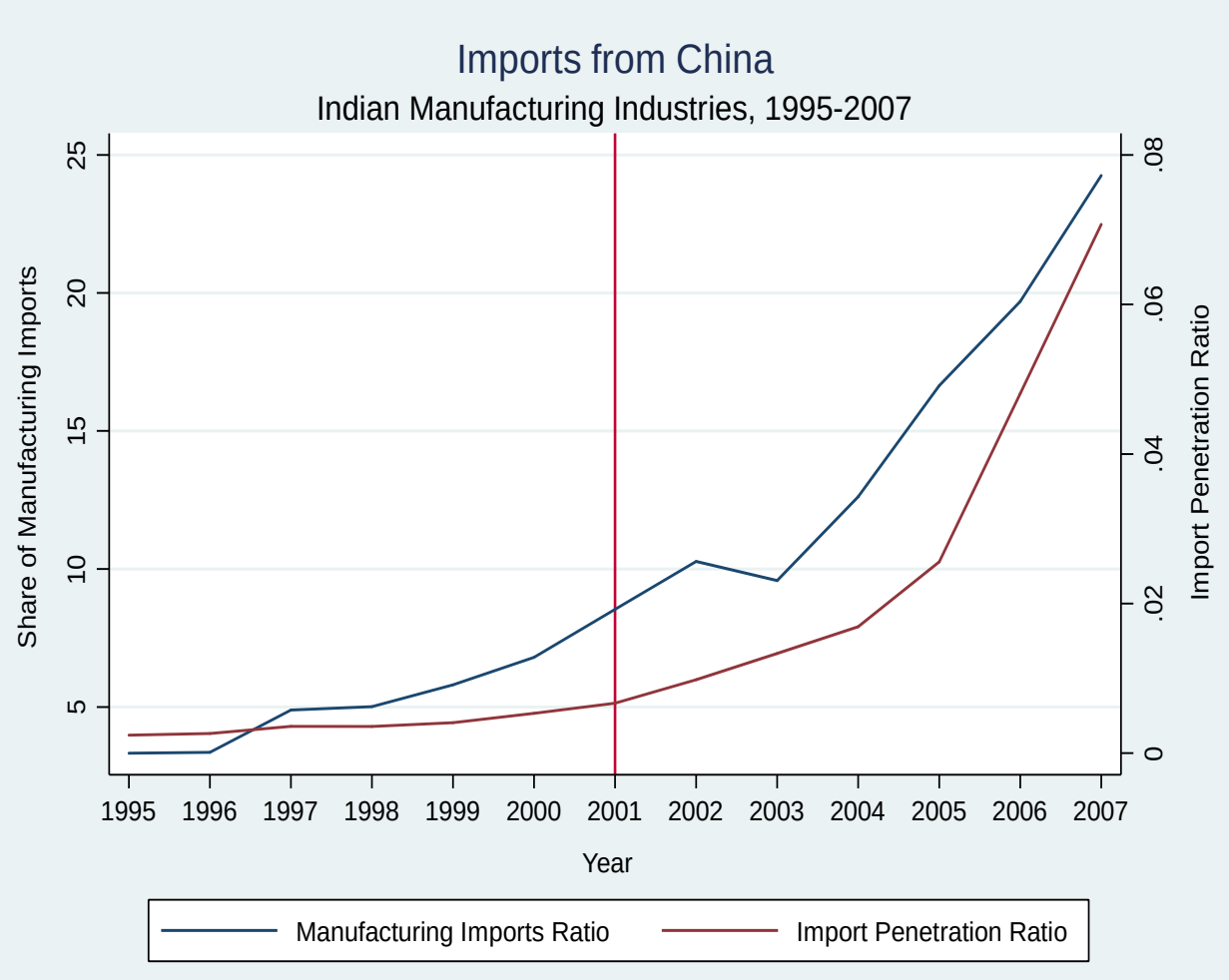


Figure 2: Share of Manufacturing Imports and Import Penetration Ratio for India from China, Indian Manufacturing Industries, 1995-2007

Notes: 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.

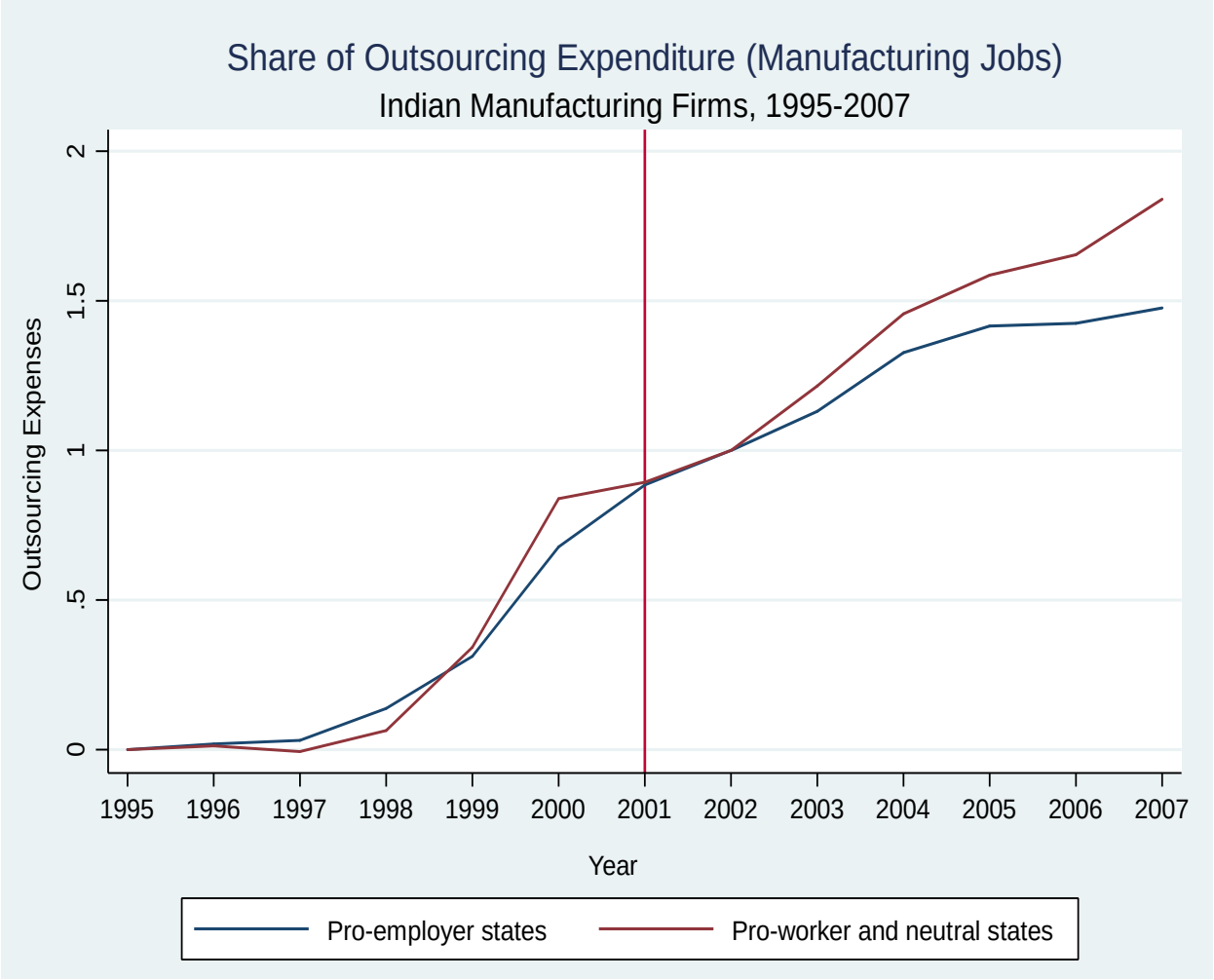


Figure 3: Normalized Expenditure of Outsourcing of Manufacturing Jobs, Indian Manufacturing Firms, 1995-2007

Notes: Figure plots the normalized share of outsourcing expenses of manufacturing jobs in total expenses. 'States with Pro-employer Labour Laws': Andhra Pradesh, Karnataka, Rajasthan, Tamil Nadu and Uttar Pradesh. 'States with Pro-worker and Neutral Labour Laws': Assam, Bihar, Gujarat, Haryana, Kerela, Madhya Pradesh, Maharastra, Orissa, Punjab, and West Bengal.

Table 1: 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
1992	2.32	2.60	18.95	38.27	124.42	402.50
2001	20.51	10.35	48.88	36.21	116.11	568.70
2007	218.80	84.51	187.24	126.48	288.42	1946.65
Growth (1992-2007)	9339.34%	3150.38%	888.07%	230.49%	131.81%	383.64%

Notes: Numbers represent real trade values (deflated using Wholesale Price Index of the entire manufacturing sector in India) in INR Millions. Source: Chakraborty and Henry (2019).

Table 2: Firms Reporting Outsourcing of Manufacturing Jobs Vs. Firms Not Reporting Outsourcing of Manufacturing Jobs

	Outsourcing Manufacturing Jobs				
	Mean	Median	Std. Dev.	Min	Max
Panel A: Firms with Reported Outsourcing Expenditure					
Sales	2624.44	257.8	34441.31	0.1	2000000
Assets	2569.80	309.65	24727.86	0.2	1200000
GVA	1404.75	121.6	20711.66	0	1200000
Productivity	0.557	0.496	0.355	0.0001	5.50
Exports	406.27	4.9	5828.86	0	585313
Imports	700.46	7.3	15583.72	0	972704
R&D Intensity	0.013	0.009	0.724	0	89.86
Capital Employed/GVA	7.08	1.73	121.48	0	16789
MCom/TComp	0.062	0.032	0.085	0	1
MIncentives/TIncentives	0.049	0	0.192	0	1
Panel B: Firms with No Reported Outsourcing Expenditure					
Sales	1640.03	321.9	14519.2	0	1000000
Assets	1616.59	224	9104.12	0.1	347562
GVA	314.55	0	5671.78	0	591644
Productivity	0.533	0.475	0.348	0.0001	4.52
Exports	59.47	0	903.33	0	119211
Imports	117.48	0	3115.78	0	391216
R&D Intensity	0.002	0	0.089	0	18.73
Capital Employed/GVA	3.40	0	81.34	0	10688
MCom/TComp	0.020	0	0.080	0	1
MIncentives/TIncentives	0.010	0	0.085	0	1

Notes: All the numbers reported are in INR Millions. 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. '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. 'MComp/TComp' is the share of managerial compensation. 'MIncentives/TIncentives' is the share of managerial incentives. For further information on variables see data **Appendix A**.

