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THE LINK BETWEEN MANUFACTURING GROWTH AND ACCELERATED SERVICES GROWTH IN INDIA

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ABSTRACT

The impact of trade liberalization on manufacturing growth has been widely studied in the literature. What has gone unappreciated is that accelerated manufacturing growth has also been accompanied by accelerated services growth. Using firm-level data from India, we find a positive spillover from manufacturing growth to gross value added, wages, employment, and worker productivity in services, especially large urban firms and in service sectors whose output is used as a manufacturing input.

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1. Introduction

The critical role of manufacturing growth, especially in the labor-intensive sectors, in the early stages of development in the labor-abundant economies is widely recognized (for example, Kuznets 1957 and 1973 and Chenery 1960). Some of the more dramatic examples from recent history are South Korea and Taiwan in the 1960s and 1970s, and India and China more recently, which have grown at near miracle rates. Opening to the world economy in these countries at different points in time was followed by accelerated growth. While there remains some controversy over whether openness or industrial targeting is to be credited for the high growth rates, the importance of manufacturing growth in the making of these miracles is rarely questioned except in the case of India. And even in the latter case, the upward shift in the growth rate has been accompanied by acceleration in the growth rate of manufacturing.

A phenomenon that has received far less attention in the literature, however, is that the upward shift in the growth rate in manufacturing following trade liberalization is often accompanied by an upward shift in the growth rate in services as well. Table 1 documents this shift for three of the four countries just named: South Korea, Taiwan, and India. In each case, the table shows that acceleration in growth in the GDP is accompanied by acceleration in growth in not just industry but services as well. In the first two cases, which represent the conventional pattern, growth in industry far outstrips growth in services but acceleration in both sectors in the second period is unmistakable. In the case of India, the relative growth rates of industry and services are unconventional with the former exhibiting slower growth but the acceleration in the second period is observed in both sectors simultaneously.

Debates on the role of openness in triggering and sustaining growth in the labor abundant economies have generally focused on industry since this is the sector that is often subject to early attempts at liberalization. This is particularly the case with discussion and analyses of the early growth miracles in East Asia that included Singapore, Hong Kong, Taiwan and South Korea as well the most recent one, China. It is only in the case of India, where services growth has outstripped industrial growth, that services growth has received some attention.

The question we wish to address in the present paper is why services growth also accelerates alongside acceleration in industrial growth in the early stages of development. Whether we credit openness or industrial targeting, the object of policy in the case of Taiwan and South Korea was industry. Yet, services growth there also accelerated with industrial growth. In the case of India, while it is true that services sectors such as banking and finance and telecommunications were themselves subject to significant liberalizing reforms, it is also true that other services such as transportation, education, and health that were not subject to any serious policy changes saw acceleration as well. Why should that be the case?

In this paper, we offer and test two hypotheses aimed at linking the liberalization of and acceleration in growth in manufacturing (which accounts for the bulk of what constitutes industry) to accelerated growth in services. First, we hypothesize that there is a spillover from manufacturing growth to service sector growth. This spillover works through two channels. One, there is the derived demand or direct channel whereby the manufacturing sector uses domestic services such as transport, telecommunications, and business activities as inputs. And second, there is an indirect channel whereby accelerated growth in manufactures increases incomes and shifts relative prices, which in turn increase the demand for and equilibrium quantities of non-traded services such as passenger travel, tourism, restaurant food, and real estate activity.[1]

According to our second hypothesis, the efficiency of production in some traded and non-traded services crucially depends on the availability of quality tools and equipment that become more reliably available either from abroad or from improved domestic supply following the reforms that lead to acceleration in manufacturing growth. For example, business process outsourcing in India needs access to state of the art computer hardware and software. Firms in the transport sector need access to high-quality cars, buses, and trucks. Taxi and courier services cannot grow without access to good, reliable means of transportation in the necessary volume.

We test these hypotheses using two firm-level surveys of service sector firms carried out in India in 2001-02 and 2006-07. As Table 1 shows, India saw its growth rate in industry shift from 5.6 to 8 percent and that in services from 7.1 to 9.6 percent between periods 1991-92 to 2002-03 and 2002-03 to 2011-12.[2] Therefore, the first of these surveys was done in the lower growth period and the second in the higher growth period. Moreover, since significant liberalizing reforms such as the end to licensing on consumer goods imports and substantial cuts in tariffs were undertaken during the first half of the 2000s, the first survey can be thought of as having been done in the pre-reform period and the second in the post-reform period. The surveys that form the basis of our analysis are two independent, albeit nationally representative, cross-sections. As such, we cannot form a panel of firms but we are able to distinguish each

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[1] In Section 3.1, we sketch a model incorporating these two effects within a three-sector general-equilibrium model. This model is developed more fully in the Appendix. Also see also Kongsamut, Rebelo and Xie 1999 and Ngai and Pissaredes 2007 in this context.

[2] Data in India are recorded according to the fiscal year, which begins on April 1 and ends on March 31. Therefore, a year such as 1991-92 refers to the period from April 1, 1991 to March 31, 1992.

observation according to the state in which the firm is located, whether the firm is urban or rural, the service sub-sector to which it belongs, and the year of the survey.

In our empirical analysis below, we do not relate reform variables such as tariffs or abolition of import licensing directly to services growth. Instead, our strategy is to examine the differential impact of the key variables of interest, most importantly growth in manufacturing, on services in the post-reform 2006-2007 year relative to the base year of 2001-2002. In effect, we see reduced protection as inducing higher growth in manufactures, which in turn produces higher growth in services through the two channels mentioned in the discussion of our first hypothesis. It is the latter half of effect that is the focus of our analysis.

Our first hypothesis has two parts, one relating to the overall demand effect of increased manufacturing output and the other to the use of services as inputs in manufacturing. We test the first part of the hypothesis by estimating the effect of manufacturing growth on overall services growth in the post-reform period over and above its impact in the pre-reform period. To test the second part of the hypothesis, we use data from the input-output tables to create an index measuring the intensity of use of each service in manufacturing output. The greater the proportion of a service sector's output used in manufacturing as an input, the greater the value of the index. Using the index, we test whether services used more intensively in manufacturing experienced more rapid growth in the post-reform period.

To test the second hypothesis, we assume that relatively capital-intensive services use imported inputs more intensively and therefore stand to benefit from tariff reductions on the latter. We then formally test whether capital-intensive services grew more rapidly than non-capital-intensive service sectors in the post-reform period relative to the pre-reform period. This exploits the fact that by 2006-7 imported inputs were more freely and reliably available than in 2001-2. We also use a measure of state-level financial development, and interact it with capital intensity, to examine whether capital-intensive service sectors grew more rapidly after economic reforms in states where it was easier to access capital.

Our approach faces two econometric challenges: omitted variable bias (there could be time-, state- and service-sector-specific unobservable variables that drive both manufacturing and services growth) and simultaneity (manufacturing and services growth could be jointly determined and both affected by common shocks). We address the omitted variable bias problem by including year, two-digit industry, and state fixed effects. While addressing unobservable variables at the state, industry, and year level, we do remain exposed to unobservable variables that vary along two or more of these dimensions, namely state × year, industry × year or state × year × industry.

We use an instrumental variables strategy to deal with the remaining omitted variable concerns and with simultaneity. In particular, we use state labor regulations interacted with the 1988 level of manufacturing as an instrumental variable for manufacturing growth in 1998. State-level labor laws were enacted in the 1970s and early 1980s, long before it would have been possible to anticipate economic reform and the surge in service growth twenty years later; as such they are plausibly exogenous with respect to services growth. Although these laws relate primarily to amendments to the Industrial Disputes Act, hence are mainly concerned with manufacturing and *prima facie* excludable, we allow labor regulations to have a direct impact on services, and rely on the excludability of labor regulations interacted with 1988 manufacturing. The claim is that the economic boost from employer-friendly labor regulations in states, for example, with a higher level of 1988 manufacturing affects manufacturing growth in 1998 but does not directly affect services. The underlying assumption is that the effect of the instrument on services (e.g., through factor markets) dissipates by 1999, whereas the effect on the slowly evolving manufacturing sector persists. We discuss our empirical strategy in greater detail in Section 3.2 and our instrumental variables approach in Section 3.3.

The use of this instrumental variables strategy leads to an important caveat regarding the interpretation of our results. While our motivation in looking at spillovers from manufacturing to services is the recent economic liberalization, the effect we identify is instead due to predating changes in labor regulations. This is unavoidable, since there is no between-state variation in the economic liberalization that took place in the early 2000s that provides a plausible instrument for manufacturing growth. At the same time, we believe that underlying spillover mechanism that we investigate plausibly applies to both policies.

Overall our paper makes three contributions to the literature. First and perhaps most important, we take what is to our knowledge the first stab at explaining why services may experience accelerated growth consequent to reforms that are largely aimed at stimulating manufacturing growth. Within the specific context of the Indian experience, some reform critics have argued that since reforms had been aimed at industry and it is services that have grown faster, the link between reforms and growth is tenuous (see Panagariya 2008, Chapter 1 and references cited therein). While part of the answer to this critique lies in the fact that Indian reforms have encompassed not just industry but services as well, our analysis provides channels through which services growth accelerated even in sectors that were not directly subject to the reforms.

Second, we add to a large literature on the role of the service sector in structural transformation. The early literature (e.g., Kuznets 1957 and 1973; Chenery 1960) notably did not find any significant shift in services with growth, whereas Kongsamut, Rebelo and Xie (1999) and Eichengreen and Gupta (2009) find evidence supporting a positive relationship. Our contribution here is an empirical one: to use an instrumental variables strategy firmly to establish one direction of causality and the magnitude of the relationship.

Finally, the existing literature examining services growth relies exclusively on industry-level data.[3] In a break from this approach, we employ two large-scale firm-level surveys of the service sector that allow us to distinguish between the effects of reforms on small versus large firms and rural versus urban firms. In our view, this is crucial since large and urban firms are likely to be better integrated with the part of the economy most impacted by the reforms. They are also more likely to be impacted by shifts in manufacturing growth related to shifts in labor market regulations. Also relevant in the context of our second hypothesis is access to credit, which will be more readily available to larger and urban firms.

The remainder of the paper is organized as follows. In Section 2, we describe the services surveys and other data. In Section 3, we discuss the theoretical and empirical frameworks within which we test our two hypotheses. In Section 4, we report our main results, and in Section 5 we consider an extension (examining whether firm size is an important mediating variable for the growth of service sector firms) and robustness checks (excluding

[3] We hasten to add that several recent studies on the growth of Indian manufacturing do use firm-level data. These include Khandelwal and Topalova (2011), Nataraj (2011), Harrison, Martin, and Nataraj (2013) and Hsieh and Klenow (2009).

service sectors that might have been directly affected by economic liberalization and presenting a test of over-identifying restrictions for the instrumental variables). Section 6 concludes the paper.

2. The Services Surveys and Additional Data Sources

We begin by describing the service sector surveys we use in our analysis. Further details are available in a companion descriptive paper, Dehejia and Panagariya (2012).

