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Abstract

This paper examines the effect of tradable services growth on non-tradable services across Indian districts. We use a shift-share "Bartik-type" instrumental variable, that relies on changes in foreign demand shocks for tradable services, weighted by the initial district employment shares in tradable services. Using multiple rounds of the Indian Economic Censuses, we find that an increase in tradable services employment leads to an increase in non-tradable services employment and increases the number of firms in non-tradable services. Our evidence suggests that this positive impact is due to an increase in consumer demand for local non-tradable services that results from the growth in tradable services employment, and not due to sectoral linkages between tradable and non-tradable services sectors. The employment impact is much larger for female workers compared to male workers, and for the number of female-owned firms relative to male-owned firms. Further, the employment impact is only significant for small non-tradable service firms.

Keywords: Service sector, Employment, Female Employment

JEL Classification: O1, O14, O19

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1. Introduction

The peak shares of manufacturing in value added and employment across a range of developing economies, since the 1980s, occurred at lower levels of per capita income than in their high-income, early industrializer precursors (Rodrik 2016). This "premature" deindustrialization reflects a structural transformation where the services sector has grown relatively faster. Much like manufacturing (Rodrik 2013), this services growth has been characterized by unconditional convergence of productivity to the frontier: countries starting from lower labor productivity in the services sector grew faster between 1975 and 2012 than those with higher initial labor productivity in that sector (Kinfemichael and Morshed 2019).

Much of this catch-up is attributable to tradable services, such as ICT (information and communications technology), business, and financial services, that are offshorable just like goods. Digital technologies have boosted trade in these services (Freund and Weinhold 2002), many of which now have trade costs comparable to manufacturing industries (Gervais and Jensen 2019). Tradable services have also had broader productivity impacts because they enable trade in goods. There is evidence, for instance, which finds that the liberalization of telecommunications and transportation services has improved the productivity of downstream manufacturing firms (Arnold et al. 2016; Bas 2014).

However, many of these tradable services are also typically skill-intensive (Nayyar et al. 2021a; Amirapu and Subramanian 2015; Nayyar 2012a). Large numbers of low-skilled workers are often employed in services, such as retail and hospitality, that are associated with a high intensity of face-to-face interaction between consumers and services providers. And while there is some evidence to suggest that these non-tradable services have contributed to productivity growth (Fan et al. 2021), demand is typically constrained by the size of the local market. This reduces workers' opportunities to benefit from international trade. The question therefore is whether less traded services that often account for the lion's share of services employment in developing economies can benefit from services trade.

In this paper, we study the effect of the growth of employment in tradable services on the growth of employment in non-traded services, across Indian districts, between 1990 and 2013. India provides the relevant context given the rapid growth of its export-oriented services, such as software and business process outsourcing, since the 1990s (Eichengreen and Gupta 2011; Nayyar 2012a). In documenting two waves of services-sector growth, Eichengreen and Gupta (2013) show that the share of modern services in output began to rise in a second wave at a level of per capita income of about US $4,000 (in year 2000 US purchasing-power-parity [PPP] dollars

terms) before 1990. However, this wave started at lower levels of per capita income after 1990 than in the preceding four decades. India—which experienced a dramatic growth of its software and business services sector during the decades since 1980—had a per capita income level of about US $3,300 (in year 2000 PPP dollars terms) in as late as 2009. However, evidence also shows that the export of these services has benefited skilled workers more than unskilled workers in India (Mehta and Hasan 2012). As a result, there are concerns that a labor-abundant economy, such as India, cannot rely on information technology-related services to facilitate structural transformation. These concerns can be alleviated, at least in part, to the extent that the growth of tradable services boosts job creation in non-tradable services.