Table 3: Outsourcing of Manufacturing Jobs - Total Expenditure, Share of Expenses, Percentage of Firms

	Outsourcing Manufacturing Jobs		
	Total	Share	% of Firms
Panel A			
Aggregate	37.00	0.47	13.86
Panel B: Dividing into States by Labour Laws			
States with pro-employer Labour Laws	32.46	0.43	11.80
States with pro-worker Labour Laws	41.02	0.57	15.47

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

Table 4: Outsourcing Expenditure and Intensity of Manufacturing Jobs: By User-based Industries and Labour Laws

Industry Name	Outsourcing Manufacturing Jobs					
	Total		Share		% of Firms	
	States with Pro-employer Labour Laws	States with Pro-worker Labour Laws	States with Pro-employer Labour Laws	States with Pro-worker Labour Laws	States with Pro-employer Labour Laws	States with Pro-worker Labour Laws
	(1)	(2)	(3)	(4)	(5)	(6)
Final Goods	31.99	42.57	0.51	0.60	12.69	15.22
Intermediate Goods	33.06	39.93	0.35	0.44	10.83	15.65

Notes: Numbers represent average across manufacturing firms belonging to each user-based industry. Final Goods include Consumer Durables and Consumer Non-Durables, whereas, Intermediate Goods include Basic, Intermediate and Capital goods. Columns (1) and (2) calculate the mean outsourcing expenditure by an Indian manufacturing firm. It is expressed in INR Million. Columns (3) and (4) represent the mean share of outsourcing expenditure in total expenditure of a firm multiplied by 100. Columns (5) and (6) represent mean percentage of firms involved in outsourcing of manufacturing jobs. 'States with Pro-employer Labour Laws' are: Andhra Pradesh, Karnataka, Rajasthan, Tamil Nadu and Uttar Pradesh. 'States with pro-worker Labour Laws' are: Assam, Bihar, Gujarat, Haryana, Kerela, Madhya Pradesh, Maharastra, Orissa, Punjab, and West Bengal. These include neutral states as well.

Table 5: Distribution of Industries by Outsourcing Share of Manufacturing Jobs

	Outsourcing Share (%)	No of Industries
	(1)	(2)
$1992-2001$	0–0.25	67
	0.26–0.5	22
	0.6–1	7
	$\rangle$ 1	4
$2002-2007$	0–0.25	22
	0.26–0.5	21
	0.6–1	19
	$\rangle$ 1	39

Notes: Column (1) represents the mean outsourcing share of an industry at NIC 4-digit level. Outsourcing Share is defined as the share of outsourcing expenditure in total expenses multiplied by 100. Column (2) counts the number of industries within the relevant range of outsourcing share.

Table 6: Import Competition and Outsourcing of Manufacturing Jobs: Benchmark Results

	Outsourcing Expenses (Manufacturing Jobs)/ Total Expenses									
	Year 1995−2007				Year 1995−2001	Year 1995−2007				Year 1995−2001
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$DComp^{China}_{IN,jt-1}$	0.019*** (0.004)	0.016*** (0.004)	0.017*** (0.004)	0.017*** (0.004)	0.041 (0.051)	0.024*** (0.006)	0.031*** (0.005)	0.024** (0.010)	0.030*** (0.005)	0.030 (0.296)
$FComp^{China}_{IN,jt-1}$	0.002** (0.001)	0.0001 (0.0001)	0.0001 (0.0001)	0.0001 (0.0001)	0.0003 (0.0003)	0.0002* (0.0001)	0.0001 (0.0001)	0.0001 (0.0001)	0.0001 (0.0001)	0.0003 (0.0003)
$InpTariff_{jt-1}$				0.002 (0.002)	0.003 (0.007)				0.002 (0.002)	0.003 (0.007)
$OutTariff_{jt-1}$				0.003* (0.002)	0.001 (0.003)				0.003* (0.002)	0.001 (0.003)
Estimation Method	OLS	OLS	OLS	OLS	OLS	IV	IV	IV	IV	IV
Firm Controls$_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-Square	0.58	0.59	0.59	0.59	0.55	0.04	0.06	0.05	0.06	0.04
N	35,285	35,285	35,285	35,285	15,572	35,489	35,489	35,489	35,489	15,810
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	No	No	No	No	Yes	No	Yes	No	No
Industry FE (4-digit)*Year Trend	Yes	No	No	No	No	Yes	No	No	No	No
Industry FE (3-digit)*Year FE	No	Yes	No	Yes	Yes	No	Yes	No	Yes	Yes
Industry FE (2-digit)*Year FE	No	No	Yes	No	No	No	No	Yes	No	No
State FE*Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1st Stage										
						$DComp^{China}_{IN,,jt-1}$				
$DComp^{China}_{BIMM,jt-1}$						0.149*** (0.011)	0.180*** (0.031)	0.173*** (0.023)	0.180*** (0.031)	0.035*** (0.011)
F-Stat						155.06	143.64	164.23	192.77	10.49

Notes: Columns (1) - (10) use expenditure on outsourcing of manufacturing jobs (especially to the informal sector) as a share of total expenses as the dependent variable. '$DComp^{China}_{IN,jt-1}$' is the Chinese import pentration 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 1994 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). '$InpTariff$' and '$OutTariff$' are the natural logarithm of input and output tariffs faced by Indian industries at 2004 NIC 4-digit level. '$FComp^{China}_{IN,jt-1}$' is the measure of Chinese import competition faced by Indian firms in an export destination (US). '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. Intercepts are not reported. *,**,*** denotes 10%, 5% and 1% level of significance, respectively.

Table 7: Import Competition and Outsourcing of Manufacturing Jobs: Robustness Checks

	Outsourcing Expenses (Manufacturing Jobs)/ Total Expenses											
			Accession to WTO	First Diff	Long Diff	FComp UEA	TB Analysis	LR (2013)	PPML	DComp World,HI	DComp Other Regions	Intermediate Inputs
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$DComp^{China}_{IN,jt-1}$	0.020*** (0.004)	0.032*** (0.005)		0.009** (0.002)	0.009** (0.005)	0.031*** (0.004)		0.996*** (0.135)	0.016*** (0.002)	0.043** (0.021)	0.058** (0.027)	0.063** (0.024)
$(OutMan\ Jobs/TE)_{it-1}$	0.312*** (0.066)											
$DComp^{Other\ LWC}_{IN,jt-1}$		−0.005 (0.003)										
$AvgM^{China}_{IN,j} \times WTO_t$			0.011** (0.005)									
$DComp^{China}_{IN,jt-1} \times (t-2001)T$							−0.013* (0.007)					
$DComp^{China}_{IN,jt-1} \times (2002-2007)T$							0.022** (0.009)					
Estimation Method	IV	IV	IV	OLS	IV	IV	OLS	IV	OLS	IV	IV	IV
Other Trade Channels	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls$_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-Square	0.17	0.06	0.06	0.01	0.11	0.06	0.57	0.06	n/a	0.06	0.06	0.07
N	35,489	33,647	35,489	32,543	6,063	33,884	35,489	35,489	43,003	33,101	33,101	32,621
Firm FE	Yes	Yes	Yes	No	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	Yes
State FE*Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Columns (1) – (12) use expenditure on outsourcing of manufacturing jobs (especially to the informal sector) as a share of total expenses as the dependent variable. All the regressions are run for the years 1995-2007. '$DComp^{China}_{IN,jt-1}$' is the Chinese import pentration 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 1994 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). '$(OutMan\ Jobs/TE)_{it-1}$' is the lagged dependent variable in Column (1). '$DComp^{Other\ LWC}_{IN,jt-1}$' is the share of imports from all other low-wage countries in Column (2). In Column (3), '$AvgM^{China}_{IN,j}$' is the average of imports from China for each of the 4-digit industry group between 1995 and 2001. 'WTO_t' is a year dummy variable which represents China's accession to WTO. It takes a value 1 if year is greater than equal to 2002. '$(t-2001)T$' captures the differential pre- and post-trends of China joining the WTO in 2001; whereas '$(2002-2007)T$' only captures a fixed time trend after China joined WTO in 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. Column (6) controls for competition faced by Indian firms not just in the US, but also in the EU and ASEAN as third-country markets. Columns (7) uses a trend break model. In column (8), the Chinese import penetration variable is at the firm level, *a la* Liu and Rosell (2013). Column (9) employs a PPML model. Columns (10) - (12) control for import comeptition from high-income countries, other emerging economies and Chinese import penetration in intermediate input sectors, respectively. '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. 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.

Table 8: Import Competition and Outsourcing of Manufacturing Jobs: The Role of Labour Market Regulation

	Outsourcing Expenses (Manufacturing Jobs)/ Total Expenses							
	Using Gupta et al. (2009)							Using Adhvaryu et al. (2013)
				Year 1995−2001	Single-Prod Firms	Multi-Prod Firms	Baseline Character	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel A: OLS							
$DComp^{China}_{IN,jt-1}$	0.026*** (0.004)	0.026*** (0.006)	0.026*** (0.004)	0.007 (0.008)	−0.003 (0.019)	0.026*** (0.007)	0.046*** (0.013)	0.010 (0.008)
$DComp^{China}_{IN,jt-1} \times LMktR_s$	−0.031*** (0.009)	−0.027*** (0.007)	−0.031*** (0.007)	−0.022 (0.044)	0.058 (0.084)	−0.028*** (0.011)	−0.037** (0.014)	
$DComp^{China}_{IN,jt-1} \times pro-worker$								0.033*** (0.008)
$DComp^{China}_{IN,jt-1} \times neutral$								0.018 (0.018)
R-Square	0.61	0.62	0.61	0.55	0.74	0.63	0.62	0.62
N	32,375	32,105	32,105	14,108	3,615	28,760	32,375	32,349
	Panel B: IV							
$DComp^{China}_{IN,jt-1}$	0.031*** (0.006)	0.054*** (0.008)	0.040*** (0.008)	2.169 (2.585)	0.085 (0.198)	0.040*** (0.004)	0.057*** (0.018)	0.0002 (0.021)
$DComp^{China}_{IN,jt-1} \times LMktR_s$	−0.041** (0.020)	−0.038** (0.015)	−0.044** (0.017)	−0.433 (0.428)	0.468 (0.523)	−0.033* (0.020)	−0.041** (0.016)	
$DComp^{China}_{IN,jt-1} \times pro-worker$								0.048*** (0.008)
$DComp^{China}_{IN,jt-1} \times neutral$								0.031*** (0.007)
Firm Controls$_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other Trade Channels	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-Square	0.04	0.07	0.05	0.02	0.33	0.09	0.07	0.45
N	29,396	29,396	29,396	11,820	2,350	27,046	29,396	32,375
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	No	No	No	No	No	No	No
Industry FE (4-digit)*Year Trend	Yes	No	No	No	No	No	No	No
Industry FE (3-digit)*Year FE	No	Yes	No	Yes	Yes	Yes	Yes	Yes
Industry FE (2-digit)*Year FE	No	No	Yes	No	No	No	No	No
State FE*Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Columns (1) – (8) use expenditure on outsourcing of manufacturing jobs (especially to the informal sector) as a share of total expenses as the dependent variable. '$DComp^{China}_{IN,jt-1}$' is the Chinese import pentration 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 1994 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). '$LMktR_s$' is an indicator for labour market regulation. It takes a value 1 if a state has pro-employer labour market laws and 0 otherwise. '$pro-worker$' 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. '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. Column (7) controls for interactions of Chinese import penetration with state level baseline characteristics. Standard errors in parentheses are clustered at the industry level. 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.