2.1 National Sample Survey Service Data

In this paper we use data from two nationally representative repeated cross-sections of service sector firms: round 57 (2001-02) and round 63 (2006-2007) of the National Sample Survey. The surveys cover a broad range of service activities including hotels and restaurants; transport, storage, and communications; real estate, renting, and business activities; education; health and social work; and other community, social, and personal activities. The 63rd round includes financial intermediation as well, but since these services are not included in the 57th round, we exclude them from our analysis. Also excluded from both rounds of surveys are: the wholesale and retail sector; public administration and defense; production activities of private households; and extraterritorial organizations. Furthermore, no public sector enterprises are covered by the two surveys.

In our empirical work, below, we will also distinguish between more capital-intensive (such as transport, computer services, and media) and less capital-intensive (such as restaurants, property, education, health, and personal services) service sectors. Overall, the service data from the NSS comprises approximately half of the economic activity captured by National Accounts data for the service sector (see Dehejia and Panagariya 2012 for a more detailed discussion).

We note one difference between the 2001-02 and 2006-07 survey designs, which is potentially important. The former includes all establishment enterprises, whether large or small in the main geographical sampling frame (the so-called "area frame"), whereas the latter introduces a separate "list frame" for the largest enterprises in the corporate sector. It initially identified 998 large service sector companies distributed throughout India for this frame but after exclusions for reasons of public ownership and registration under the Factories Act (1948), narrowed down the relevant universe of eligible list frame enterprises to 626. For a variety of reasons, the survey was able to sample only 438 of the 626 enterprises.

This difference between the two surveys raises the initial concern that the information on large enterprises might have been better captured in the 63rd relative to the 57th round. But this concern is counteracted by the fact that the 57th round paid special attention to large enterprises in essence in the same way as did the list frame of the 63rd round. It surveyed *all* enterprises with 200 or more workers, which provided essentially the same coverage to large enterprises as the list frame in the 63rd round.[4] Therefore, we conclude that despite the identification of a separate list frame in the 63rd round, the two rounds are fully comparable.

The 57th (2001-02) round selected a total of 15,869 first stage units (FSUs) of which 41 percent were rural and the remainder urban. Altogether 244,376 enterprises within these FSUs

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[4] To quote from Appendix B of the NSS (2003, p. B6) report on the 57th round, "After determining the boundaries of the sample FSU [First Stage Unit], all big non-agricultural enterprises having 200 or more workers in the entire FSU and having operated at least one day during the last 365 days preceding the day of survey (hereinafter to be called as big enterprises for brevity) were listed. All the listed big enterprises constituted segment 9 of the selected FSU. All big enterprises under coverage listed in segment 9 were surveyed separately in addition to the required number of smaller enterprises under coverage in the other segments of the selected FSU as per normal procedure."

were surveyed with 37.85 percent in rural areas and 62.15 percent in urban areas. The 63rd (2006-07) round selected 13,271 FSUs of which 42 percent were in rural and 58 percent in urban areas (see Table 2). It surveyed 189,844 enterprises (not counting the 438 list frame units) altogether with 43.82 percent in rural and 56.18 percent in urban areas.

We convert nominal values in both rounds to constant 1999-2000 prices. We can see in Table 2 that the average firm has a yearly gross value added (GVA) of Rupees 74,424 or approximately USD$1,650 at 2000 exchange rates. There are an average of 1.8 workers per firm, although it is worth noting that the modal firm employs only one worker (namely the proprietor). Yearly salaries are Rs. 28,486 (or approximately USD$633). Our fourth outcome of interest, productivity is computed as yearly GVA per worker, and is Rupees 40,536 per worker. Across columns (2) to (7), we see that there is a significant increase in GVA and salary across rounds, although not employment, and that GVA is much higher in urban areas while employment is only somewhat higher, implying that productivity is significantly higher in urban firms compared to rural firms. Table 3 presents summary statistics by state and for the key dependent variables as scaled in our subsequent tables (log yearly GVA, total employment. log wages, and log productivity).

2.2 Additional Data Sources

We supplement data from NSS rounds 57 and 63 with four additional sources. First we make use of data on labor-market flexibility by state; originally proposed by Besley and Burgess (2004), we use the further refined classification by Hasan, Mitra, and Ramaswamy (2007) summarized in Table 3. Each state is categorized as having enacted employer-friendly labor regulations as compared to the default of national legislation that heavily favors employees. *De jure* these regulations affected with greater potency the manufacturing sector. Besley and Burgess (2002) and Hasan, Mitra, and Ramaswamy (2007) demonstrate their positive effect on the manufacturing sector; in this paper, we explore their impact on services.

Second, we make use of a state-specific financial development index developed by Ghosh and De (2004). Using factor analysis, these authors derive an index of financial-infrastructure development as a composite of the state level credit-to-deposit ratio in nationalized banks, a state’s tax revenue as a proportion of the net state domestic product, and the number of post offices per 10,000 individuals.[5] This analysis assigns the largest weight to the credit-to-deposit ratio in nationalized banks.

Third, we use manufacturing growth by state in fiscal year 1998-99 from the National Accounts Statistics as our measure of manufacturing activity at the state level; given the timing of National Accounts data and the NSS rounds, this is the best match between the two. We also use the level of manufacturing activity by state in 1988-89 as part of our instrumental variable strategy. State-level variables are summarized in Table 3, columns (5) to (8).

Fourth, we use data from the 1998-99 input-output table (Government of India, 2005) to create an index of reliance on manufacturing demand by service sectors at the two-digit level. In particular, we sum the proportion of a 2-digit service sector's output that is used as an input in manufacturing taken as a whole. Table 4 summarizes the service-sector-specific index of reliance on manufacturing. This ranges from 0 for storage and warehousing, ownership of dwellings, and

[5] In India, small savings are held in post-office savings accounts.

education, to 0.22 for communication, 0.3 for other transport services, and 0.39 for trade services.

3. **Theoretical and Empirical Framework**

3.1 Theoretical Framework

In the appendix, we provide a formal theoretical model linking trade liberalization to services output. In this section, we summarize the main features and implications of the model.

Imagine an economy producing three goods, 1, 2 and 3. Goods 1 and 2 are traded while good 3, representing services, is non-traded. All three goods serve as final consumption goods while goods 1 and 3 additionally serve as intermediate inputs. Good 1, the import-competing good, which can be thought of as computers or cell phones, serves as an intermediate input in the production of the services good, good 3. Good 3, on the other hand, is used as an intermediate input in the exportable good, good 2, which may be thought of as manufactures. The economy is small so that the price ratio between goods 1 and 2 is given in the world markets.

To allow for productivity effects (as measured by output per worker) resulting from size, we assume that services production is subject to increasing returns. To do this most simply, we let scale economies be external to the firm but internal to the industry (for example, see Panagariya 1981, Ethier 1982 and Helpman 1984). This assumption allows us to work with services as a homogeneous good and maintain perfect competition assumption with zero profits in equilibrium. Replacing this structure by a differentiated good subject to internal economies of scale as in Krugman (1979) will add some complications but not alter the basic results. Imbedding the Melitz (2003) model within our three-good model will lead to richer results by virtue of its distinction among firms by size but poses greater challenges. We assume that goods 1 and 2 are produced under constant returns to scale.

One further detail with respect to technology concerns the use of intermediate inputs in goods 2 and 3. We assume a two-stage production function for these goods. First, a composite input is produced using the primary inputs via a smooth twice-differentiable homogeneous production function and this composite input is then combined in fixed proportions with the other intermediate input (good 1 in the case of good 3 and good 3 in the case of good 2) to produce the final good.

We assume that good 1 is initially subject to a tariff. The tariff leads to a distortion in both consumption and production. In addition, the external economy in the production of good 3 leads to a third distortion: the output of good 3 falls short of its optimum, given the tariff.

Now imagine a reduction in the tariff on good 1. For the moment, hold the price of good 3 at its original level. The change leads to a decline in the output of good 1, with resources released for reallocation to goods 2 and 3. Good 3 expands for this reason. In addition, since good 3 uses good 1 as an intermediate input, the reduction in the latter's price gives an added reason for its expansion; this was the second of the two hypotheses outlined in the Introduction. Finally, the expansion of good 2, which uses good 3 as an intermediate input, creates demand for good 3 adding to the expansion of the latter; we referred to this as the derived demand channel from manufacturing to services in the first of the two hypotheses sketched in the Introduction.

Next, consider the effect on the price of good 3. As just described, at the original price of this good, the reduction in the tariff leads to an expansion of good 3. This fact by itself creates an excess supply of good 3 and works to push its price down. But the reduction in the tariff also creates an income effect. The tariff reduction itself represents a reduction in distortion. In addition, it reduces the externality distortion in good 3 by leading to an expansion of output of the latter. These improvements in real income lead to increased demand for services; we referred to this as the indirect channel from manufacturing to services in the Introduction. If the income elasticity of services is sufficiently high, the increase in demand will outweigh the increase in supply, leading to an increase in the price of good 3 and further expansion of this good.

Finally, the expansion of good 3 gives rise to two effects on output per worker. The usual diminishing returns effect works to lower this measure of productivity. But the scale effect goes the opposite way. The net effect is ambiguous. The larger the cost share of labor relative to those of other factors, the smaller is the diminishing returns effect. Likewise, the larger the parameter defining scale economies, the greater is the scale effect.

To summarize, the predictions of the model are ambiguous: liberalization can lead to an increase in services' output through multiple channels: increased availability of imported and domestically produced inputs, increased demand for services as inputs into manufactured goods, and an income effect. But these implications rely on a sufficiently high income elasticity of demand for services. Likewise, the model predicts an increase in worker productivity in services, if there are sufficient scale economies in the service sector. The equivocal nature of the predictions motivates our empirical work, which is outlined in the next subsection.

3.2 Identification Strategy

As outlined in the Introduction and in the model sketched in Section 3.1, we are interested in examining the relationship between service sector growth and the growth in manufacturing spanning the years 2001-02 and 2006-07. If we had a firm-level panel, then we could regress growth at the firm level on manufacturing growth. Instead, with two repeated cross-sections, we regress the firm-level outcome for each round on a round dummy, manufacturing growth, and manufacturing growth interacted with the round dummy.

Consider the following specification, which provides a useful starting point for our discussion of identification, although it is not the one we will ultimately estimate:

$$s_{ijtf} = \alpha + \beta\, g_i + \gamma\, I_t + \delta\, (g_i \times I_t) + \varepsilon_{ijtf} \qquad (1)$$

where i indexes states, j indexes the 2-digit service sectors, t = 2001-02 or 2006-07, and $f = 1,\ldots, R_1$ indexes firms in 2001-02 and $f = R_1+1,\ldots, R_2+R_1$ indexes firms in 2006-07 (i.e., we have a repeated cross-section of firms). The variable s_{ijtf} is log gross value added (GVA) (or log wages, employment, or log GVA per worker) by firm, g_i is the growth rate in manufacturing in state i in 1998-99, I_t is an indicator variable for t = 2006-07 (i.e., I_t = 0 for 2001-02 and =1 for 2006-07), and ε_{ijtf} is an error term. With the presence of a year dummy, I_t, β estimates the contemporaneous effect of manufacturing growth on services in 2001-02, and δ – our coefficient of interest – estimates the differential effect of manufacturing growth on the growth of services between 2006-07 and 2001-02.[6]

There are two main concerns regarding this specification. First, state manufacturing growth in 1998-99 might be simultaneously determined with the distribution of GVA in services across states in 2001-02: a positive shock to the state economy would have a positive effect on

[6] More precisely, differencing equation (1) at time t and t+1, we obtain:

$$s_{ijt+1f} - s_{ijtf} = \gamma + \delta\, g_i + \varepsilon_{ijt+1f} - \varepsilon_{ijtf},$$

so δ measures the impact of manufacturing growth, g_i, on the change in services between rounds. For outcomes that are in logs – ln(GVA), ln(wages), and ln(GVA per worker) – this corresponds to the effect of growth in manufacturing on the growth of services' GVA, wages, and productivity. For employment, which is in levels, this corresponds to the effect of the growth of manufacturing on the level difference in employment between rounds.

both manufacturing and services, not only on levels in 1998-99, but also possibly on the growth rate if it is persistent. Second, there are many omitted variables that are common to both manufacturing and services at the state level; for example, a business-friendly environment would benefit both services and manufacturing.