The main challenge in analyzing the question is that time-varying unobservable district level characteristics may be correlated with district-level changes in employment in both tradable and non-traded services. This would preclude us from making any policy-relevant causal conclusions on the strength of the relationship between growth in tradable and nontraded services. Ideally, we would like to generate exogenous variation in the growth in tradable services employment and the current proportion of workers in the district that are affected by the growth in tradable services. We rely on changes in foreign demand shocks (world import demand changes) for these services that are otherwise unrelated to increases in employment in non-traded services, to obtain exogenous variation in employment growth in tradable services sectors ("shift"). This exogenous employment growth in tradable services common to all districts, however, would have differential effects across districts, depending on their current employment shares in these services. We rely on the initial district-level employment shares in traded services ("share") to obtain exogenous variation in the current district-level employment shares in these services. We therefore use a district-specific shift-share "Bartik-type" instrumental variable, following Hummels et al. (2014), that is the average change in world import demand – excluding India – for tradable services weighted by the initial employment shares of these services across districts. Using the instrumental variable strategy, we find that a 10percent increase in tradable services employment leads to a 4.2percent increase in non-traded services employment. Furthermore, such an increase in tradable services employment increases the number of firms in non-tradable services by 2.8percent.

Although we find a positive impact of the growth in tradable services on non-traded services in Indian districts, it is important to understand the potential mechanisms driving this relationship. Both the demand-side factors and sectoral linkages may have played a role. On the one hand, the growth in tradable services employment may have raised income levels in the district, in turn leading to higher consumer demand for local non-traded services (demand-side channel). On the other

hand, the growth in tradable services may have led to the growth in those non-tradable services that have strong input-output linkages (sectoral-linkages channel). We find stronger suggestive evidence that demand-side factors rather than the supply-side factors explain the relationship between the growth in tradable and non-tradable services in Indian districts. First, we find that non-traded services that benefit the most from tradable service growth have very low input-output linkages. Next, we find that household expenditure on key non-tradable services increased in districts that were exposed to larger increases in employment among tradable services.

Studying the consequences of services trade on non-tradable services is also important given that women might be disproportionately affected. This is because of their comparative advantage in non-traded pink-collar services occupations, such as teaching, residential care, social work, nursing, and personal services – as they were in the United States between 1950 and 1970 (Goldin 2006).The literature also finds that female entrepreneurs tend to be predominantly in non-tradable services, such as retail (Bank 2022; Bardasi and Terrell 2011). Assessing the effects on non-tradable services, where women are more likely to work, becomes especially critical in the Indian setting where women's labor force participation remains low (Chiplunkar and Goldberg, 2021).

Furthermore, services establishments tend to be significantly smaller than manufacturing establishments, especially those in non-tradable services, such as retail trade. This observed gap in establishment size can be explained, at least in part, by the extent of informality. Non-tradable services, such as retail and personal services, comprise a large part of the informal sector in developing economies (Nayyar et al., 2021b). Informality plays a role in explaining size differences between services firms across developing and developed economies. Based on evidence from Latin America, Alfaro and Eslava (2020) show that the exclusion of the informal sector – that is more pervasive in developing economies – reduces the size gap between services firms across countries at different levels of per capita income. Therefore, analyzing the heterogeneous effects of the growth in non-tradable services by firm size is also important, especially in the Indian context where informality pervades the services sector. There are also overlaps between gender and firm size. Women are more likely than men to operate in informal firms that are typically smaller (Hallward-Driemeier, 2013).

We therefore look at gender and firm size as two important margins of heterogeneity.

We find that magnitude of the impact is much larger for female workers; a 10percent increase in tradable services employment leads to a 9.1percent increase in

non-traded services employment for women compared to 4.2percent for men. We find even larger differences between female-owned and male-owned firms. A 10percent increase in tradable services employment leads to a 13.7percent increase in female-owned firms in non-traded services for women compared to a statistically insignificant 1.6percent increase for male-owned firms. Finally, we find that the effects are only significant for small non-tradable service firms (for firms between 1-10 workers).

Our paper contributes to several strands of literature. First and foremost, our paper is related to the literature on structural transformation into the services sector. Eichengreen and Gupta (2013) find that the growth of modern, tradable services – finance, ICT, and business services – started at lower levels of per capita income after 1990 than in the preceding four decades, thereby benefiting developing economies relatively early in their structural transformation process. Furthermore, the growth of these services has improved educational outcomes. Oster and Steinberg 2013 show that the IT revolution in India boosted the enrollment of girls and boys, equally, in schools with English as the language of instruction. Nano et al. (2021) find that employment growth in telecommunications and financial services, boosted by liberalization in these sub-sectors, increased school enrollment rates. As a result, the increase in the skill premium was also less pronounced in India (Shastry 2012). Using data from India, Fan et al. (2021) show that even traditional, non-tradable services have contributed to productivity growth, albeit benefiting consumers at the top of the income ladder more.