Table 9: Import Competition and Outsourcing of Manufacturing Jobs: Probing Mechanisms

	Outsourcing = 1		Outsourcing = 0		Outsourcing = 1		Outsourcing = 0	
	Pro-work States	Pro-emp States	Pro-work States	Pro-emp States	Pro-work States	Pro-emp States	Pro-work States	Pro-emp States
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel A							
	Costs				Prices			
$DComp^{China}_{IN,jt-1}$	-1.269^{***} (0.224)	-0.943^{***} (0.155)	-0.107 (1.105)	-0.157 (0.564)	-0.471^{***} (0.138)	-0.408^{**} (0.198)	-0.262 (0.209)	-0.310 (0.339)
R-Square	0.59	0.63	0.89	0.89	0.89	0.67	0.89	0.89
N	3,303	10,223	8,435	17,089	3,303	10,227	8,435	17,097
	Panel B							
	Markups				Product Varieties Produced			
$DComp^{China}_{IN,jt-1}$	-0.145 (0.231)	-0.222^{*} (0.131)	-0.084 (0.261)	-0.337 (0.330)	1.089^{***} (0.269)	-0.026 (0.123)	-0.813^{***} (0.299)	0.004 (0.421)
R-Square	0.83	0.85	0.84	0.84	0.86	0.84	0.80	0.80
N	3,303	10,223	8,435	17,089	2,603	8,733	8,815	18,062
	Panel C							
	Quantities Sold				Sales			
$DComp^{China}_{IN,jt-1}$	0.837^{***} (0.275)	0.088 (0.169)	0.448 (0.351)	-1.039^{**} (0.533)	0.103 (0.184)	-0.128 (0.094)	-0.552 (0.546)	-0.359 (0.230)
R-Square	0.96	0.96	0.96	0.96	0.93	0.93	0.89	0.89
N	3,017	9,102	7,610	15,223	2,512	8,467	7,385	15,416
Estimation Method	IV	IV	IV	IV	IV	IV	IV	IV
Other Trade Channels	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls$_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Product FE	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

Notes: In Panel A, columns (1) – (4) use marginal costs and columns (5) – (8) use prices; in Panel B, columns (1) – (4) use markups and columns (5) – (8) use number of product varieties produced; in Panel C, columns (1) – (4) use quantities sold and columns (5) – (8) use total sales of a firm as the dependent variable, respectively. '$DComp^{China}_{IN,jt-1}$' is the Chinese import pentration 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 1994 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). '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. We use 'Marginal Cost' as an additional control in the regressions involving markups as the dependent variable. '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. 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.

Table 10: Import Competition, Labour Market Dynamics, and Outsourcing: Using Data from the Informal Sector

	Panel A							
	Outsource = 1 (a firm is on contract or sells its output to other enterprises)						Outsource = 1 (firm sells to other enterprises)	Outsource = 1 (a firm is on contract)
		Probit	Logit		Urban	Rural		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$DComp^{China}_{IN,jt}$	1.196***	0.693**	0.671**	1.538***	0.951***	2.101***	1.660***	0.578***
	(0.053)	(0.272)	(0.286)	(0.068)	(0.088)	(0.108)	(0.067)	(0.089)
$DComp^{China}_{IN,jt} \times LMktR_s$				−0.745***	−0.432***	−1.295***	−0.682***	−0.019
				(0.096)	(0.113)	(0.166)	(0.094)	(0.120)
R-Square	0.41	0.33	0.33	0.41	0.39	0.41	0.44	0.53
N	190,496	182,432	182,432	190,496	116,483	74,013	133,916	44,471
Estimation Method	IV	OLS	OLS	IV	IV	IV	IV	IV
	Panel B							
	Output (per Worker)							
	Outsource = 1		Outsource = 0					
	Big Firm	Small Firm	Big Firm	Small Firm				
$DComp^{China}_{IN,jt}$	0.978***	0.317***	0.119	−0.173				
	(0.177)	(0.119)	(0.452)	(0.123)				
$DComp^{China}_{IN,jt} \times LMktR_s$	0.181	−0.313***	0.616	−0.004				
	(0.222)	(0.155)	(0.560)	(0.176)				
R-Square	0.73	0.42	0.49	0.31				
N	68,722	34,460	39,634	47,381				
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

Notes: 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 (in the formal sector) 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 (in the formal sector) and column (8) uses an outsourcing indicator variable which takes a value 1 if a firm is on contract to sell to another firm (in the formal sector) or middleman. 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 pentration 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 1994 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). '$LMktR_s$' is an indicator for labour market regulation. It takes a value 1 if a state has pro-employer labour 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. Standard errors in parentheses are clustered at the industry level. 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.

Table 11: Import Competition and Other Types of Outsourcing

	Total Outsourcing Expenditure		Other Outsourcing Expenses			
	Traditional + Our Measure	Traditional Measure	Raw Material Expenditure		Energy Costs (Power + Fuel + Water)	Professional Jobs
			Domestic	Import		Audit, Consultancy, ITES, Advertising, Marketing, Doistribution
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: Aggregate					
$DComp^{China}_{IN,jt-1}$	0.145** (0.069)	0.109* (0.066)	0.103** (0.048)	0.034 (0.063)	0.006 (0.013)	−0.071 (0.052)
R-Square	0.08	0.07	0.04	0.03	0.04	0.04
N	29,554	29,554	29,554	29,554	29,554	29,554
	Panel B: Role of Labour Market Regulation					
$DComp^{China}_{IN,jt-1}$	0.065 (0.073)	0.042 (0.073)	0.683** (0.272)	0.049 (0.060)	−0.004 (0.014)	−0.057 (0.046)
$DComp^{China}_{IN,jt-1} \times LMktR_s$	0.602 (0.445)	0.717* (0.421)	0.033 (0.044)	0.147 (0.226)	0.111** (0.050)	−0.028 (0.024)
R-Square	0.08	0.07	0.04	0.03	0.04	0.05
N	28,112	28,112	28,112	28,112	28,112	28,112
Other Trade Channels	Yes	Yes	Yes	Yes	Yes	Yes
Estimation Method	IV	IV	IV	IV	IV	IV
Firm Controls$_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE (2-digit)*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
State FE*Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Column (1) utilizes total outsourcing expenditure (we define total outsourcing as the sum of outsourcing of manufacturing jobs, import of raw materials, domestic raw material expenditure, and energy costs); column (2) uses the total outsourcing measure our measure of outsourcing (outsourcing of manufacturing jobs); column (3) uses domestic raw material expenditure, while column (4) uses expenditure on import of raw materials; column (5) uses energy costs, 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 share of total expenses of a firm. '$DComp^{China}_{IN,jt-1}$' is the Chinese import pentration 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 1994 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. '$LMktR_s$' is an indicator for labour market regulation. It takes a value 1 if a state has pro-employer labour 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. Standard errors in parentheses are clustered at the industry level. 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.

Appendix

A Data

We use an annual panel of Indian manufacturing firms that covers 9000+ firms, across 105 industries, over the period of 1995-2007. Data is used from the PROWESS database of the Centre for Monitoring Indian Economy (CMIE). All monetary-based variables measured in Millions of Indian Rupees (INR), deflated by 2005 industry-specific Wholesale Price Index (WPI). We use 2004 National Industrial Classification (NIC). We use import penetration data from the UN-COMTRADE database.

Variable definitions

Expenditure on Outsourcing of Manufacturing Jobs: These are expenses incurred by firms to get their manufacturing requirements fulfilled from outside parties, mainly from the informal sector. It is a normal practice followed by firms to outsource a part of their requirements. Also, certain firms that manufacture large products (like car manufacturers) outsource requirements to outside firms as it may not be feasible or economical for them to manufacture all inputs into the product. Many firms outsource the whole of their manufacturing process and add their brand name to the product. This variables reports any amount expended by a firm on outsourcing of manufacturing jobs. It includes labour charges, fabrication charges, processing charges, machining charges, fettling charges and the like. Other terms include – conversion charges, contracted production and sub-contracted production.

Expenditure on Outsourcing on Professional Jobs: These are the expenses incurred by firms for engaging external professional services. The services include: (i) Software development fees, (ii) IT enabled services charges, (iii) Cost audit fees, (iv) Legal charges, (v) Miscellaneous professional services, (vi) Auditors fees, (vii) Consultancy fees, (viii) Marketing expenses, (ix) Advertising expenses, and (x) Distribution expenses. Such services exclude those relating to manufacturing jobs, selling and distribution and those related to financial intermediaries or financial services.

Total Expenses: It is the sum of all the following revenue expenses incurred by a firm: (1) Raw materials, stores and spares; (2) Packaging and packing expenses; (3) Purchase of finished goods; (4) Power, fuel (including wheeling charges paid by electricity companies) & water charges; (5) Compensation to employees; (6) Indirect taxes; (7) Royalties, technical know-how fees, etc.; (8) Rent & lease rent; (9) Repairs and maintenance; (10) Insurance premium paid; (11) Outsourced manufacturing jobs; (12) Outsourced professional jobs; (13) Non-executive directors' fees; (14) Selling and distribution expenses; (15) Travel expenses; (16) Communication expenses; (17) Printing and stationery expenses; (18) Miscellaneous expenditure; (19) Other operational expenses of industrial enterprises; (20) Other operational expenses of non-financial services enterprises; (21) Financial services expenses; (22) Provision; (23) Depreciation (net of transfer from revaluation

reserves); (24) Amortisation; (25) Write-offs; (26) Prior period and extra-ordinary expenses; and (27) Provision for direct tax. The list is designed to be comprehensive; not all the item heads are not applicable to all firms. However, all disclosures are mapped to one of these or their sub-parts.