We adopt three strategies for dealing with these concerns. First, we include year, state, and two-digit industry fixed effects in the specification. Many of the omitted variable concerns are either at the state or industry level, and fixed effects soak up these time invariant industry and state unobservables.

Second, state labor regulations can be used as an instrumental variable for manufacturing growth. In particular, we use labor regulations interacted with the level of manufacturing prior to the period we examine as an instrument for manufacturing growth, allowing labor regulations to have a direct impact on services growth. We use manufacturing by state in 1988-89, more than a decade prior to and plausibly exogenous with respect to services growth in the period we examine. Our specification takes the form:

$$g_i \times I_t = a + bI_t + c(L_i \times m_{i\,1988} \times I_t) + d(L_i \times I_t) + e_i + l_j + \omega_{it} \quad (2)$$

$$s_{ijtf} = \alpha + \gamma I_t + \delta \overbrace{(g_i \times I_t)}^{predicted} + \theta(L_i \times I_t) + \eta_i + \lambda_j + \varepsilon_{ijtf} \quad (3)$$

where L_i are state-level labor regulations, $m_{i\,1988}$ is the value of state manufacturing in fiscal year 1988-89, the η_i are state fixed effects, and the λ_j are two-digit industry fixed effects. Note that state fixed effects absorb the direct effect of labor regulations L_i, $m_{i\,1988}$, and $L_i \times m_{i\,1988}$. We discuss the plausibility of the instrumental variable strategy in Section 3.3.

Third, rather than rely on the association between manufacturing and services growth at the state level, we examine whether the growth in services comes precisely from those two-digit service sectors that rely on manufacturing for derived demand, the mechanism discussed in Section 3.1. Specifically, we interact growth in manufacturing with a measure of the proportion of a service sector's output that is used as an input in manufacturing, z_j:

$$g_i \times I_t = a + bI_t + c(L_i \times m_{i\,1988} \times I_t) + d(L_i \times m_{i\,1988} \times z_j \times I_t) + eX_{it} + f_i + h_j + v_{it} \quad (4)$$

$$g_i \times z_j \times I_t = k + nI_t + p(L_i \times m_{i\,1988} \times I_t) + q(L_i \times m_{i\,1988} \times z_j \times I_t) + rX_{it} + s_i + u_j + \omega_{it} \quad (5)$$

$$s_{ijtf} = \alpha + \gamma I_t + \delta \overbrace{(g_i \times I_t)}^{predicted} + \theta(L_i \times I_t) + \rho \overbrace{(g_i \times z_j \times I_t)}^{predicted} + \beta X_{ij} + \eta_i + \lambda_j + \varepsilon_{ijtf} \quad (6)$$

where j indexes two-digit service sectors and z_j is the proportion of output of service sector j used as an input in manufacturing. In order to identify this model, we use $L_i \times m_{i\,1988}$ interacted with z_j as a second instrument. The direct effect of z_j is absorbed by service-sector fixed effects; the direct effects of L_i, $m_{i\,1988}$, z_j, and $L_i \times m_{i\,1988}$ are absorbed by state fixed effects; and the remaining interactions ($L_i \times z_j$ and $m_{i\,1988} \times z_j$) are included in X_{it}. We discuss the instruments at greater length in the next section.

We refer to ρ as the direct effect of manufacturing, since this is the effect of manufacturing growth on service sectors whose output is directly used as an input in manufacturing. We refer to δ as the indirect effect of manufacturing, since this is the effect of manufacturing growth on service sectors in general, controlling for the direct use of services as an input in the manufacturing sector; this subsumes the price, input, and income effects discussed in Section 3.1 and the Appendix. Given the inclusion of fixed effects, both of these reflect the average impact of manufacturing on services growth within state and two-digit industry cells, controlling for secular time effects with round fixed effects.

In order to test our second hypothesis, regarding the effect of access to imported inputs, capital intensity, and financial development on service sector growth, we will include an indicator for capital-intensive service sectors, for financial development by state, and the interaction of these two. We will treat these as plausibly exogenous variables (an assumption supported by the prior literature on financial development and growth across Indian states), and thus we do not instrument for them.

Throughout the analysis we cluster standard errors at the state level.

3.3 Plausibility of the Instrumental Variables Approach

State-level labor regulations have been extensively used in the literature as a source of exogenous variation in manufacturing (see *inter alia* Besley and Burgess 2004 and Hasan, Mitra, and Ramaswamy 2007). In this section, we argue that state labor regulations are plausible instrumental variable for manufacturing when regressed against services growth.

The literature has argued that cross-sectional variation in labor regulations is plausibly exogenous. The case for the exogeneity of these laws rests on the timing of their enactment in the 1960s, 1970s, and early1980s (with only Karnataka having enacted pro-employer legislation in 1988), which was 10 or more years prior to serious economic reforms, more than 15 years prior to the reforms we are considering, and long before the upsurge in services growth could have been anticipated. The literature has also shown that state labor laws are significant predictors of manufacturing growth (i.e., that the instruments are relevant). We will demonstrate this for our data in Section 4.1 and that the instrument passes standard relevance and weak-instrument tests.

The most challenging assumption to establish is the exclusion restriction, namely that labor laws affect services only through manufacturing. The *prima facie* case for the validity of the exclusion restrictions is that *de jure* these laws were primarily concerned with industrial (i.e., manufacturing) labor disputes.[7] At the same time, one can imagine a variety of mechanisms through which labor regulation could affect services growth directly. Some of these (e.g., a business-friendly environment or macro trends) are picked up by state, two-digit industry, and year fixed effects, but a direct spillover from labor regulations to services remains a concern.

Thus, we allow for this direct effect rather than assume it away, and instead use the interaction of labor regulations and the value of manufacturing by state in 1988-89 as our instrument. The identifying assumption is that the boost to a state's service growth between 2001-02 and 2006-2007 from employer-friendly labor regulations in states with high versus low manufacturing output in 1988-89 is channeled only through the effect on manufacturing output.

The underlying assumption is that whatever direct impacts labor regulations in states with high versus low levels of 1988-89 manufacturing output can have on services (e.g., through labor markets) will be small in magnitude or would have dissipated by 2001, unlike the impact on manufacturing, which will persist. The asymmetry is plausible since factor markets are flows while the manufacturing base is a stock[8]; a decade is long enough for the former to dissipate a shock, whereas the latter could be impacted permanently (e.g., Dumais, Ellison, and Glaeser

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[7] The labor market index is defined with respect to the Industrial Disputes Act (IDA) and modifications to it at the state level. The focus of this index is primarily Chapter V.B of the IDA, which applies to manufacturing.

[8] This is particularly true in the Indian context where manufacturing firms adjust very slowly to external shocks.

2002). Furthermore, it is worth recalling that the organized-sector manufacturing, which is the principal target of labor laws, employs a tiny fraction of the labor force, so that any labor market spillover from labor laws in high versus low manufacturing states to services should be relatively small.[9] In Section 4.1, we use data from the NSS Employment-Unemployment surveys to provide corroborative evidence that even in the short-run there was no significant direct impact of labor regulations on wages in services.

We also use manufacturing interacted with the service-sector-specific share of reliance on manufacturing, z_j, as an explanatory variable, which requires a second instrumental variable. For this we use the further interaction of labor regulation, manufacturing in 1988-89, and z_j. In addition to the arguments outlined above, we also rely on the exogeneity of z_j and the excludability of the instrument. Exogeneity is plausible because our input-output data predate our services data by two years; furthermore, z_j is presumably determined primarily by technology. The exclusion restriction is motivated similarly to above: just as the direct effect of labor market regulations in high versus low manufacturing level states on services is likely to be small, further variation of this effect with service-sector-specific manufacturing reliance should be second order.

Finally, in Section 5, we instrument for firm size using labor regulations interacted with manufacturing in 1988-89 and average firm size by two-digit industry. Again, based on the discussion above, we would argue that the direct impact of labor regulations on the service sector should remain small even when interacted with firm size, especially when further interacted with

[9] Employment in organized manufacturing (both private and public) was 6.33 million in 1991 and fell to 5.63 million in 2005. The total non-agricultural labor force exceeded 200 million throughout these years.

manufacturing levels by state. In order to avoid any simultaneity between firm size and services growth, we use average firm size in the initial period in creating this interaction. An alternative use of the additional instrument is to include it in the model outlined in equations (4) to (6) and to test for the validity of the instruments using the standard test of over-identifying restrictions. We present this in Section 5.2 below.

4. Results

We divide the discussion of our results into two sub-sections. We first present our results on the relationship between manufacturing and services growth, and then present our results on capital intensity, financial development, and services growth.

4.1. The Effect of Manufacturing Growth on Service-Sector Growth

In Table 5, we begin by presenting reduced-form estimates of the effect of labor regulations on log yearly GVA in the service sector; although labor regulations will eventually (interacted with 1988-89 manufacturing) be used as an instrumental variable, the reduced-form estimates are a useful starting point. The effect in the full sample, column (1), is positive and significant at the one percent level. Since labor regulations most directly affect the manufacturing sector, which is concentrated in urban areas and among larger firms, we expect the primary effect of labor regulations to be on larger and urban service sector firms.

Thus, in columns (2) to (5) of Table 5, we split the sample by urban and rural and by small (four or less workers) and large (five or more workers) firms.[10] As expected, we find the smallest effect of labor regulations on small rural firms, and uniformly large effects on large and urban service firms, with a 30 to 35 percent boost in service sector growth in employer-friendly states.

In columns (6) to (9) of Table 5, we add manufacturing growth variables. The direct effect of manufacturing growth (i.e., the effect of manufacturing growth interacted with industry-specific services demand, and hence the effect of manufacturing on services through the direct demand channel) turns out to be positive and statistically significant for smaller firms, with the effect of labor regulation preserved. The indirect effect of manufacturing growth (i.e., the main effect of manufacturing growth and hence the indirect effect of manufacturing growth on service sectors whose output is not used as an input in manufacturing) is positive and statistically significant among large urban firms. Since manufacturing growth is simultaneously determined with services growth, these results should not be interpreted causally.[11] Hence, we proceed to use the instrumental variables strategy outlined in Section 3.