Our paper also contributes to the literature on how linkages between the services and manufacturing sectors benefit overall economic growth. A substantial body of evidence across countries shows that the services "embodied" in manufactured goods have a significant impact on manufacturing productivity (Arnold et al. 2016; Arnold et al. 2011; Bas and Causa 2013; Francois and Woerz 2008). Services used as inputs in the manufacturing sector have benefited from growth in the latter too. Evidence from India shows that growth in manufacturing has accelerated growth in value added and worker productivity in services firms within the same geographic region (Dehejia and Panagariya 2016).

We also contribute to the literature on the effects of globalization on non-tradable services. Mun˜oz (2021) analyzes the impact of "posting" policies in the European Union (EU) that enables firms in one country to send ("post") their workers to perform non-tradable services jobs, such as plumbers or drivers, in another country. She finds that firms in previously "non-tradable" services increase their sales, profits and wages when accessing foreign markets through the movement of workers across national boundaries. Such exports of services are less

prevalent outside the EU where the movement of labor is constrained by regulatory barriers. Non-tradable services can also benefit from globalization indirectly through greater demand resulting from the growth of knowledge-intensive tradable services, such as ICT and professional services. Frocrain and Giraud (2017) investigate the evolution of employment in the tradable and non-tradable sectors in France, and find that 80 additional non-tradable jobs were created for every 100 tradable jobs created in a local employment area between 2008 and 2016. However, they do not distinguish between the services and manufacturing sectors in their analysis.

Last, but not least, our paper contributes to the literature on how services growth is reducing gender gaps. Ngai and Petrongolo (2017) show that the expansion of the services sector, driven by structural transformation and marketization of home production, has raised women's relative wages and market hours in the United States. Ben Yahmed and Bombarda (2019) find that trade liberalization increases the probability of informal employment in the services sector among low-skilled women that is linked – at least in part – to women entering the labor force. Jensen (2012) finds that an increase in labor market opportunities in the business process outsourcing industry increased education and health outcomes of girls, boosted career aspirations, and delayed marriage and fertility decisions of young women. On the consumption side, Atkin et al. (2018) show that female-headed households are likely to benefit more from imports of consumer services because they tend to spend a larger share of their income on, for example, food and retail.

Our paper provides new evidence on a dimension of structural transformation that is often ignored by policymakers who are most concerned with the movement of labor from agriculture to manufacturing. In India, the positive contribution of structural change to economic growth after the 1990s was largely attributable to the expansion of tradable service activities: finance, IT, business process outsourcing (BPO), and other business services (McMillan et al. 2017). The skill-intensity of these services, relative to manufacturing, has raised concerns that large-scale job creation, especially for low-skilled workers, is not as forthcoming. We find that the growth of employment in tradable services has a positive impact on growth of employment in non-tradable services. This impact magnifies the magnitude of employment creation associated with the growth of tradable services.

The rest of this paper is structured as follows. Section 2 discusses the empirical strategy and data, section 3 presents the results, while section 4 concludes.

2. Empirical Strategy and Data

2.1 Data

Our main data sources include multiple rounds of the Economic Censuses in India, namely the 3rd (1990), 4th (1998), 5th (2005) and 6th (2013) rounds. The census covers all economic enterprises in the country, except those engaged in crop production and plantations, and provides information on the number of workers hired by each enterprise, number of enterprises, as well as ownership (male/female) of enterprises. We aggregate this information at the district-level. However, after 1990 several new districts were created in India. As a result, the administrative boundaries of many districts changed between the various Economic census rounds. Therefore, we reclassify the newly formed districts to their original district administrative boundary in 1990. In total therefore, we have 433 districts in our data.

We also use National Sample Survey Consumer Expenditure (NSS CES) rounds 55 (199900), 61 (2004-05) and 68 (2011-12), for household expenditure data. To explore linkages between tradable and non-traded services sectors, we use the Indian Input Output Transactions (IOT) Table from 2006-2007. Lastly, the trade data for world import demand for services sector comes from the WIOD database, as described in Timmer et al. (2015).