Outsourcing Indicator (NSSO): It takes a value 1 if a firm sells or is on contract to sell to another private enterprise (in the formal sector) or to a contractor/middleman. It can be divided into two parts – (1) takes a value 1 when a firm sells most of its output to another firm; and (2) takes a value 1 if a firm is on contract to sell to another firm or middlemen.

Chinese Competition at Domestic Market ($DComp^{China}_{IN,,jt}$): This is the Chinese import pentration 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 1994 for India.

Chinese Competition at Export Market ($FComp^{China}_{IN,jt}$): This is the Chinese import ratio in one Indian export market, namely the US. We also use a combined ratio of the US, EU and ASEAN. It is defined as the share of Chinese imports in total imports.

Chinese Competition for Other Developing Countries ($DComp^{China}_{BIMM,jt-1}$): We use $DComp^{China}_{BIMM,jt-1}$ as an instrument for $DComp^{China}_{IN,jt-1}$. We measure $DComp^{China}_{BIMM,jt-1}$ using Chinese imports by other developing countries such as Brazil (B), Indonesia (I), Malaysia (M) and Mexico (M).

Chinese Competition for Latin American Countries ($DComp^{China}_{LA,,jt-1}$): We use $DComp^{China}_{LA,jt-1}$ as an alternative for $DComp^{China}_{IN,jt-1}$. We measure $DComp^{China}_{LA,jt-1}$ using Chinese imports by all Latin American countries such as Brazil, Argentina, Bolivia, Uruguay, Malaysia (M) and Mexico (M).

States with pro-employer Labour Laws ($LMktR_s$): This is an indicator for labour market regulation. It takes a value 1 if a state has pro-employer labour market laws and 0 otherwise. States with pro-employer labour laws are: Andhra Pradesh, Karnataka, Rajasthan, Tamil Nadu, and Uttar Pradesh. States with pro-worker and neutral labour laws are: Gujarat, Maharastra, Orissa, West Bengal, Assam, Bihar, Haryana, Jammu and Kashmir, Punjab, Kerela, and Madhya Pradesh. Source: Gupta, Hasan and Kumar (2009).

Import Penetration from Other Low-Wage Countries ($DComp^{Other\ LWC}_{IN,jt-1}$): This is the import penetration ratio in the domestic market of India from low-wage countries (as per World Bank definition) other than China. It is constructed in a manner similar to $DComp^{China}_{IN,,jt}$.

Import Penetration Ratio from World: This is an aggregate import penetration ratio.

Import Penetration Ratio from High-Income Countries: This is an import penetration ratio of high-income countries. It includes USA and EU countries.

Import Penetration Ratio from Other Regions: It includes import penetration ratio of South American countries, Least Developed countries, Middle East and North Africa, and South Asian countries.

Input/Output Tariffs: Input/Output tariffs at the 4-digit industry level, obtained from Ahsan and Mitra (2014) for the period of 1990-2003, with the balance collected from the TRAINS-WITS tariff database.

Productivity: Total Factor Productivity (TFP) is computed using the Levinsohn and Petrin (2003) methodology.

Mcomp/Tcomp: The share of managerial compensation in total labour compensation; compensation defined as the sum of all salaries, and additional bonuses.

MWages/TWages: The share of managerial wages in total wages of a firm.

MIncentives/TIncentives: The share of managerial incentives in total incentives of a firm.

Skill intensity: It is defined as the ratio of non-production workers to total employees at the 3-digit level of 2004 NIC. We obtained this from various publications of the Annual Survey of Industries, Central Statistical Organization, India.

Factories: The number of factories at the 3-digit level of 2004 NIC.

Intermediate goods: Goods classified according to the I-O table as inputs by end-use. It combines intermediates, capital and basic goods.

Final goods: Goods classified according to the I-O table as final products by end-use. It combines consumer durable and consumer non-durable goods.

TechAdop/GVA: Share of R&D expenditure and Royalty Payments for Technical Knowhow in gross value-added.

Cap/GVA: Share of the total amount of capital employed in gross value-added.

GVA: Gross Value-Added = Total Sales - Total Raw Material Expenditure.

Assets: Total assets of a firm.

Sales: Total sales (exports + domestic sales) of a firm.

Exports: Total exports of a firm.

Imports: Total imports (imports of raw materials, finished goods, stores & spares, and capital goods)

Ownership: It indicates whether a firm is domestic-owned or foreign-owned.

Age: Age of a firm in years.

B Graphs

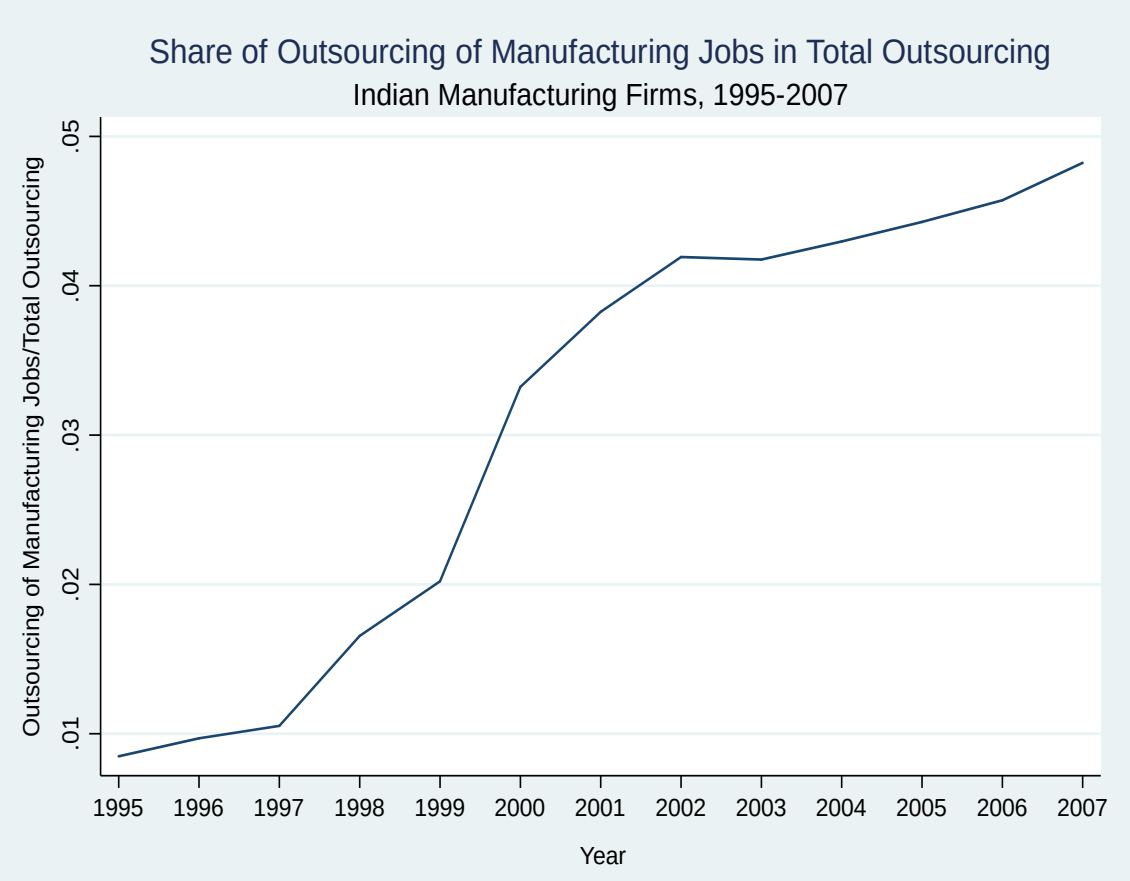


Figure B1: Outsourcing of Manufacturing Jobs as a share of Total Outsourcing Expenditure, Indian Manufacturing Firms, 1995-2007

Notes: Figure plots the average share of outsourcing expenses of manufacturing jobs in total outsourcing. We sum (i) expendiure on outsourcing of manufacturing jobs, (ii) domestic raw material expenditure, (iii) import of intermediates (raw materials), and (iv) energy costs to derive total outsourcing of a firm.

C Tables

Table C1: India's Trade Reforms and Outsourcing of Manufacturing Jobs

	Outsourcing Expenses/ Total Expenses				Outsourcing Intensity			
	Year 1992−2007	Year ≤2003	Year ≤2001	Year ≤1999	Year 1992−2007	Year ≤2003	Year ≤2001	Year ≤1999
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$InpTariff_{jt-1}$	0.001	0.006	0.004	−0.006	−0.027	−0.076	−0.053	−0.154*
	(0.002)	(0.005)	(0.005)	(0.006)	(0.048)	(0.055)	(0.086)	(0.079)
$OutTariff_{jt-1}$	0.004**	0.001	0.001	0.002	0.013	0.003	0.016	0.044*
	(0.002)	(0.002)	(0.003)	(0.002)	(0.030)	(0.036)	(0.044)	(0.024)
Firm Controls$_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-Square	0.59	0.57	0.55	0.65	0.63	0.61	0.62	0.73
N	35,703	21,577	15,727	9,751	35,703	21,577	15,727	9,751
Firm FE	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

Notes: Columns (1) – (4) use expenditure on outsourcing of manufacturing jobs (especially to the informal sector) as a share of total expenses as the dependent variable. Columns (5) – (8) takes a value 1 when outsourcing expenditure on manufacturing jobs (especially to the informal sector) of a firm is greater than zero, respectively as the dependent variable. We treat the former as the intensive and latter as the extensive margin of outsourcing. '$InpTariff$' and '$OutTariff$' are the natural logarithm of input and output tariffs faced by Indian industries at 2004 NIC 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 at the industry level. Intercepts are not reported. ** denotes 5% level of significance.