In Tables 6 to 10, we present instrumental variables estimates of the impact of manufacturing on the service sector. In addition to instrumenting for manufacturing growth, we also instrument for the interaction between manufacturing growth and service-sector-specific

[10] Note that we refer to firms with five or more workers as "large" relative to the size of firms in our sample: less than 10 percent of firms in the overall sample have five or more workers. Even in the urban sample, the ninetieth percentile firms in the firm-size distribution have five workers.

[11] While it is tempting to interpret the significant effect of manufacturing on services, even after controlling for labor regulations, as evidence for violation of the exclusion restriction, this is not a valid econometric test of the exclusion restriction. Nonetheless, it does provide additional motivation for our strategy of allowing for a direct effect of labor regulations on services, not channeled through manufacturing, and then instrumenting for manufacturing growth.

linkage to manufacturing. The instruments are labor regulations interacted with manufacturing output value in 1988-89 and labor regulations interacted with manufacturing in 1988-89 and service-sector-specific intensity of manufacturing. In Table 6, columns (1) and (2), we present first-stage results for large urban firms, and see that these instruments are jointly significant at the one-percent level; with F-statistics of 100 and 216 respectively, the relevance of these instruments in predicting manufacturing growth is not in question.[12] While it is not possible within our data set to prove the validity of the exclusion restriction, i.e., that labor regulations interacted with initial levels of manufacturing affect services only through manufacturing, we can provide corroborative evidence using an additional data source.

In particular, we turn to rounds 38, 43, and 50 of the NSS Employment-Unemployment Survey, the so-called "thick rounds" conducted in 1983, 1987-88 and 1993-94, respectively, where we examine whether labor regulations affect wages in the service sector, over and above their impact on manufacturing. Specifically, we regress real wages on: a set of dummy variables for years since enactment of labor laws; state, year, and industry fixed effects; and age, gender, and education dummies at the individual level. The results are summarized in Figure 1, which depicts the estimated coefficients of the years-since-labor-law-enacted dummies. After a few significant effects in the early years after the adoption of labor laws, the effects taper off after five years and are both small in magnitude and not statistically significant at standard levels. This corroborates the assumption that labor laws have a limited direct impact on the service sector.

[12] First stage results for the rural and small-firm samples are similar. In columns (3) to (6) we also confirm that these instrumental variables pass more stringent weak- and under-identification tests. The minimum value of the Stock-Yogo weak identification statistic is 24.6, exceeding suggested critical values (e.g., the commonly suggest rule of thumb of 10). Likewise the Cragg-Donaladson statistic exceeds the critical value for under-identification.

In Table 6, columns (3) to (6), we examine our main hypothesis that there is a spillover between manufacturing growth and service sector growth. The last of these columns considers urban firms with five or more workers; we find that the direct effect of manufacturing growth is positive and statistically significant at the one percent level. It shows that an additional one percent growth in manufacturing leads to an 11.1 percent increase in the growth rate of urban service firms in sectors whose reliance on manufacturing is 100 percent, or more realistically at the average level of service-sector manufacturing reliance (0.2316) to a 2.58 percent increase in overall services growth. The indirect effect of manufacturing growth on large urban firms (i.e., the main effect of manufacturing growth) has a positive sign but is not statistically significant.

The direct effect of manufacturing growth on small urban firms turns out to be negative and statistically significant (Table 6, column (5)). This suggests that small and large firms are substitutes; the jump in the growth rate of the latter comes partially at the expense of the former. The direct effect of manufacturing growth on the growth in GVA of rural firms goes in the same direction, although only the effect for larger firms is statistically significant. The indirect effects are also not significant for rural firms.

Continuing with the same specification, we examine the effect of manufacturing growth on employment, wages, and worker productivity in Tables 7, 8, and 9, respectively. Similar to GVA growth, in Table 7, for large urban firms, we find a positive direct effect of manufacturing on employment growth, but an insignificant indirect effect. Consistent with this, the direct effect on wages is positive and statistically significant in large urban firms. Finally, both the direct and indirect effects of manufacturing growth turn out to be positive and statistically significant for gross value added per worker in large firms. This last result is particularly important as it shows that manufacturing growth leads not only to size growth but also to productivity growth in large urban services firms.

For smaller urban firms we find that the direct effect of manufacturing is a decrease in employment, wages, and productivity, with the only positive effect being a positive indirect effect on wages. For rural firms, whether large or small, the only significant effects are for wages, which follow a similar pattern to urban firms (positive for larger firms, negative for smaller firms).

Overall, the results strongly support our hypothesis of a link between manufacturing and services growth through the direct channel (of manufacturing growth affecting those service sectors that rely on demand from manufacturing) and provide at best weak support for the indirect channel (with a significant effect only for productivity). Our results are consistent with our expectation that the growth of larger and urban firms is more likely to be linked to manufacturing. There is also consistent evidence that as larger firms are growing and becoming more productive smaller firms are contracting.

4.2 The Effect of Capital Intensity and Financial Development

Tables 6 to 9 also examine our second hypothesis regarding the growth in services, namely that easier access to inputs in the post-liberalization period led to enhanced growth in capital intensive services, which are expected to be more dependent on traded inputs. In column (6) of Table 6, we see that the capital intensity variable has a positive and statistically significant effect on services growth in large urban firms. The capital-intensity variable also turns up statistically significantly with a positive sign in the gross value added equation for small-scale rural and urban firms. It is statistically insignificant, although with a positive sign, in the case of large rural firms. Interestingly, the positive effect of the capital-intensity variable carries over to gross value added per worker across all categories of firms in Table 9. Assuming that our hypothesized connection between capital intensity and the need for traded inputs is correct, improved access to traded inputs has had a positive effect on services growth across the board.

In Tables 6 and 9, the interaction of capital intensity and financial development is not statistically significant for large urban firms. For small rural firms, it is negative and statistically significant. This is consistent with better-developed financial markets channeling credit toward larger urban firms and away from rural firms.

The results for employment and wages in Tables 7 and 8 are inherently more difficult to interpret. Access to capital could either be a substitute or a complement to labor demand. Likewise an increase in employment driven by an outward shift in the demand curve would increase wages for all workers, whereas skill-biased technological change could increase the wages of high-skill workers while driving down the wages of low-skill workers (Verhoogen 2008). In Tables 7 and 8 we find some evidence for both of these. Capital intensity is associated with wage growth among small and large urban firms, but a decrease (albeit statistically insignificant) in employment among large firms and an increase in employment in smaller urban firms. Instead, financial development, in those instances where it is significant, has a negative effect, hinting that growth fueled by access to capital may be associated with reduced demand for workers.

5. An Extension and Robustness Checks

5.1 Is Firm Size a Mediator?

Our results in Section 4.1 suggest a large spillover effect from manufacturing to the service sector. Since we see increases in productivity on the one hand and in size (total GVA and employment) on the other, our results do not establish whether growth is due to firms increasing in size or whether there is technological improvement, with firms becoming more productive at a given size. This is inherently a difficult question in a repeated cross-section data set.

Figures 2 to 4 provide circumstantial, if not causal, evidence by plotting the density of productivity per worker in 2001-2 and 2006-07. In Figure 2 we see that the overall density of worker productivity shifts right from 2001-02 to 2006-07. This pattern is accentuated in Figure 3 when we focus on firms with 5 or more workers. Even when we focus on very large firms (with 20 or more workers in Figure 4) we detect a rightward shift in the upper tail of productivity. Thus, the results suggest that, even controlling for firm size, firms have become more productive.

Table 10 presents a more formal test of this hypothesis by controlling for log employment in our instrumental variables specification (equations (4) to (6)). As with manufacturing growth, the econometric challenge is the simultaneity of firm size and our measures of firm behavior such as GVA, wages, and productivity. Extending the strategy used in Tables 6 to 9 we instrument for firm size by interacting average firm size in 2001-2 within two-digit sector with employer-friendly labor regulations. We continue to instrument for the direct effect of manufacturing growth on services growth and the interaction of manufacturing growth and service-sector-specific manufacturing reliance; industry fixed effects pick up the direct effect of average firm size by sector in 2001-02.

The results in Table 10 suggest that of the two mechanisms—an increase in firm size and an increase in productivity conditional on firm size—the latter is more important. Even after controlling for firm size, we continue to find positive and statistically significant effects of manufacturing on services. For log GVA we find that both indirect and direct manufacturing effects are significant at the one percent level. The coefficient of the direct effect, which was statistically significant in Table 6 as well, is unchanged in value. For wages, the indirect effect remains insignificant but the direct effect of manufacturing through the demand for service-sector output is now positive and statistically significant. For productivity, both coefficients remain positive and statistically significant, and slightly larger in value than their counterparts in Table 9 (although the difference is not statistically significant). The coefficient on firm size is positive, albeit not statistically significant, for GVA, wages, and productivity.

Thus our results suggest that the impact of manufacturing growth on services growth is not only a story of firms growing larger, but also of firms growing more productive conditional on size.

5.2 Test of Over-Identifying Restrictions

Rather than use labor regulations interacted with average firm size by two-digit industry to instrument for firm size, we can instead estimate the reference model in equations (4) to (6) and in Tables 6 to 9 using three instruments and test for the validity of the over-identifying restrictions (using Hansen's J-statistic; see Baum, Schaffer and Stillman 2010). We present the results from this analysis for our main results – namely for large, urban firms – in Table 11. Comparing Table 11 to the relevant columns in Tables 6 to 9, we find similar results qualitatively, in terms of statistical significance, and also in terms of magnitudes: the direct effect of manufacturing is statistically significant only for log productivity and the interaction with industry-specific services demand is statistically significant for all four outcomes. In the notes to the table, we present the p-value of the Hansen J-statistic test of over-identifying restrictions. We fail to reject the null hypothesis of valid instruments at a 5 percent level of significance or higher. For productivity and wages, we reject the null hypothesis of valid instruments at the 10 percent level.

In conjunction with the corroborative evidence presented in Figure 1, we believe this buttresses the case for the plausibility of our instrumental variables strategy.

5.3 Excluding Liberalized Service Sectors

Although the bulk of liberalization that occurred in the period we study was focused on manufacturing, there is a lingering concern that some of the services growth we are picking up could be due to direct reforms in the service sector. In this section we address this issue by excluding from the analysis those services sectors that were affected by liberalizing reforms: passenger and cargo air travel, courier services, and telecommunications. We also exclude all business services, which were largely made possible by the liberalization of the telecommunication sector, and travel agents, whose services were a direct outgrowth of the increasing options for passenger air travel. Banking is excluded in any case since it does not appear in round 57.

For brevity, we present results only for urban firms in Table 12. The pattern of the results is similar to the relevant columns in Tables 6 to 9, although magnitudes are somewhat smaller.

We continue to find a statistically significant and positive spillover from manufacturing to large urban service firms for those service sectors that provide inputs to manufacturing. This spillover effect, when statistically significant, tends to be negative for small urban firms. But overall Table 12 confirms that our main results are not being driven by direct deregulation of the service sector.

6. Concluding Remarks

Recent growth in India has been unconventional: while manufacturing growth has accelerated following trade liberalization and other pro-market reforms, services growth has accelerated far more. The result has been that the share of manufacturing in GDP has remained constant while that of services has expanded significantly.