2.2 Classifying Tradability

Our discussion of tradable and non-tradable services first requires a classification. To classify sectors into tradable and non-tradable, a popular approach is to analyze the geographic dispersion of industries, following Jensen and Kletzer (2006). However, Gervais and Jensen (2019) have recently improved upon this approach by constructing a classification based on implied trade costs.

Due to data limitations, we cannot estimate trade costs in the same way as Gervais and Jensen (2019). Instead, we follow the approach proposed by Head and Ries (2001) and then adapted by Chen and Novy (2011) using data from the World Input-Output Database (WIOD).

In this sense, implied bilateral trade costs can be expressed as a ratio of intra-national to international trade flows:

$$\theta_{ij}^{k} = \left(\frac{X_{ii}^{k} X_{jj}^{k}}{X_{ij}^{k} X_{ji}^{k}} \right)^{\frac{1}{2\sigma_k - 1}} \tag{1}$$

Here X_{ii}^k and X_{jj}^k represent domestic trade of industry k for countries i and j respectively, whereas X_{ij}^k are bilateral imports from country i's industry k to country j and σ_k is the elasticity of substitution for industry k.

The more two countries trade with each other (i.e., the higher is $X_{ij}^k X_{ji}^k$) the lower is the measure of relative trade costs, ceteris paribus. Conversely, if domestic consumption becomes relatively more important in either country, this would indicate larger international trade frictions or lower tradability. Then, sectors with high tradability (low trade costs) are considered tradable, while the rest are classified as non-tradable. Since we are not able to (causally) estimate σ by industry, we follow Chen and Novy (2011) and WTO (2018) in assuming a value of eight across sectors. Note that, as long as we assume a constant value across sectors, the value itself does not change the ranking of trade costs and therefore cannot affect the tradability classification. We then average the bilateral trade costs for India across partner countries. For a few sectors, there is no data on Indian trade available, in which case we take the global average trade costs instead.

Lastly, as in any classification, we must set a threshold for tradability. Since the tradability of manufacturing is well known, we set the threshold for trade costs equal to the highest level for manufacturing, such that all manufacturing is just tradable. This approach has also been applied, for example, in Frocrain and Giraud (2017) and Eliasson et al. (2012). As a result, our tradable service sectors are those that are just as tradable as manufacturing.

Our sample contains 35 broad service sectors, of which 17 are classified as non-tradable. The list of non-tradable and tradable service sectors is shown in Table 2. This classification is fairly similar to a closely related paper on France by Frocrain and Giraud (2017), despite different methodologies.[1] While modern technology is rapidly changing the tradability of services, it is worth noting that our classification intends to be representative for our sample period of 1998-2013, during which time many services were in part not as easily tradable as today.

Some relevant summary statistics are presented in Table 1. The share of non-tradable services in total non-agricultural employment was overwhelmingly large, increasing from 55 percent in 1998 to 65 percent in 2013. The corresponding share of tradable services was as low as 4 percent in 2013. Women workers comprised 14 percent of total employment in non-tradable services in 1998 and this increased to 23 percent by 2013. The share of women-owned firms in non-tradable services similarly

[1] Only two of our non-tradable sectors are tradable according to Frocrain and Giraud (2017). These are rental and leasing activities and travel agencies, with the difference likely due to the older time period which we examine, i.e. when physically going to a travel agency may have largely been necessary.

increased, albeit from a lower base. The corresponding shares of women workers and women-owned firms was lower in tradable services. Furthermore, the share of employment among small firms (less than workers) in non-tradable services, at more than three-fourths, was consistently large between 1998 and 2013.

Table 1: Summary Statistics

	1998	2005	2013
Share of non-tradable in total non-agri employment (%)	55.03	59.80	64.54
Share of women employment (%)	14.19	16.96	22.58
Share of women ownership (%)	4.18	4.72	8.92
Average employment (No.)	2.14	2.04	2.12
% Share of employment in small firm (1-10)	80.09	82.52	81.13
% Share of employment in large firm (> 10)	19.91	17.48	18.87
b) **Tradable services**			
Share of tradable in total non-agri employment (%)	2.20	2.41	3.56
Share of women employment (%)	7.38	8.13	11.70
Share of women ownership (%)	2.58	2.38	6.10
Average employment (No.)	2.95	2.55	2.48
% Share of employment in small firm (1-10)	71.60	81.57	84.96
% Share of employment in large firm (> 10)	28.40	18.43	15.04