Table C2: Chinese Imports: By Industries - Before and After 2001

Industry Code	Industry Name	Chinese Imports/ World Imports	
NIC 2004 2-digit		1992–2001	2002–2007
		(1)	(2)
15	Foods Products and Beverages	1.72	3.04
16	Tobacco Products	0.69	4.95
17	Textiles	21.66	43.02
18	Wearing Apparel	9.11	18.84
19	Leather	8.80	33.70
20	Wood and Wood Products	2.81	15.73
21	Paper and Paper Products	0.92	5.39
22	Recorded Media	1.37	9.24
23	Coke, Refined Petroleum, Nuclear Fuel	10.05	10.97
24	Chemical and Chemical Products	7.94	20.12
25	Rubber and Plastics	2.27	13.51
26	Non-metallic Mineral Products	2.53	17.32
27	Basic Metals	2.05	9.01
28	Fabricated Metal Products	2.47	12.13
29	Machinery and Equipment	2.65	13.03
30	Office, Accounting & Computing Machinery	4.75	23.67
31	Electrical Machinery and Apparatus	4.75	21.57
32	Communication Equipment	4.62	19.00
33	Medical, Precision and Optical Instruments	2.82	7.42
34	Motor vehicles, Trailers and Semi-Trailers	0.39	1.28
35	Other transport equipment	1.51	20.74
36	Furniture; Manufacturing n.e.c	2.56	7.17
	Average	4.48	15.10

Notes: Numbers represent average across each industrial category according to National Industrial Classification (NIC) 2004 2-digit level. 'Chinese Imports/World Imports' is the share of Chinese imports in total imports of India. Source: Chakraborty and Henry (2018).

Table C3: Outsourcing of Manufacturing Jobs - Total Expenditure, Share of Expenses, Percentage of Firms: User-based Industries

Industry Name	Outsourcing Manufacturing Jobs		
	Total	Share	% of Firms
	(1)	(2)	(3)
Basic Goods	32.46	0.50	12.55
Intermediate	30.74	0.30	12.81
Capital Goods	46.16	0.29	12.86
Consumer Durables	36.50	0.77	18.51
Consumer Non-Durables	46.43	0.64	16.30

Notes: Numbers represent average across manufacturing firms belonging to each user-based industry. Column (1) calculates the mean outsourcing expenditure by an Indian manufacturing firm. It is expressed in INR Million. Column (2) represents the mean share of outsourcing expenditure in total expenditure of a firm multiplied by 100. Column (3) represents mean percentage of firms involved in outsourcing of manufacturing jobs.

Table C4: Outsourcing of Manufacturing Jobs - Total Expenditure, Share of Expenses, Percentage of Firms: At Industry-level (NIC 2-digit)

Industry Code	Industry Name	Outsourcing Manufacturing Jobs		
NIC 2004 2-digit		Total	Share	% of Firms
15	Foods Products and Beverages	35.50	0.17	7.30
16	Tobacco Products	77.36	1.33	18.01
17	Textiles	29.70	0.73	17.91
18	Wearing Apparel	66.54	1.41	16.17
19	Leather	25.15	1.02	15.19
20	Wood and Wood Products	3.27	0.08	7.20
21	Paper and Paper Products	9.68	0.20	9.33
22	Recorded Media	10.43	1.00	6.74
23	Coke, Refined Petroleum, Nuclear Fuel	257.13	0.15	8.06
24	Chemical and Chemical Products	26.71	0.25	12.88
25	Rubber and Plastics	16.66	0.44	17.37
26	Non-metallic Mineral Products	17.28	0.25	6.68
27	Basic Metals	59.02	0.37	14.63
28	Fabricated Metal Products	35.58	0.88	21.08
29	Machinery and Equipment	35.34	0.82	19.67
30	Office, Accounting & Computing Machinery	1.84	0.02	3.12
31	Electrical Machinery and Apparatus	20.14	0.40	13.33
32	Communication Equipment	6.24	0.25	12.06
33	Medical, Precision and Optical Instruments	10.15	0.53	14.67
34	Motor vehicles, Trailers and Semi-Trailers	1370.55	0.09	6.53
35	Other transport equipment	44.76	0.94	19.54
36	Furniture; Manufacturing n.e.c	64.69	0.72	18.07

Notes: Column (1) calculates the mean outsourcing expenditure by an Indian manufacturing firm. It is expressed in INR Million. Column (2) represents the mean share of outsourcing expenditure in total expenditure of a firm multiplied by 100. Column (3) represents mean percentage of firms involved in outsourcing of manufacturing jobs.

Table C5: Import Competition and Outsourcing of Manufacturing Jobs: Using a Different IV

	Outsourcing Expenses (Manufacturing Jobs)/ Total Expenses				
	Year 1995−2007				Year 1995−2001
	(1)	(2)	(3)	(4)	(5)
$DComp^{China}_{IN,jt-1}$	0.024*** (0.005)	0.031*** (0.003)	0.021*** (0.007)	0.031*** (0.003)	−0.212 (0.234)
$FComp^{China}_{IN,jt-1}$	0.0001 (0.0001)	−0.0001 (0.0001)	−0.00002 (0.0001)	0.0001 (0.0001)	−0.00003 (0.0002)
$InpTariff_{jt-1}$				0.0004 (0.001)	0.006 (0.010)
$OutTariff_{jt-1}$				0.003 (0.002)	0.0001 (0.003)
Estimation Method	IV	IV	IV	IV	IV
Firm Controls$_{t-1}$	Yes	Yes	Yes	Yes	Yes
R-Square	0.04	0.06	0.05	0.06	0.07
N	30,663	30,663	30,663	30,663	12,433
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	No	Yes	No	No
Industry FE (4-digit)*Year Trend	Yes	No	No	No	No
Industry FE (3-digit)*Year FE	No	Yes	No	Yes	Yes
Industry FE (2-digit)*Year FE	No	No	Yes	No	No
State FE*Year FE	Yes	Yes	Yes	Yes	Yes
1st Stage					
	$DComp^{China}_{IN,.,jt-1}$				
$DComp^{China}_{LA,jt-1}$	0.214*** (0.041)	0.197*** (0.012)	0.246*** (0.065)	0.197*** (0.012)	0.033** (0.015)

Notes: Columns (1) - (10) use expenditure on outsourcing of manufacturing jobs (especially to the informal sector) as a share of total expenses as the dependent variable. '$DComp^{China}_{IN,jt-1}$' is the Chinese import pentration ratio in the domestic market of India. 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, Chile, Argentina, Bolivia, Uruguay, etc. '$InpTariff$' and '$OutTariff$' are the natural logarithm of input and output tariffs faced by Indian industries at 2004 NIC 4-digit level. '$FComp^{China}_{IN,jt-1}$' is the measure of Chinese import competition faced by Indian firms in an export destination (US). '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. Intercepts are not reported. *,**,*** denotes 10%, 5% and 1% level of significance, respectively.

Table C6: Import Competition and Outsourcing of Manufacturing Jobs: Firm Characteristics

	Outsourcing Expenses (Manufacturing Jobs)/ Total Expenses			
	Size	End Use	Export Orientation	Ownership
	(1)	(2)	(3)	(4)
$DComp^{China}_{IN,,jt-1} \times Small\ Firm$	0.007			
	(0.007)			
$DComp^{China}_{IN,,jt-1} \times Big\ Firm$	0.013**			
	(0.016)			
$DComp^{China}_{IN,,jt-1} \times Final$		0.014**		
		(0.003)		
$DComp^{China}_{IN,,jt-1} \times Intermediate$		0.014***		
		(0.005)		
$DComp^{China}_{IN,,jt-1} \times Exporter$			−0.003	
			(0.009)	
$DComp^{China}_{IN,,jt-1} \times Non-Exporter$			0.021**	
			(0.010)	
$DComp^{China}_{IN,,jt-1} \times Domestic$				0.019***
				(0.003)
$DComp^{China}_{IN,,jt-1} \times Foreign$				−0.014
				(0.013)
Firm Controls$_{t-1}$	Yes	Yes	Yes	Yes
Other Trade Channels	Yes	Yes	Yes	Yes
R-Square	0.59	0.59	0.59	0.59
N	35,285	35,285	35,285	35,285
Firm FE	Yes	Yes	Yes	Yes
Industry FE (3-digit)*Year FE	Yes	Yes	Yes	Yes
State FE*Year FE	Yes	Yes	Yes	Yes

Notes: Columns (1) - (4) use expenditure on outsourcing of manufacturing jobs (especially to the informal sector) as a share of total expenses as the dependent variable. '$DComp^{China}_{IN,jt-1}$' is the Chinese import pentration 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 1994 for India. '$Small\ Firm$' is an indicator for firms belonging to the 1st and 2nd quartiles. '$Big\ Firm$' is an indicator for firms belonging to the 3rd and 4th quartiles. Quartiles ($Qr_{i=1,2,3,4}$) are defined according to the total sales of a firm. '$Final$' is a dummy variable that takes a value 1 if the industry produces consumer durable and non-durable products. '$Intermediate$' is a dummy variable which takes a value 1 if the industry produces basic, capital and intermediate goods. '$Exporter$' is a variable which takes a value 1 if a firm exports. '$Non-Exporter$' is a variable which assumes a value 1 if a firm's export flow is 0. '$Domestic$' is a variable which assumes a value 1 if a firm's ownership is domestic. '$Foreign$' takes a value 1 in case a firm has foreign ownership. All regressions control for '$FComp^{China}_{IN,jt}$' and its interaction terms. '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 at the industry level. Intercepts are not reported. *,**,*** denotes 10%, 5% and 1% level of significance, respectively.

Table C7: Import Competition and Outsourcing of Manufacturing Jobs: Short- and Long-term Effects

	Outsourcing Expenses/ Total Expenses				Outsourcing Intensity			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$DComp^{China}_{IN,,jt}$	0.018***			0.018	0.024			0.095
	(0.004)			(0.013)	(0.051)			(0.230)
$DComp^{China}_{IN,,jt-1}$				0.035**				0.045
				(0.017)				(0.167)
$DComp^{China}_{IN,,jt-2}$		0.040***		−0.056		−0.016		0.695*
		(0.013)		(0.062)		(0.107)		(0.371)
$DComp^{China}_{IN,,jt-3}$			0.072***	−0.0003			0.089	0.497
			(0.011)	(0.046)			(0.155)	(0.659)
Firm Controls$_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other Trade Channels	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-Square	0.61	0.64	0.67	0.67	0.64	0.66	0.68	0.68
N	32,105	29,100	26,729	26,298	32,105	29,100	26,729	26,298
Firm FE	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

Notes: Columns (1) – (4) use expenditure on outsourcing of manufacturing jobs (especially to the informal sector) as a share of total expenses and columns (5) – (8) takes a value 1 when outsourcing expenditure on manufacturing jobs of a firm is greater than zero, respectively as the dependent variable. We treat the former as the intensive and latter as the extensive margin of outsourcing. '$DComp^{China}_{IN,jt}$' is the Chinese import pentration 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 1994 for India. '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 at the industry level. Intercepts are not reported. *,**,*** denotes 10%, 5% and 1% level of significance, respectively.