The literature to date (Besley and Burgess 2004, Aghion, Burgess, Redding, and Zilibotti 2008, and Hasan, Mitra, and Ramaswamy 2007) has been exclusively devoted to explaining the growth in manufacturing. This is natural since at least some of the earlier reforms, such as tariff reductions and the end to industrial and import licensing, had been aimed at industry. Yet, the observed pattern of growth raises the question: why have services grown rapidly?

In this paper, we have taken a first stab at trying to explain the unusually high growth in services. A novel feature of our analysis, not present in the previous studies of services cited above, is the use of micro, firm-level data. This approach allows us to distinguish between the response to the reforms by small versus large and rural versus urban firms. In so far as it is large and urban firms that are more likely to be integrated into the market economy, reforms are more likely to impact those firms.

Our analysis begins by noting that some of the growth in services occurred because many of the reforms after 1991-92 were aimed precisely at services. These included the reforms of the financial sector, telecommunications, and civil aviation. But these reforms do not explain why growth in other services that are non-traded and were not subject to significant reform such as hotels and restaurants, transportation and education and health also accelerated.

We offer and test two hypotheses to explain this acceleration. First, liberalization in manufacturing that accelerated growth in manufacturing increased the demand for services through two possible channels: a direct channel involving the use of services as inputs by these manufactures and an indirect channel through increased expenditures. This increased demand led to accelerated growth in the services. Second, even though these services themselves are non-traded, they use inputs that are traded. Therefore, liberalization, which made traded inputs more accessible, helped accelerate growth in the service sectors using them.

Because growth in manufacturing itself responds to reforms simultaneously with growth in services, we face an identification problem. In the paper, we apply a variety of approaches to identify an exogenous change in manufacturing that we then use to study the impact on services growth. Our identification strategy is described in detail in the paper and we do not repeat it here. Instead, we provide a brief summary of our main findings.

First, in our preferred specification that uses an instrumental variable for identification, we find evidence for the positive and statistically significant direct effect of manufacturing growth (i.e., the effect operating through the use of services by manufacturing) on the growth of GVA in large urban services firms. We also find that the direct effect on smaller urban firms is negative and statistically significant suggesting that large and small firms are substitutes.[13] The indirect effect of manufacturing growth on services is typically not statistically significant.

Second, for large urban firms, we also find a positive direct effect of growth in manufacturing on employment growth and an insignificant indirect effect. Both the direct and indirect effects of manufacturing growth on gross value added per worker in large urban firms turn out to be positive and statistically significant. This last result is particularly important as it shows that manufacturing growth leads not only to size growth but also to productivity growth in large urban services firms.

Third, capital intensity has a positive and statistically significant effect on services growth in large urban firms. Even more interestingly, when we consider gross value added per worker, the positive and statistically significant effect of the capital-intensity variable carries over to all categories of firms. Under the assumption that the capital intensity variable correctly captures the need for traded inputs, improved access to the latter has had a positive and statistically significant effect on services growth across the board.

Finally, we also ask whether the strong effect on productivity as measured by gross value added per worker that we have found is mediated through firm size or is present even controlling for firm size. We find evidence that productivity increases in step with manufacturing growth even when we hold the firm size fixed. Therefore, the increase in firm size is at most only a partial explanation for the increase in output per worker.

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[13] This effect is similar to one of the results in Sundaram, Ahsan and Mitra (2012). These authors find substitutability between organized and unorganized sector manufacturing firms in states with les restrictive labor laws.

In the context of our theoretical model, our results are consistent with the direct spillover from manufacturing to services, but do not provide support for significant indirect effect, either through income or general equilibrium price effects. Increased worker productivity in services is consistent with the positive scale economies built into our model. At the same time the pattern of results comparing urban to rural and larger to smaller firms suggests the possibility of a richer model incorporating heterogeneity within the service sector. In particular, the contrast of the positive spillover of manufacturing on larger service firms with the negative effect on smaller service firms suggests several possibilities: that more productive firms are expanding while less productive firms are contracting; that smaller and larger firms produce a different range of services, with growth opportunities centered on the latter; or that worker human capital is being sorted by firm size, with growth opportunities favoring highly skilled workers. While it is beyond the purview of the present paper, this suggests an interesting agenda for future work.

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Appendix: A Simple Model of Liberalization and Services Growth with Scale Economies

In this appendix, we present a simple three-good model with economies of scale in services to provide a basic theory underlying the empirical analysis in the paper.

Imagine an economy producing three goods distinguished by subscripts 1, 2 and 3. Terms goods and sectors are used interchangeably throughout the appendix. Let X stand for gross physical output so that X_i (i = 1, 2, 3) represents gross output of good i. By assumption, good 1 is imported and used both as a final good and input in the production of good 3 representing non-traded services; good 2 is exported and uses as input good 3; and good 3, representing non-traded services, is subject to increasing returns in production.

We assume that the economy under consideration is small. By the choice of units, we can set the world prices of goods 1 and 2 at unity with the relative price between them being fixed at unity as well. The price of good 3, which is non-traded, is determined endogenously. Since our focus is on the supply side of the economy, we do not explicitly solve for this price, however.

Imports of good 1 are subject to a per-unit tariff at rate t. With the world price of good 1 normalized at unity, t is also an ad valorem tariff and the domestic price of good is $1 + t$. The domestic price of good 2 is the same as the world price, 1. We denote the domestic price of good 3 by p_3. As just noted, it is determined endogenously though we do not explicitly solve for it.

Goods 1 and 2 are produced under constant returns to scale with the standard production functions with the qualification that technology is fixed-coefficients-type with respect to produced inputs. Good 3 is subject to external economies of scale, which allows us to preserve the perfect competition assumption (see, for example, Panagariya 1981 and Helpman 1984). This form of scale economies considerably simplifies the analysis though our results could also be derived assuming product differentiation and internal economies of scale as in Krugman (1979).

The Revenue Function

Our main hypothesis is that trade liberalization expands services through three channels: cheaper imported inputs directly lower the production cost; expansion of manufactures that use services as inputs increase the demand for services; and increased income increases the demand for services. Our model tries to capture the first two effects through the assumptions that services use the import good, good 1, which is liberalized, as an input and that the export good, good 2, which expands upon trade liberalization, uses services as an input. The third effect comes from increased income following trade liberalization and the expansion of the increasing returns good, which is under-produced on account of the externality. We denote by β the amount of good 3 used per unit of good 2 and by γ the amount of good 1 used per unit of good 3.

To derive these and related effects, it is convenient to work with the GDP or revenue function (Dixit and Norman 1980), which we proceed to derive next.

For brevity, let Z_i denote the vector of primary inputs used in the production of good i (i = 1, 2, 3). Represent the production function of good 1 by

$$X_1 = F_1(Z_1). \tag{A.1}$$

Here $F_1(.)$ is linearly homogeneous in its arguments. Good 2, the export good, uses services as an input. We assume a two-stage production function for it. First, a composite factor of production V_2 is produced using primary factors of production via the linear homogeneous production function:

$$V_2 = F_2(Z_2). \tag{A.2}$$

One unit of the composite factor V_2 is then combined with β units of good 3 to yield one unit of good 2. That is,

$$X_2 = \min\ \{V_2, (M_3/\beta)\}. \tag{A.3}$$

Here M_3 is the quantity of good 3 used as input in good 2. The assumption of free disposal leads to:

$$X_2 = V_2 \tag{A.4a}$$

and

$$M_3 = \beta\, X_2 \tag{A.4b}$$

Good 3 is also produced via a two-stage production function with the qualification that the production of the composite factor used in it is subject to economies of scale that are external to the firm and internal to the industry. The standard way such external economies are captured in the literature is to postulate the production function of firm *j* as

$$V_3^j = G(V_3)\, F_3(Z_3^j). \tag{A.5}$$

In (A.5), V_3^j and Z_3^j denote the output of the composite factor used in good 3 by firm *j* and the vector of primary inputs employed by it. $F_3(.)$ is linearly homogeneous in its arguments and V_3

is the industry level value added. The function $G(.)$ captures the externality. Assuming $G'(.) > 0$, the externality is positive: the larger the industry-level output of the composite factor, the larger the agglomeration externality, which can arise from diffusion of ideas and the creation of skills that become available to all firms in larger volumes as the industry grows larger.

Aggregating over all firms, we obtain the industry-level production function of the composite factor used in good 3:

$$V_3 = G(V_3)\, F_3(Z_3). \tag{A.6}$$

We impose the restriction that the elasticity $\varepsilon = V_3 G'/G < 1$. This ensures that more output requires more input.

We produce good 3 by combining one unit of the composite factor of production with γ units of good 1. That is to say,

$$X_3 = \min\,\{V_3, (M_1/\gamma)\}. \tag{A.7}$$

Here M_1 is the amount of good 1 used as input in the production of good 3. Assuming free disposal,

$$X_3 = V_3 \tag{A.8a}$$

and

$$M_1 = \gamma X_3 \tag{A.8b}$$

We can now represent the competitive equilibrium in the economy through the revenue-maximization problem:

$$\max\ \Psi = (1+t)F_1(Z_1) + (1-\beta p_3)F_2(Z_2) + [p_3 - \gamma(1+t)]\ G(V_3)\ F_3(Z_3) + \lambda[Z - (Z_1 + Z_2 + Z_3)], \quad \text{(A.9)}$$

where Z represents the vector of endowments of primary factors of production and λ the vector of Lagrange multipliers associated with the full-employment constraints. The choice variables in the problem are factor allocations Z_i (i = 1, 2, 3) and the Lagrange multipliers λ. Recognizing that $1 - \beta p_3$ and $p_3 - \gamma(1+t)$ represent the implicit prices of valued added in sectors 2 and 3, equation (A.9) is equivalent to maximizing value added by primary factors valued at their implicit prices in the domestic economy.

The envelope function associated with the solution to the problem is the standard revenue function and may be written as (see Panagariya 1988):

$$R = R(1+t,\ 1 - \beta p_3,\ G(V_3)\{p_3 - \gamma(1+t)\};\ Z). \quad \text{(A.10)}$$

The partial derivatives of $R(.)$ with respect to the first three arguments yield the equilibrium values of the $F_i(.)$, which also equal the equilibrium values of the X_i for i = 1, 2 and X_1 and $X_3/G(X_3)$ in the case of i = 3. Note that X_1 and X_3 represent the gross values of outputs of goods 1 and 3, respectively. Explicitly stated

$$X_1 = R_1(.) \quad \text{(A.11a)}$$

$$X_2 = R_2(.) \quad \text{(A.11b)}$$

$$\frac{X_3}{G(X_3)} = R_3(.) \qquad \text{(A.11c)}$$

The net outputs of goods 1 and 3 are given by partial derivatives of $R(.)$ with respect to $1+t$ and p_3, respectively. Denoting by x_1 and x_3 the net outputs, we have:

$$x_1 = R_{1+t}(.) = R_1(.) - \gamma R_3(.) = X_1 - \gamma X_3 = X_1 - M_1 \qquad \text{(A.12a)}$$

and

$$x_3 = R_{p_3}(.) = -\beta R_2(.) + G(X_3)R_3(.) = X_3 - \beta X_2 = X_3 - M_3 \qquad \text{(A.12b)}$$

Trade Liberalization

We are interested in computing the effect of a change in t on the gross output of good 3 (which is what we use as the dependent variable in our empirical exercise as opposed to net output of services). Totally differentiating (A.11c), we have

$$\mathrm{d}X_3 = G[(R_{31} - \gamma GR_{33})dt + (-\beta R_{32} + GR_{33})dp_3] + R_3G'(.)dX_3.$$

Dividing both sides by X_3 and using a circumflex (^) to denote the proportionate change in a variable, we can rewrite this equation as

$$(1 - e)\hat{X}_3 = -\frac{1}{R_3}(gGR_{33} - R_{31})\, dt + \frac{1}{R_3}(GR_{33} - bR_{32})\, dp_3\,. \qquad \text{(A.13)}$$

By convexity of the revenue function, R_{33} is non-negative. If we additionally assume substitutability in production (this will be true, for example, if the Z_i consisted of one sector-specific factor and one factor common to all sectors), then R_{ik} ($i \neq k$) would be negative.