Table C8: Import Competition and Outsourcing of Manufacturing Jobs: Heterogeneous Effects

	Outsourcing Expenses (Manufacturing Jobs)/ Total Expenses								
	Skill Intensity	Factories	Total Factor Productivity	Multi-Product Firms	Managerial Compensation	Managerial Wages	Managerial Incentives		
							Total	Executives	Non-Executives
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$DComp^{China}_{IN,jt-1}$	0.059*	−0.014	0.339**	0.005	−0.053	−0.036	0.007	0.007	0.464***
	(0.035)	(0.037)	(0.140)	(0.013)	(0.092)	(0.036)	(0.007)	(0.007)	(0.176)
$DComp^{China}_{IN,jt-1} \times SkIntens_j$	0.029								
	(0.025)								
$DComp^{China}_{IN,jt-1} \times Factories_j$		0.004							
		(0.005)							
$DComp^{China}_{IN,jt-1} \times MPFirm_i$				0.014***					
				(0.005)					
$DComp^{China}_{IN,jt-1} \times TFP_i$			0.541**						
			(0.236)						
$DComp^{China}_{IN,jt-1} \times MComp_i$					−0.019				
					(0.026)				
$DComp^{China}_{IN,jt-1} \times MWages_i$						−0.009			
						(0.006)			
$DComp^{China}_{IN,jt-1} \times MIncentives_i$							−0.001	−0.001	0.040***
							(0.001)	(0.001)	(0.015)
Firm Controls$_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other Trade Channels	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-Square	0.59	0.59	0.59	0.65	0.59	0.59	0.59	0.59	0.62
N	35,548	35,548	35,548	41,515	35,548	35,548	35,161	35,161	24,660
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE (3-digit)*Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE*Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Columns (1) – (9) use expenditure on outsourcing of manufacturing jobs (especially to the informal sector) as a share of total expenses as the dependent variable. '$DComp^{China}_{IN,jt-1}$' is the Chinese import pentration 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 1994 for India. 'Other Trade Channels' includes 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. '$SkIntens$' is a proxy for skill intensity at the industry level. It is defined as the share of non-production workers to total employees at the NIC 3-digit level. '$Factories$' is the number of factories at the 3-digit level NIC 2004. 'TFP' is total factor productivity at firm level estimated using Levinshon and Petrin (2003). '$MPFirm$' is a dummy variable which takes a value 1 when a firm produces more than 1 product. '$MComp$' is the share of managerial compensation in total labour compensation for firm i. '$MWages$' is the share of total manaegrial wages in total wages for firm i. '$MIncentives$' is the share of total managerial incentives in total incentives for firm i. '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. Intercepts are not reported. *,**,*** denotes 10%, 5% and 1% level of significance, respectively.

Table C9: Import Competition and Outsourcing (of Manufacturing Jobs) as a share of GVA

	Outsourcing Expenses (Manufacturing Jobs)/ GVA					
	Year 1995−2007		Year 1995−2001	Year 1995−2007		Year 1995−2001
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: Aggregate					
$DComp^{China}_{IN,jt-1}$	0.135*** (0.021)	0.137*** (0.021)	0.203 (0.180)	0.348*** (0.039)	0.347*** (0.039)	0.948 (1.558)
$FComp^{China}_{IN,jt-1}$	0.0002 (0.0006)	0.0002 (0.0006)	0.001 (0.001)	−0.0001 (0.0005)	−0.0002 (0.006)	0.001 (0.002)
$InpTariff_{jt-1}$		0.012 (0.008)	0.032 (0.025)		0.017* (0.009)	0.033 (0.025)
$OutTariff_{jt-1}$		0.0002 (0.005)	−0.002 (0.007)		−0.0001 (0.006)	−0.0001 (0.007)
R-Square	0.34	0.34	0.43	0.02	0.02	0.03
N	29,408	29,408	13,321	29,919	29,919	13,769
	Panel B: Role of Labour Market Regulation					
$DComp^{China}_{IN,jt-1}$	0.153*** (0.025)	0.155*** (0.025)	0.200 (0.205)	0.387*** (0.045)	0.387*** (0.044)	−0.140 (3.732)
$DComp^{China}_{IN,jt-1} \times LMktR_s$	−0.138*** (0.040)	−0.137*** (0.040)	−0.016 (0.191)	−0.336*** (0.113)	−0.348*** (0.111)	−0.536 (1.916)
Other Trade Channels	Yes	Yes	Yes	Yes	Yes	Yes
R-Square	0.34	0.34	0.43	0.02	0.02	0.03
N	29,408	29,408	13,321	27,698	27,698	11,564
Estimation Method	OLS	OLS	OLS	IV	IV	IV
Firm Controls$_{t-1}$	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

Notes: Columns (1) - (6) use expenditure on outsourcing of manufacturing jobs (especially to the informal sector) as a share of gross value-added of a firm as the dependent variable. '$DComp^{China}_{IN,jt-1}$' is the Chinese import pentration ratio in the domestic market of India. We use '$DComp^{China}_{BIMM,jt-1}$' as the instrument for '$DComp^{China}_{IN,jt-1}$' for the IV regressions in columns (4) – (6). We measure '$DComp^{China}_{BIMM,jt-1}$' using imports from other developing countries such as Brazil (B), Indonesia (I), Malaysia (M) and Mexico (M). '$InpTariff$' and '$OutTariff$' are the natural logarithm of input and output tariffs faced by Indian industries at 2004 NIC 4-digit level. '$FComp^{China}_{IN,jt-1}$' is the measure of Chinese import competition faced by Indian firms in an export destination (US). '$LMktR_s$' is an indicator for labour market regulation. It takes a value 1 if a state has pro-employer labour 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 at the industry level. 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.

Table C10: Import Competition and Outsourcing Intensity: Extensive Margin

	Outsourcing Intensity							
				First Difference	Trend Break Analysis	Using Labour Laws		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$DComp^{China}_{IN,jt-1}$	0.106*	0.121	−0.013	0.454**		0.038	−0.108	−0.143
	(0.062)	(0.105)	(0.101)	(0.215)		(0.095)	(0.093)	(0.102)
$DComp^{China}_{IN,jt-1} \times (t-2001)Trend$					−0.249***			
					(0.064)			
$DComp^{China}_{IN,jt-1} \times (2002-2007)Trend$					0.397***			
					(0.102)			
$DComp^{China}_{IN,jt-1} \times LMktR_s$						−0.324***	−0.472***	
						(0.099)	(0.227)	
$DComp^{China}_{IN,jt-1} \times pro-worker$								0.412***
								(0.091)
$DComp^{China}_{IN,jt-1} \times neutral$								0.197**
								(0.098)
Estimation Method	OLS	IV	OLS	OLS	OLS	OLS	IV	OLS
Other Trade Channels	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls$_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-Square	0.62	0.10	0.62	0.10	0.62	0.62	0.12	0.64
N	35,285	35,489	35,285	32,543	35,489	32,105	29,396	32,105
Firm FE	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	No	No	No	No	No	No
Industry FE(4-digit)*Year Trend	Yes	Yes	Yes	Yes	No	No	No	No
Industry FE (2-digit)*Year FE	No	No	Yes	No	Yes	Yes	Yes	Yes
State FE*Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Columns (1) - (8) use outsourcing intensity (it takes a value 1 when outsourcing expenditure on manufacturing jobs of a firm is greater than zero) as the dependent variable. We treat this as the extensive margin of outsourcing. '$DComp^{China}_{IN,jt-1}$' is the Chinese import pentration ratio in the domestic market of India. We use '$DComp^{China}_{BIMM,jt-1}$' as the instrument for '$DComp^{China}_{IN,jt-1}$' for the IV regressions in columns (2) and (7). '$DComp^{China}_{BIMM,jt-1}$' using imports from other developing countries such as Brazil (B), Indonesia (I), Malaysia (M) and Mexico (M). '$LMktR_s$' is an indicator for labour market regulation. It takes a value 1 if a state has pro-employer labour market laws and 0 otherwise. '$pro-worker$' 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' includes 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 at the industry level. 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.

Table C11: States according to Labour Regulations

States with pro-worker labour laws	States with pro-employer labour laws	States with neutral labour laws
(1)	(2)	(3)
Gujarat	Andhra Pradesh	Assam
Maharashtra	Karnataka	Bihar
Orissa	Rajasthan	Haryana
West Bengal	Tamil Nadu	Jammu and Kashmir
	Uttar Pradesh	Punjab
		Kerela
		Madhya Pradesh

Notes: Columns (1) – (3) list Indian states according to types of labour regulation according to Gupta et al. (2009).

D Analytical Framework

In this section, we provide a conceptual framework to examine the impact of import competition on outsourcing following Lommerud et al. (2009). Consider a firm i operating in a monopolistically competitive environment producing a variety of a differentiated good, which it produces by using a continuum of inputs indexed by $j \in [0,1]$. One unit of the final good requires γ_i^{-1} units of each input for firm i. Each input can either be produced in-house or outsourced. In-house, the firm can produce one unit of j using one unit of labour at an exogenous wage rate w. Alternatively, the firm can outsource production at the cost of c per unit of input, where we assume $w > c$ to capture the idea that the wage rate is higher than the marginal cost of outsourcing to smaller (informal sector) firms. For instance, since it operates in the formal sector, the firm has to ensure adherence to safety standards, offer benefits, including overtime and abide by hiring and firing regulations. As pointed out by Besley and Burgess (2004), these provisions of the Indian Factories Act do not apply to firms hiring fewer than 10 workers operating in the unorganized or unregistered (informal) manufacturing sector.

An important ingredient of our framework is that outsourcing incurs fixed costs, which depend on the input j. Specifically, ordering the inputs on $[0,1]$ so that $g(j) < g(l)$ for $j < l$, the cost of outsourcing k inputs is given by

$$G(k) = \int_0^k g(j)dj \tag{10}$$

Assume that $G'(k) > 0$ and $G''(k) > 0, G'(0) = 0$ and $G'(1) \to \infty$, where the last assumption means that it is not economical to outsource all production. A motivation for outsourcing costs increasing exponentially is the coordination costs involved in dealing with multiple small firms or contractors. Demand for the final good is given by $y_i = \Gamma p_i^{-\sigma}$, where p_i is the price of variety i and $\Gamma > 0, \sigma > 1$. We first examine the firm's outsourcing decision.

Suppose that the firm chooses not to outsource. Then, its profits are given by

$$\pi_{i,n} = [(p_i - \gamma_i^{-1}w)]\Gamma p_i^{-\sigma} \tag{11}$$

Standard profit maximization yields optimal price, output and profits for a firm that does not outsource as:

$$p_i^* = \frac{\sigma}{\sigma - 1}\gamma_i^{-1}w \tag{12}$$

$$\pi_{i,n}^* = [(p_i^* - \gamma_i^{-1}w)]\Gamma p_i^{*-\sigma} = \Gamma(\gamma_i^{-1}w)^{1-\sigma}(\frac{1}{\sigma - 1})^{1-\sigma}\sigma^{-\sigma} \tag{13}$$

Now, suppose that the firm outsources the production of k_i inputs, its profits are given by

$$\pi_{i,o} = [(p_i - \gamma_i^{-1}(k_i c + (1 - k_i)w)]\Gamma p_i^{-\sigma} - G(k_i) \tag{14}$$

The first order condition with respect to price yields optimal price

$$\frac{\delta \pi_i}{\delta p_i} = \Gamma[(1 - \sigma)p_i^{-\sigma} + \sigma\gamma_i^{-1}(k_i c + (1 - k_i)w)p_i^{-\sigma-1}] = 0 \tag{15}$$

$$p_i^* = \frac{\sigma}{\sigma - 1}\gamma_i^{-1}(k_i c + (1 - k_i)w) \tag{16}$$

The first order condition with respect to outsourcing determines optimal outsourcing intensity k_i^* at p_i^* as follows

$$\frac{\delta \pi_i}{\delta k_i} = -\Gamma p_i^{*-\sigma}\gamma_i^{-1}(c - w) - G'(k_i) = 0 \tag{17}$$

The second order condition at the optimal outsourcing intensity k_i^* is

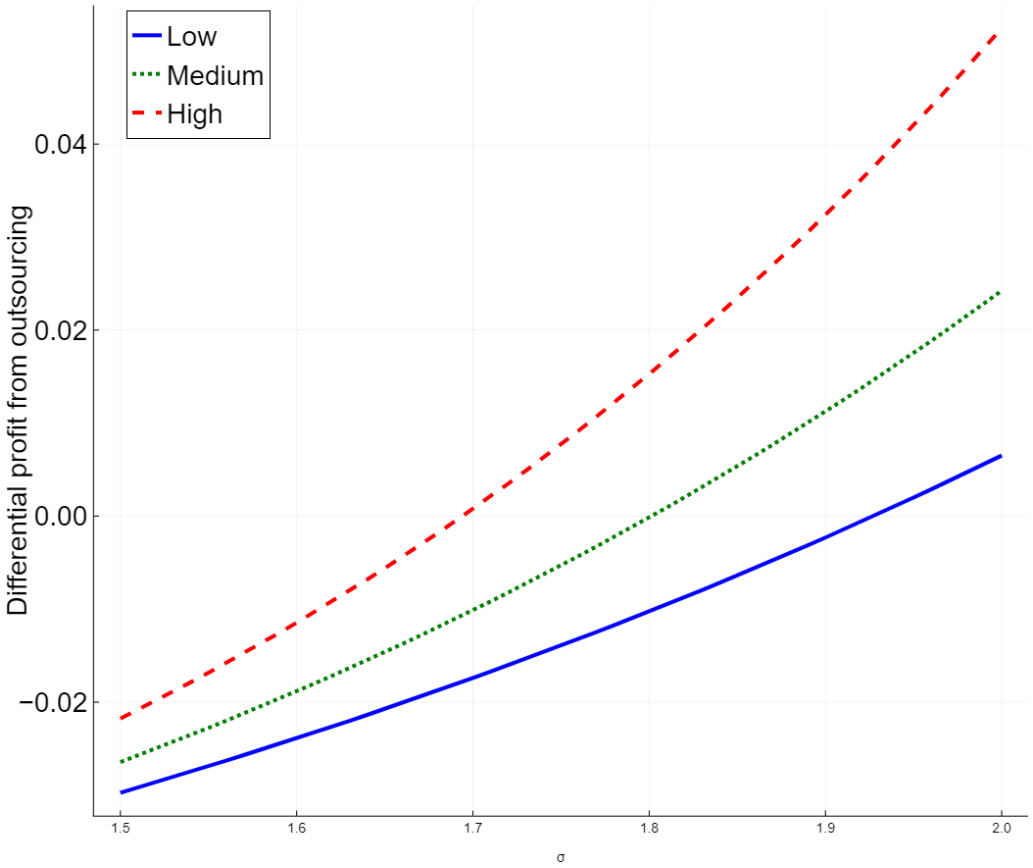
$$\frac{\delta^2 \pi_i}{\delta k_i^2} = \sigma\Gamma p_i^{*-\sigma-1}\gamma_i^{-1}(c - w)\frac{\delta p_i^*}{\delta k_i^*} - G^{"}(k_i^*) < 0 \tag{18}$$

Substituting for k_i^* and p_i^* in 14 yields optimal profit from outsourcing $\pi_{i,o}^*$. The firm outsources as long as $\pi_{i,o}^* \geq \pi_{i,n}^*$.

We posit that an increase in import competition is associated with an increase in the elasticity of substitution as more number of varieties are now available at similar prices, resulting in an increase in demand elasticity perceived by the individual firm. Given this framework, we present numerical examples to trace out impacts on key variables, including optimal outsourcing intensity .

outsourcing profit by

prod

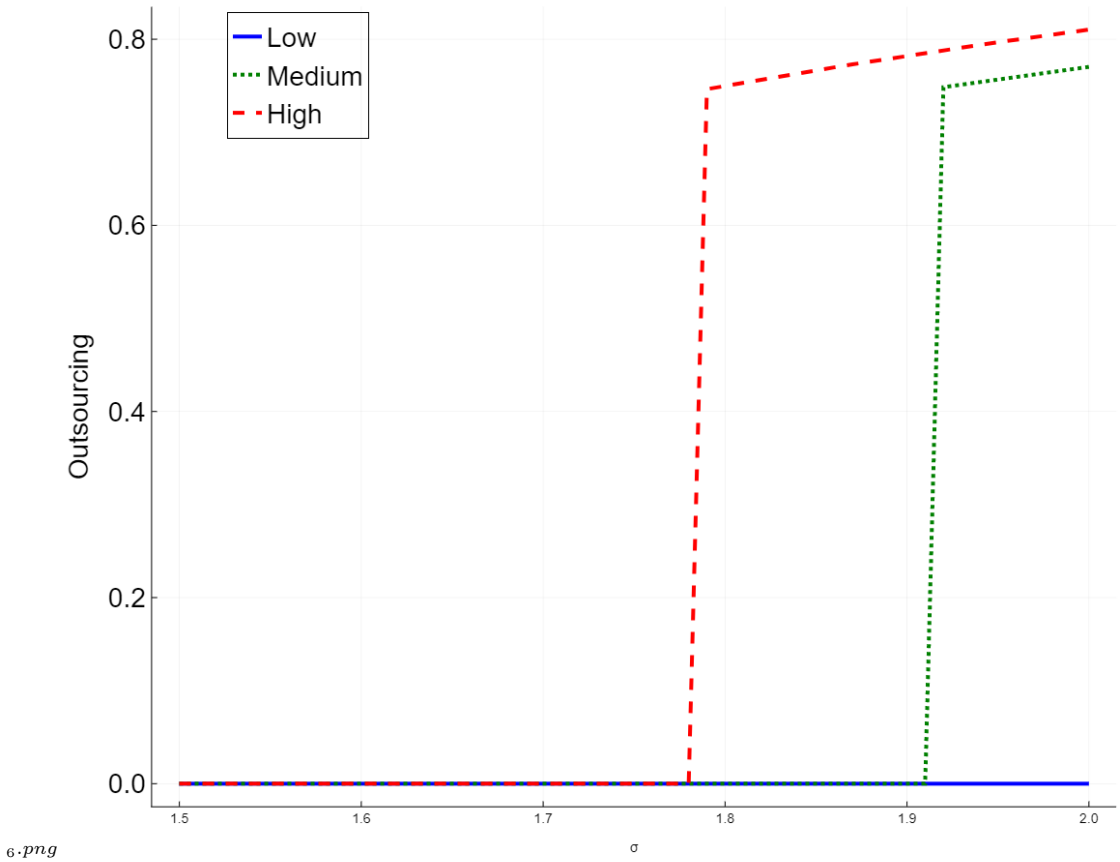


$_5.png$

Figure D1: Differential profits from outsourcing as a function of the elasticity of demand σ by productivity

Notes: Low, Medium and High productivity indicate $\gamma = 10, 12, 15$.
$\Gamma = 1; w = 5; c = 4. G(k) = a[(1-k) - \ln(1-k)], a = 0.05$

by prod

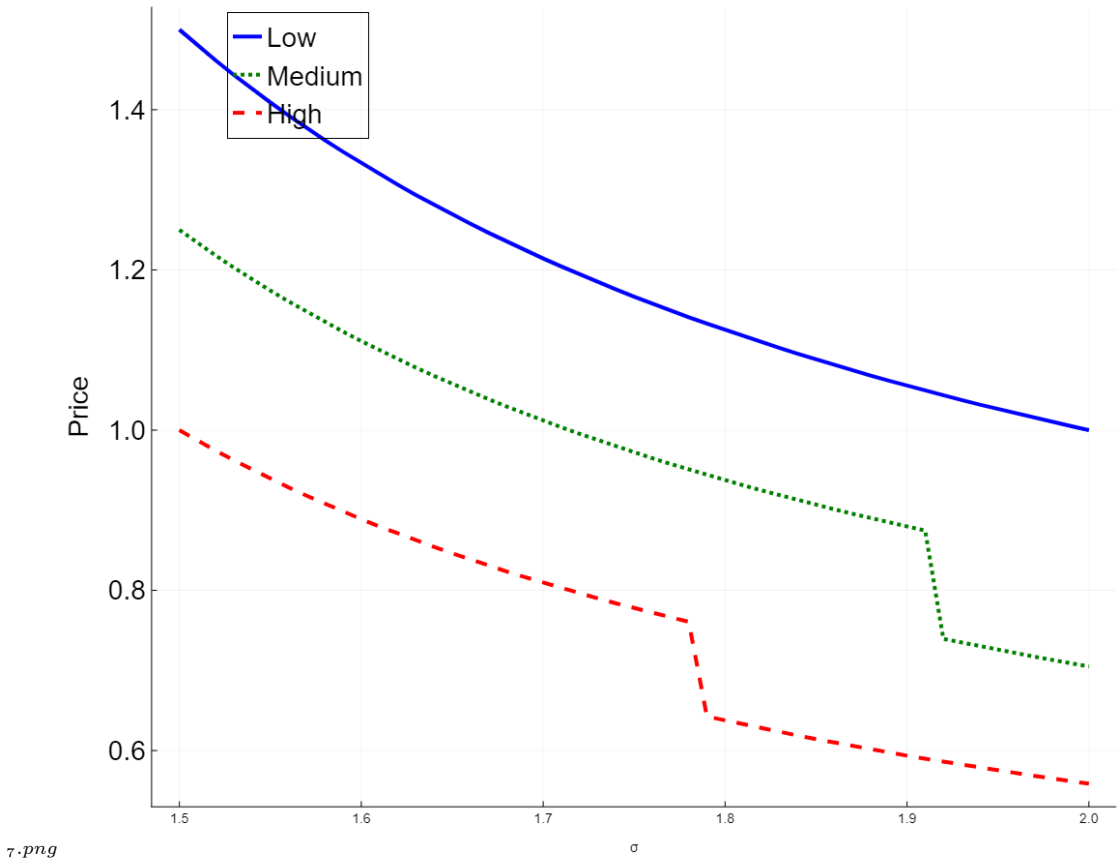


$_6.png$

Figure D2A: Outsourcing as a function of the elasticity of demand σ by productivity