Consider first the term associated with the change in the tariff in (A.13). The conditions just mentioned are sufficient though not necessary to ensure that holding the price of good 3 constant, a tariff reduction leads to an expansion of the output of services. From the first term, we may also see that the reduction in the tariff expands gross output of good 3 through two channels. One, the reduced tariff makes good 3 production more profitable and, two, it causes good 1 to shrink and releases resources for deployment into good 3 (and good 2).

It is useful to explore the term associated with tariff reduction in (A.13) a little further. We know that R_3 is homogeneous of degree zero in its arguments. Therefore, we can have:

$$(1+t)R_{31} + (1 - \beta p_3)R_{32} + G(V_3)\{p_3 - \gamma(1+t)\}R_{33} = 0. \qquad \text{(A.14)}$$

Substituting the value of R_{31} from (A.14) into the term in the parentheses associated with the change in t in (A.13), we can obtain:

$$\gamma G R_{33} - R_{31} = [G p_3 R_{33} + (1 - \beta p_3)R_{32}] \qquad \text{(A.15)}$$

In this form, we can now see the effect the use of good 3 as input in good 2 has on the output of the former as we lower the tariff. To the extent that goods 2 and 3 are substitutes in production, the expansion of good 2 upon liberalization adversely impacts the expansion of good 3. But the greater the share good 3 as input in good 2 (as captured by βp_3), the smaller the adverse impact on the expansion of good 3 as a result of good 2 expansion following the tariff reduction.

Next consider the terms associated with the change in the price of good 3. In principle, this term can be positive or negative depending on which way p_3 moves. In turn, p_3 is subject to two opposite forces. At constant p_3, the reduction in the tariff increases the supply of good 3.

But it also increases the demand for the good, increasing real income via a reduction in distortion in both consumption and production. The net result may be an excess supply of or excess demand for good 3. If the income elasticity of demand for services is sufficiently large, however, the demand effect will dominate and p_3 will rise. In that case, the term associated with price change in equation (A.13) will further add to the supply of good 3. This is the third effect we mentioned above.

Output per Worker in Services

Up to this point, scale economies have not played a qualitative role in driving our results. Its only role has been to magnify the output effect via the multiplicative term $(1 - \varepsilon)$ on the left-hand side of the equation. We now show that scale economies play a substantive, qualitative role in driving some other result. We first consider the impact on output per worker in services. This requires restricting the model further by assuming that vector Z_3 consists of only two factors: a sector-specific factor called K_3 and labor, which is used in all sectors. We denoted labor employed in sector i by L_i (i = 1, 2, 3). Under these restrictions, differentiating (A.6) totally, we can obtain:

$$(1-\varepsilon)\hat{V}_3 = \theta_{L_3}\hat{L}_3 + \theta_{K_3}\hat{K}_3. \qquad \text{(A.16)}$$

Here we use θ_{L3} and θ_{K3} to represent the cost shares of labor and capital in the composite factor used on the production of good 3. Making use of (A.8a) and holding sector-specific capital fixed, we can deduce from (A.5)

$$\hat{X}_3 - \hat{L}_3 = \left[\frac{\theta_{L_3}}{1-\varepsilon} - 1\right]\hat{L}_3. \qquad \text{(A.16′)}$$

It immediately follows from (A.16′), that as good 3 expands, output per-worker in the services sector rises if θ_{L_3} is greater than (1- ε) and falls if the opposite is true. θ_{L_3} is more likely to exceed (1- ε) the larger the share of labor in value added and the greater the degree of increasing returns.

Figure 1

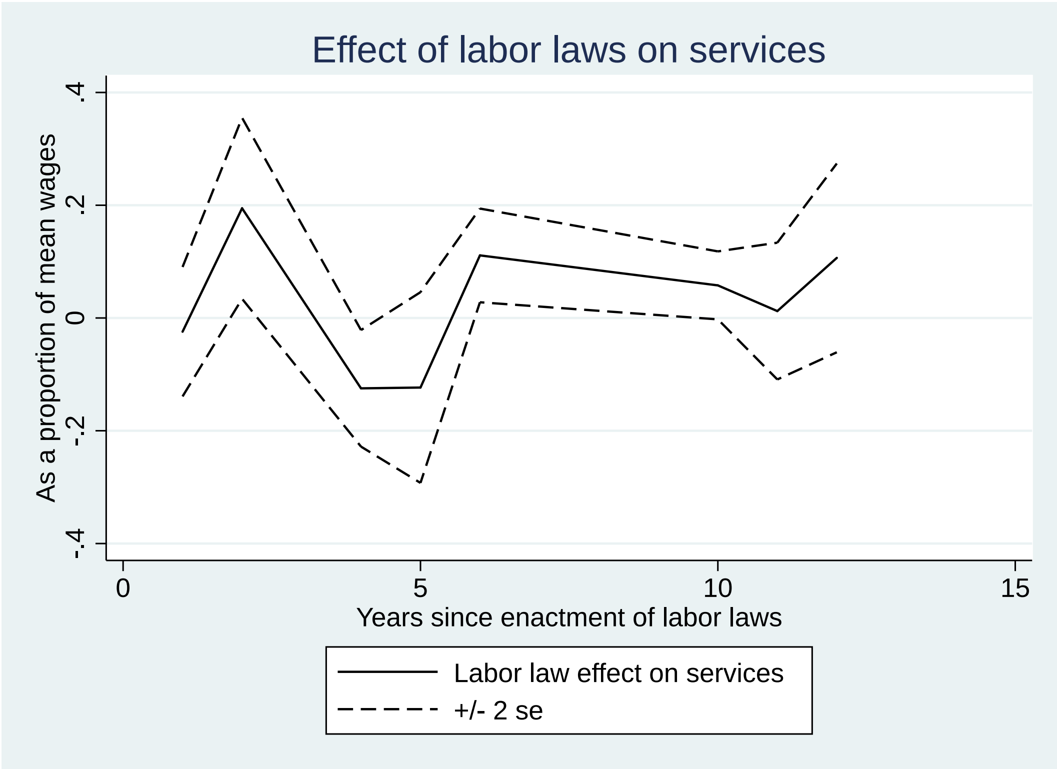
Effect of labor laws on services
As a proportion of mean wages
.4
.2
0
-.2
-.4
0
5
10
15
Years since enactment of labor laws
Labor law effect on services
+/- 2 se

Figure 2

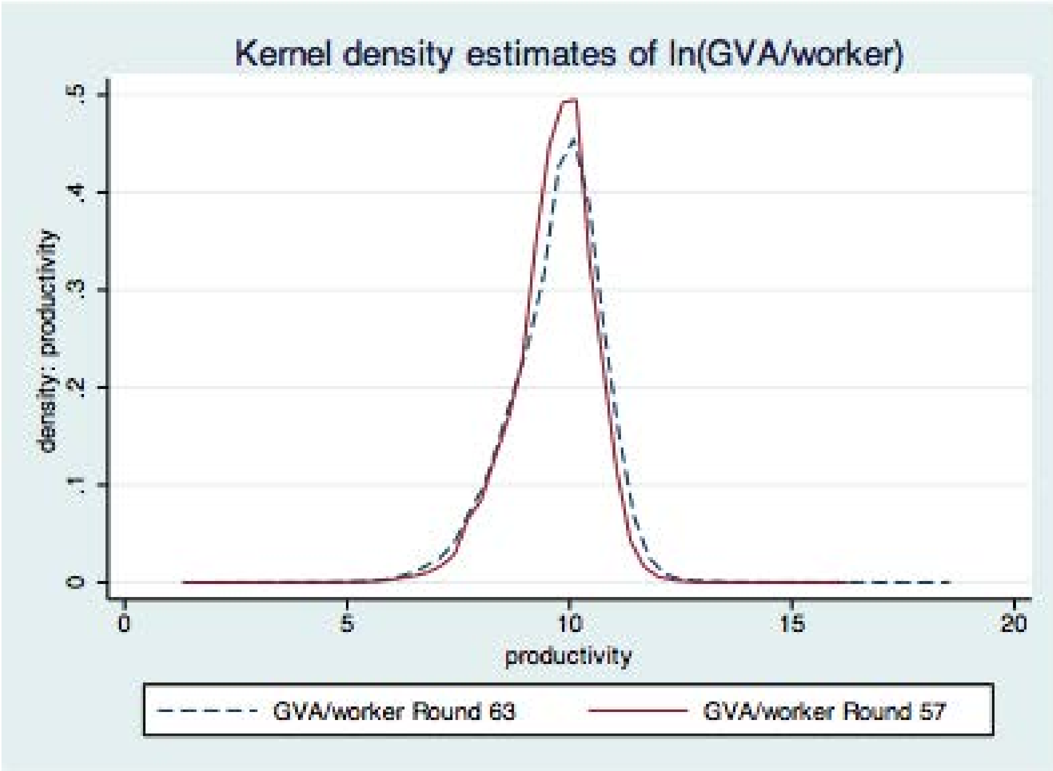
Kernel density estimates of ln(GVA/worker)
density: productivity
0
.1
.2
.3
.4
.5
0
5
10
15
20
productivity
GVA/worker Round 63
GVA/worker Round 57