Notes: Low, Medium and High productivity indicate $\gamma = 10, 12, 15$.
$\Gamma = 1; w = 5; c = 4. G(k) = a[(1-k) - \ln(1-k)], a = 0.05$

by prod



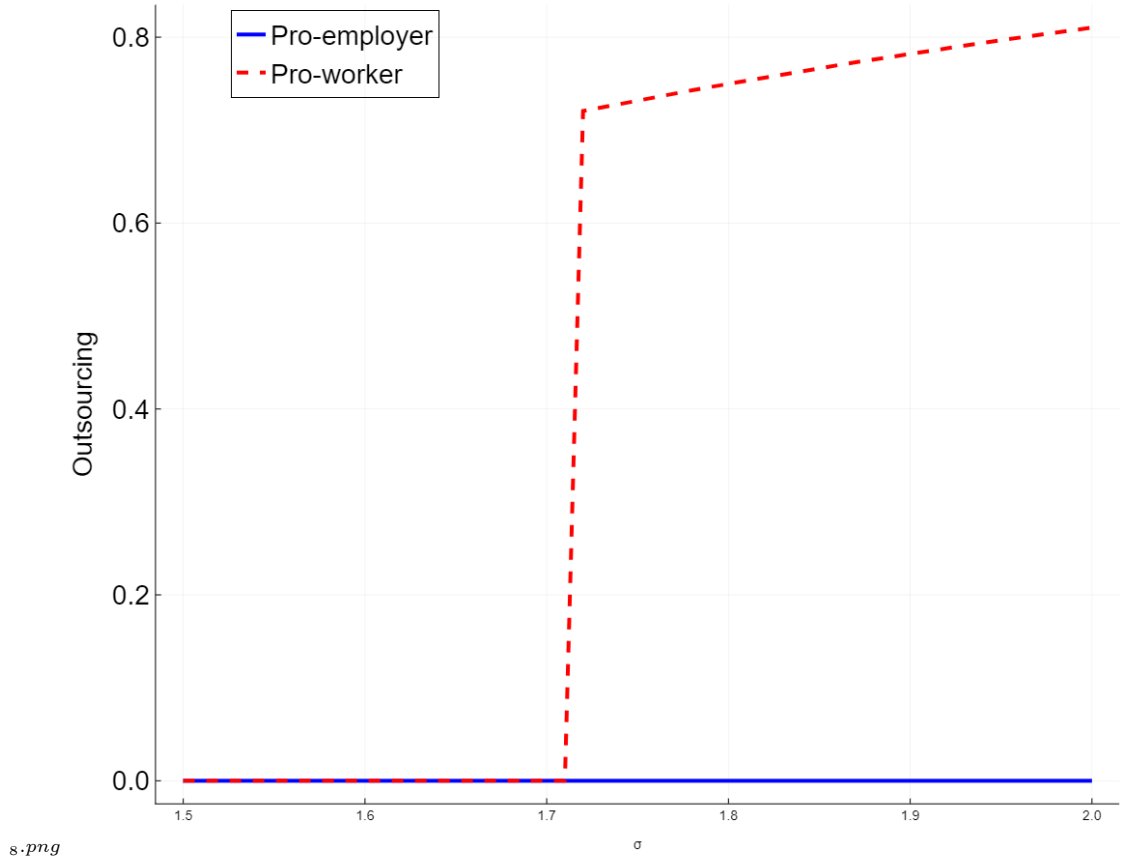
$_{7}.png$

Figure D2B: Price as a function of the elasticity of demand σ by productivity

Notes: Low, Medium and High productivity indicate $\gamma = 10, 12, 15$.
$\Gamma = 1; w = 5; c = 4. G(k) = a[(1-k) - \ln(1-k)], a = 0.05$

by labor

law



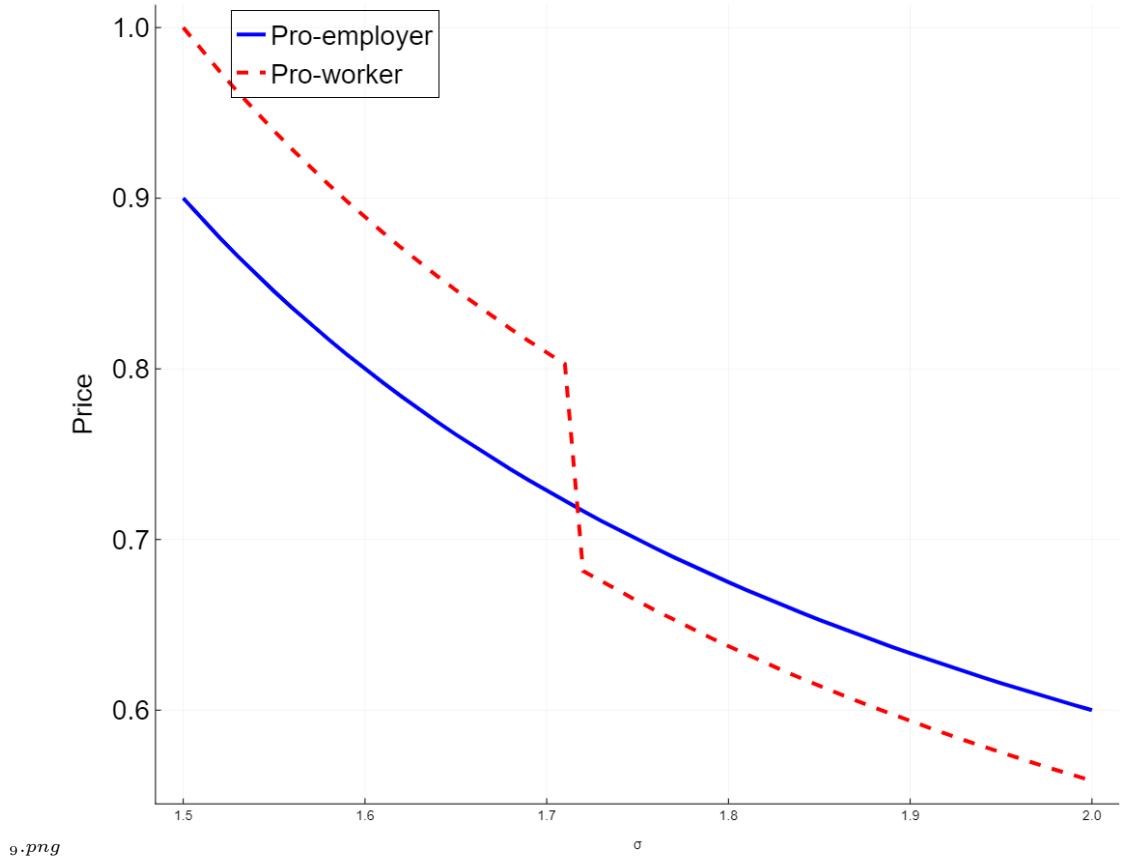
$_{8}.png$

Figure D3A: Outsourcing as a function of the elasticity of demand σ by labour law

Notes: "Pro-employer" and "Pro-worker" states indicate $w = 4.5, 5.5$.
$\gamma = 15; \Gamma = 1; c = 4. G(k) = a[(1-k) - \ln(1-k)], a = 0.05$

by labor

law



$_9.png$

Figure D3A: Price as a function of the elasticity of demand σ by labour law

Notes: "Pro-employer" and "Pro-worker" states indicate $w = 4.5, 5.5$.
$\gamma = 15; \Gamma = 1; c = 4. G(k) = a[(1-k) - \ln(1-k)], a = 0.05$

In **Figure D1**, we plot the relationship between increasing σ and the difference between profit from outsourcing versus producing inhouse for firms with low, medium and high productivity respectively (γ_i = 10, 12 and 15). We set w=5, c=4 and Γ normalized to one. Note that firms choose to outsource when the differential profit from outsourcing is greater than zero. The figure shows that greater import competition (captured by an increase in σ) is associated with increased differential profits from outsourcing. It also illustrates heterogeneous impacts of an increase in import competition on the differential profit from outsourcing. For instance, an increase in σ around 1.8 would have no impact on a low productivity firm (since its profits from producing in-house are always greater than from outsourcing), a switch from producing in-house to outsourcing for the firm with medium productivity and a potential increase in outsourcing for the high productivity firm. **Figure D2A** shows a similar graph for optimal outsourcing intensity. If σ were to increase from 1.8 to 2.0, outsourcing intensity strictly increases for the high and medium productivity firm, while it does not for the low productivity firm. **Figure D2B** shows the relationship between σ and optimal price p_i^*. Focusing on the same interval $\sigma = [1.8, 2.0]$, the decrease in price for the medium and high productivity firm is roughly 26 percent and 13 percent respectively, while it is lower at 11 percent for the low productivity firm. Note that the high (medium) productivity firm is outsourcing (starts to outsource), while the low productivity firm is not in this interval.

We now consider the differential relationship between import competition and outsourcing in states with pro-worker and pro-employer labour regulation. **Figure D3A** plots the relationship between σ and outsourcing intensity when w=4.5 and 5.5 respectively. The idea is that in states with pro-worker labour regulation, the cost of hiring labour in the formal sector is higher than in more pro-employer labour regimes. The graph shows that an increase in σ is associated with an increase in outsourcing when the formal wage is higher at 5.5 (equivalently, when the firm is in a pro-worker state), but has no impact in states with pro-employer labour regulation. **Figure D3B** presents a similar figure for the differential relationship between trade and prices for firms in states with pro-worker versus pro-employer labour regimes. With an increase in import competition, in the interval $\sigma = [1.8, 2.0]$, the price decline is about 10 (13) percent for the firm in a pro-employer (pro-worker) state.