Figure 3

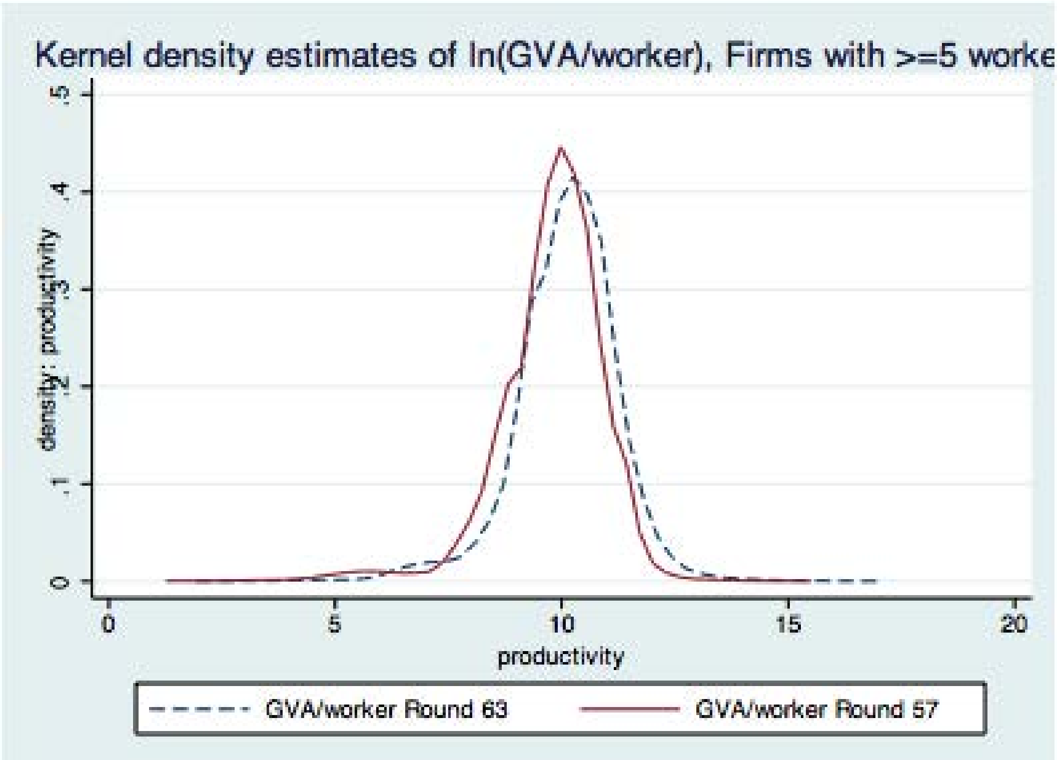
Kernel density estimates of ln(GVA/worker), Firms with >=5 worke
density: productivity
0
.1
.2
.3
.4
.5
0
5
10
15
20
productivity
GVA/worker Round 63
GVA/worker Round 57

Figure 4

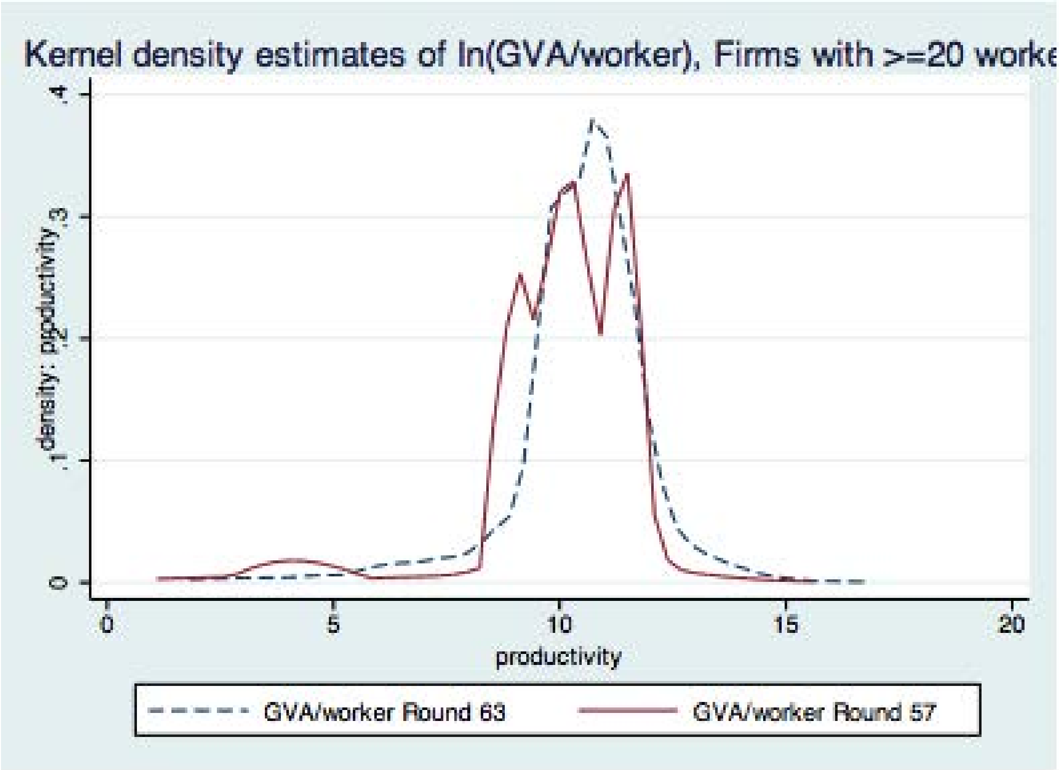
Kernel density estimates of ln(GVA/worker), Firms with >=20 worke
density: productivity
0
.1
.2
.3
.4
0
5
10
15
20
productivity
GVA/worker Round 63
GVA/worker Round 57

Table 1: Average annual growth in agriculture, industry and services in selected developing countries

Country and period	GDP	Agriculture	Industry	Services
South Korea				
1954-62	4.2	2.6	11.6	4.4
1963-72	9.5	4.7	17.3	10
Taiwan				
1951-53 to 1961-63	7	4.9	11.5	7.6
1961-63 to 1971-73	10	4.4	15.3	10.3
India				
1991-92 to 2002-03	5.6	2.3	5.6	7.1
2003-04 to 2011-11	8.4	4.1	8	9.7

Sources: Frank, Kim and Westphal (1975, Table 2-4, p. 11) for South Korea, Kuznets (1979, Tables 1.8 and 1.10) for Taiwan, and the authors' calculations using the data in the Reserve Bank of India Handbook, 2013 (Table 3) for India.

Table 2: Summary statistics by round

Sample	Full sample	Round 57	Round 63	Round 57 Rural	Round 57 Urban	Round 63 Rural	Round 63 Urban
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Yearly GVA Production	74424	46895	101368	31186	70311	33606	192599
	(24117384)	(713495)	(33918092)	(242525)	(1085954)	(188323)	(51954497)
Yearly Salary	28486	12994	43573	6479	22706	7039	92987
	(19101540)	(424249)	(26833754)	(96138)	(659043)	(152127)	(41157518)
Total Workers Employed	1.836	1.827	1.844	1.643	2.102	1.541	2.254
	(27.16)	(3.806)	(37.98)	(2.537)	(5.135)	(2.080)	(58.20)
Observations	446883	301995	144888	117081	184914	61069	83819

Notes: Mean coefficients; standard deviation in parentheses.

Table 3: Summary statistics by state

	By firm				By state			
Variable	log yearly GVA	Total employment	ln wages	ln productivity	Pro-employer labor regulations	Financial develop-ment dummy	Manufacturing growth	Manufacturing, Rs 10 billion
Sample	Rounds 57, 63	Rounds 57, 63	Rounds 57, 63	Rounds 57, 63			1998-1999	1988-1989
States	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Andhra Pradesh	9.763	1.939	7.207	9.347	1	1	7.800	1.586
	(0.00507)	(0.127)	(0.0118)	(0.00441)				
Assam	9.978	1.464	7.949	9.774	0	0	10.30	0.210
	(0.00858)	(0.216)	(0.0218)	(0.00747)				
Bihar	9.961	1.507	8.025	9.682	0	0	3.500	1.727
	(0.00585)	(0.147)	(0.0154)	(0.00510)				
Gujarat	10.52	2.033	8.885	10.16	1	1	15.10	2.846
	(0.00757)	(0.191)	(0.0185)	(0.00659)				
Haryana	10.44	1.862	8.173	10.09	0	1	9.200	1.018
	(0.0114)	(0.285)	(0.0236)	(0.00992)				
Karnataka	9.958	2.148	8.147	9.567	1	1	7.600	1.451
	(0.00723)	(0.182)	(0.0158)	(0.00630)				
Kerala	10.44	2.024	8.577	10.05	0	1	6.200	0.676
	(0.00719)	(0.179)	(0.0135)	(0.00626)				
Madhya Pradesh	9.964	2.143	8.05	9.534	0	0	-1.800	1.267
	(0.00888)	(0.223)	(0.0188)	(0.00773)				
Maharashtra	10.4	2.148	8.558	9.974	1	1	10.60	6.146
	(0.00527)	(0.133)	(0.0112)	(0.00459)				
Orissa	9.435	1.811	8.334	9.082	0	0	26.30	0.663
	(0.00796)	(0.200)	(0.0224)	(0.00693)				
Punjab	10.42	1.797	8.59	10.14	0	0	6.700	1.074
	(0.00936)	(0.235)	(0.0236)	(0.00815)				
Rajasthan	10.25	1.905	9.001	9.874	1	0	6.700	0.762
	(0.00792)	(0.196)	(0.0199)	(0.00690)				
Tamil Nadu	10.26	2.152	8.495	9.776	1	1	10.30	2.882
	(0.00593)	(0.149)	(0.0132)	(0.00516)				
Uttar Pradesh	9.818	1.722	7.816	9.49	0	0	5.800	3.149
	(0.00391)	(0.0973)	(0.0102)	(0.00340)				
West Bengal	9.766	1.441	7.328	9.595	0	0	6.400	2.493
	(0.00449)	(0.113)	(0.0120)	(0.00391)				
Observations	442,659	446,877	142,926	442,659	15	15	15	15

Notes: Standard deviations in parentheses.

Table 4: Share of service sector output used as input in manufacturing

Sector	Share used as input in manufacturing
Other transport services	0.30
Storage and warehousing	0.00
Communication	0.23
Trade	0.39
Hotels and restaurants	0.01
Banking	0.45
Insurance	0.43
Ownership of dwellings	0.00
Education and research	0.00
Medical and health	0.00
Other services	0.34

Note: Uses shares from Matrix 3 of 1998-1999 input-output tables.

Table 5: The effect of manufacturing on log(GVA) in services, fixed effect estimates

Sample	Full sample	< 5 workers Rural	< 5 workers Urban	≥ 5 workers Rural	≥ 5 workers Urban	< 5 workers Rural	< 5 workers Urban	≥ 5 workers Rural	≥ 5 workers Urban
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Labor regulations x 1(Year=2005-6)	0.412***	0.154***	0.349***	0.340***	0.301***	0.383***	0.383***	0.351***	0.278***
	[0.016]	[0.014]	[0.012]	[0.032]	[0.007]	[0.120]	[0.120]	[0.032]	[0.012]
Manufacturing growth						0.002	0.002	0.005	0.010**
						[0.011]	[0.011]	[0.020]	[0.004]
Manufacturing growth x manufacturing demand for services						0.065**	0.065**	0.063	0.026
						[0.025]	[0.025]	[0.052]	[0.037]
Observations	345,482	122,374	190,292	7,329	25,487	122,374	122,374	7,329	25,487

Notes: Robust standard errors in brackets. All specifications include state, year, and two-digit industry fixed effects. *** p<0.01, ** p<0.05, * p<0.10.

Table 6: The effect of manufacturing on log(GVA) in services, IV Estimates

Dependent variable	Manufacturing growth	Manufacturing growth x industry-specific demand	log(GVA)	log(GVA)	log(GVA)	log(GVA)
Specification	First stage	First stage	IV	IV	IV	IV
	NIC, state, and year FE	NIC, state, and year FE	NIC, state, and year FE	NIC, state, and year FE	NIC, state, and year FE	NIC, state, and year FE
Sample	≥ 5 workers	≥ 5 workers	< 5 workers	≥ 5 workers	< 5 workers	≥ 5 workers
	Urban	Urban	Rural	Rural	Urban	Urban
Variables	(1)	(2)	(3)	(4)	(5)	(6)
Manufacturing growth			-0.098	-0.008	-0.020	0.009
			[0.068]	[0.064]	[0.023]	[0.009]
Manufacturing growth x manufacturing demand for services			-0.041	0.121*	-0.076***	0.111***
			[0.066]	[0.066]	[0.023]	[0.034]
Capital intensive sector			0.637***	0.151	1.044***	0.626***
			[0.084]	[0.374]	[0.098]	[0.139]
Capital intensive sector x Financial development dummy			0.002	-0.395***	-0.140	-0.156
			[0.181]	[0.106]	[0.095]	[0.134]
Labor regulations x 1988 Manufacturing	0.770***	-0.032				
	[0.070]	[0.025]				
Labor regulations x 1988 Manufacturing x manufacturing demand for services	-0.126	1.768***				
	[0.109]	[0.089]				
Observations	25,648	25,648	122,374	7,329	190,292	25,487
F-test for IV	100	216				
Under-id LM test			973	41.9	6500	1053
Weak-id test			600	30.3	4547	777

Notes: Robust standard errors in brackets. All specifications include state, year, and two-digit industry fixed effects. *** p<0.01, ** p<0.05, * p<0.10. Instruments for Manufacturing growth and Manufacturing growth x manufacturing demand for services are Labor regulations x 1988 Manufacturing and Labor regulation x manufacturing demand for services.

Table 7: The effect of manufacturing on total employment in services, IV estimates

Specification	IV NIC, state, and year FE	IV NIC, state, and year FE	IV NIC, state, and year FE	IV NIC, state, and year FE
Sample	< 5 workers Rural	≥ 5 workers Rural	< 5 workers Urban	≥ 5 workers Urban
Variables	(1)	(2)	(3)	(4)
Manufacturing growth	-0.013	-0.057	0.001	0.076
	[0.011]	[0.274]	[0.004]	[0.096]
Manufacturing growth x industry-specific manufacturing demand	-0.008	0.312	-0.037***	1.811***
	[0.013]	[0.595]	[0.012]	[0.568]
Capital intensive sector	0.008	-4.232***	0.181*	-1.692
	[0.168]	[1.162]	[0.090]	[1.891]
Capital intensive sector x Financial development dummy	-0.194***	-1.535**	-0.137	-1.771
	[0.063]	[0.623]	[0.079]	[1.598]
Observations	123,648	7,417	192,023	25,645
Under-id LM test	953	44.5	6472	996
Weak-id test	582	33.8	4522	719

Notes: Robust standard errors in brackets. All specifications include state, year, and two-digit industry fixed effects. *** p<0.01, ** p<0.05, * p<0.10. Instruments for Manufacturing growth and Manufacturing growth x manufacturing demand for services are Labor regulations x 1988 Manufacturing and Labor regulation x manufacturing demand for services.

Table 8: The effect of manufacturing on log wages in services, IV estimates

Specification	IV NIC, state, and year FE	IV NIC, state, and year FE	IV NIC, state, and year FE	IV NIC, state, and year FE
Sample	< 5 workers Rural	≥ 5 workers Rural	< 5 workers Urban	≥ 5 workers Urban
Variables	(1)	(2)	(3)	(4)
Manufacturing growth	0.050	-0.062	0.045*	-0.011
	[0.062]	[0.063]	[0.025]	[0.018]
Manufacturing growth x industry-specific manufacturing dema	-0.171**	0.096*	-0.447***	0.083*
	[0.060]	[0.046]	[0.056]	[0.043]
Capital intensive sector	-0.105	0.034	0.375***	0.468***
	[0.215]	[0.232]	[0.089]	[0.093]
Capital intensive sector x Financial development dummy	-0.517***	-0.196**	-0.348***	-0.082
	[0.095]	[0.089]	[0.091]	[0.109]
Observations	30,159	7,128	55,718	25,168
Under-id LM test	227	43.7	1148	987
Weak-id test	142	33.4	955	725

Notes: Robust standard errors in brackets. All specifications include state, year, and two-digit industry fixed effects. *** p<0.01, ** p<0.05, * p<0.10. Instruments for Manufacturing growth and Manufacturing growth x manufacturing demand for services are Labor regulations x 1988 Manufacturing and Labor regulation x manufacturing demand for services.

Table 9: The effect of manufacturing on log worker productivity in services, IV estimates

Specification	IV NIC, state, and year FE	IV NIC, state, and year FE	IV NIC, state, and year FE	IV NIC, state, and year FE
Sample	< 5 workers Rural	≥ 5 workers Rural	< 5 workers Urban	≥ 5 workers Urban
Variables	(1)	(2)	(3)	(4)
Manufacturing growth	-0.090	-0.003	-0.020	0.013**
	[0.063]	[0.045]	[0.022]	[0.005]
Manufacturing growth x industry-specific manufacturing demand	-0.035	0.066	-0.055**	0.078**
	[0.066]	[0.064]	[0.022]	[0.026]
Capital intensive sector	0.608***	0.542*	0.919***	0.871***
	[0.114]	[0.285]	[0.061]	[0.082]
Capital intensive sector x Financial development dummy	0.117	-0.256*	-0.067	-0.077
	[0.200]	[0.121]	[0.085]	[0.079]
Observations	122,374	7,329	190,292	25,487
Under-id LM test	945	44.5	6414	1001
Weak-id test	574	33.9	4469	731

Notes: Robust standard errors in brackets. All specifications include state, year, and two-digit industry fixed effects. *** p<0.01, ** p<0.05, * p<0.10. Instruments for Manufacturing growth and Manufacturing growth x manufacturing demand for services are Labor regulations x 1988 Manufacturing and Labor regulation x manufacturing demand for services.

Table 10: The effect of manufacturing on services controlling for size, IV estimates

Dependent variable	ln(GVA)	ln(wages)	ln(productivity)
Specification	IV	IV	IV
	NIC, state, and year FE	NIC, state, and year FE	NIC, state, and year FE
Sample	≥ 5 workers Urban	≥ 5 workers Urban	≥ 5 workers Urban
Variables	(1)	(2)	(3)
Manufacturing growth	0.021**	0.012	0.023**
	[0.008]	[0.011]	[0.008]
Manufacturing growth x manufacturing demand for services	0.090**	0.100	0.091**
	[0.035]	[0.058]	[0.034]
Growth in ln(employment) between round 57 to 63	1.404	2.959	1.281
	[1.149]	[1.887]	[0.924]
Share of industry-specific manufacturing demand	0.000	0.000	0.000
	[0.000]	[0.000]	[0.000]
Capital intensive sector	0.908***	0.602***	0.934***
	[0.093]	[0.100]	[0.092]
Capital intensive sector x Financial development dummy	-0.063	-0.081	-0.065
	[0.066]	[0.074]	[0.062]
Observations	25,487	25,168	25,487
Under-id LM test	28.2	26.8	28.2
Weak-id test	5.90	5.75	5.90

Notes: Robust standard errors in brackets. All specifications include state, year, and two-digit industry fixed effects. *** p<0.01, ** p<0.05, * p<0.10. Instruments for Manufacturing growth, Manufacturing growth x manufacturing demand for services, and growth in ln(employment) are Labor regulations x 1988 Manufacturing, Labor regulation x manufacturing demand for services, and Labor regulation x average-firm-size by two-digit industry

Table 11: Testing over-identifying restrictions

	(1)	(2)	(3)	(4)
Dependent variable	ln(GVA)	total employment	ln(wages)	ln(productivity)
Specification	IV	IV	IV	IV
Sample	≥ 5 workers	≥ 5 workers	≥ 5 workers	≥ 5 workers
	urban	urban	urban	urban
VARIABLES	NIC & state FE	NIC & state FE	NIC & state FE	NIC & state FE
Manufacturing growth	0.010	0.080	-0.011	0.013**
	[0.010]	[0.094]	[0.018]	[0.005]
Manufacturing growth x industry-specific manufacturing demand	0.096*	1.307***	0.087*	0.086**
	[0.045]	[0.381]	[0.056]	[0.034]
Capital intensive sector	0.616***	-1.637	0.456***	0.859***
	[0.142]	[1.855]	[0.096]	[0.088]
Capital intensive sector x Financial development dummy	-0.150	-1.787	-0.075	-0.070
	[0.124]	[1.455]	[0.108]	[0.074]
Observations	25,487	25,645	25,168	25,487
Hansen J-stat p-val	0.064	0.094	0.13	0.29

Notes: Robust standard errors in brackets. All specifications include state, year, and two-digit industry fixed effects. *** p<0.01, ** p<0.05, * p<0.10. Instruments for Manufacturing growth and Manufacturing growth x manufacturing demand for services are Labor regulations x 1988 Manufacturing, Labor regulation x manufacturing demand for services, and Labor regulation x average-firm-size by two-digit industry
*** p<0.01, ** p<0.05, * p<0.10

Table 12:Dropping deregulated service sectors

	(1)	(1)	(2)	(2)	(3)	(3)	(4)	(4)
Dependent variable	ln(GVA)	ln(GVA)	total employment	total employment	ln(wages)	ln(wages)	ln(productivity)	ln(productivity)
Specification	IV	IV	IV	IV	IV	IV	IV	IV
Sample	< 5 workers	≥ 5 workers	< 5 workers	≥ 5 workers	< 5 workers	≥ 5 workers	< 5 workers	≥ 5 workers
	urban	urban	urban	urban	urban	urban	urban	urban
VARIABLES	NIC & state FE	NIC & state FE	NIC & state FE	NIC & state FE	NIC & state FE	NIC & state FE	NIC & state FE	NIC & state FE
Manufacturing growth	0.007	0.006	0.001	-0.018	0.032	-0.026	0.007	0.010
	[0.022]	[0.009]	[0.004]	[0.114]	[0.030]	[0.020]	[0.020]	[0.006]
Manufacturing growth x industry-specific manufacturing demand	-0.006	0.137***	-0.017*	0.454*	-0.550***	0.101***	0.003	0.110***
	[0.020]	[0.042]	[0.010]	[0.220]	[0.098]	[0.023]	[0.018]	[0.031]
Capital intensive sector	1.204***	1.679***	0.945***	0.000	0.000	1.368***	0.729***	1.344***
	[0.189]	[0.278]	[0.230]	[0.000]	[0.000]	[0.214]	[0.146]	[0.211]
Capital intensive sector x Financial development dummy	0.091	-0.168	-0.219**	-1.761	-0.361**	-0.042	0.216**	-0.085
	[0.116]	[0.120]	[0.081]	[1.540]	[0.123]	[0.079]	[0.098]	[0.068]
Observations	136,524	22,625	137,804	22,769	38,335	22,326	136,524	22,625

Notes: Robust standard errors in brackets. All specifications include state, year, and two-digit industry fixed effects and exclude the following sectors: business services, air cargo services, renting of air transport equipment, air transport support services, and travel agencies, courier services, telecom services, . *** p<0.01, ** p<0.05, * p<0.10. Instruments for Manufacturing growth and Manufacturing growth x manufacturing demand for services are Labor regulations x 1988 Manufacturing and Labor regulation x manufacturing demand for services.