Table 2: List of Tradable and Non-tradable Services

Tradable services	Non-tradable services
Sea and coastal water transport	Wholesale trade
Inland water transport	Retail trade
Air transport	Land transportation activities
Warehousing	Postal and courier activities
Support activities for transportation	Accommodation and food service
IT services	Financial and insurance activities
Picture, video and television programme	Real estate activities
Broadcasting and programming activities	Legal and accounting activities
Architectural and engineering activities	Rental and leasing activities
Technical testing and analysis	Employment activities
Scientific research and development	Travel agency, other reservation services
Advertising	Education
Photographic activities	Health
Creative, arts and entertainment activities	Residential care activities
Libraries, archives, museums and cultural	Personal service activities
Sports activities	Repair of computers, personal and household
Other amusement and recreation activities	goods
Activities of business, employers, profession	Veterinary activities
member organizations	

2.3 Estimation and Identification

We are interested in the effects of district-level changes in tradable service employment on non-tradable services employment. Hence, the baseline equation we estimate is given by:

$$lnNTrt = \beta 1 lnTrt + Xrt + \varepsilon rt \qquad (2)$$

Here $lnNT_{rt}$ and lnT_{rt} respectively denote the log annual employment of non-tradable and tradable services in district r in time t, where $t \in \{1998,2005,2013\}$, while X_{rt} is a vector of various controls, including fixed effects. As an extension, we also estimate the effect on firm creation, where $lnNT_{rt}$ represents the log number of non-tradable firms. To avoid observations with a zero value from dropping out due to logs, we also take a hyperbolic sine transformation. However, the results are also robust without it.

The parameter of interest β_1 captures the effect of local tradable service employment on the employment of non-tradable services in region *r*. Nevertheless, β_1 might still be biased, for instance, because unobserved time-varying district-level demand and supply shocks could affect both tradable and non-tradable service employment in districts.

We aim to establish a causal link by exploiting plausibly exogenous variation in tradable service activity, which does not have a direct effect on non-tradable services. As an instrument, we make use of world service import demand, excluding India. An increase in world demand for imports would create an exogenous demand increase for tradable services but not directly for Indian non-tradable service firms. We then construct region-specific Bartik shocks that reflect exposure to world import demand changes following Hummels et al. (2014).

Hence, lnT_{rt} will be instrumented by a shift-share Bartik-type instrument Z_{rt} based on the weighted average of foreign demand shocks faced by local tradable service firms in region r. The instrument is constructed as follows:

$$Zrt = \sum_k \alpha rk, t - 1 lnXkt \tag{3}$$

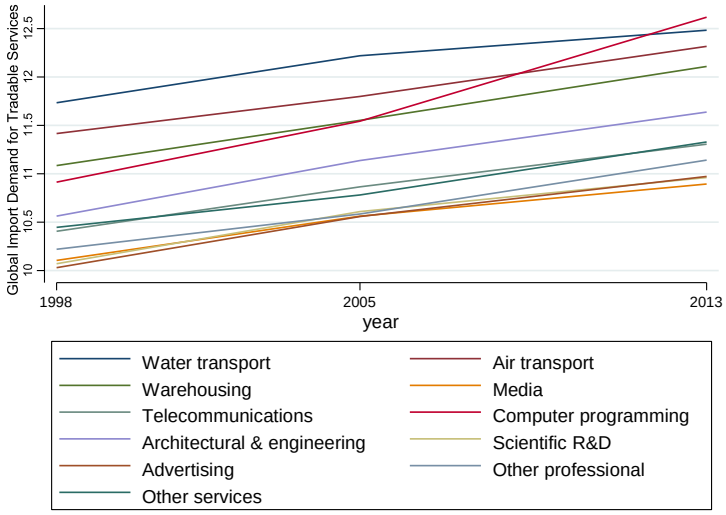
where lnX_{kt} denotes the log world imports excluding India of tradable service sector *k* at time *t*, and $a_{rk,t-1}$ captures the employment share of tradable service industry *k* of region *r* in aggregate tradable service employment in that region at time *t-1*. Note that the first base period is 1990, as t begins in 1998. We have:

$$\alpha_{rk,t-1} = \frac{T_{rk,t-1}}{\sum_K T_{rk,t-1}} \tag{4}$$

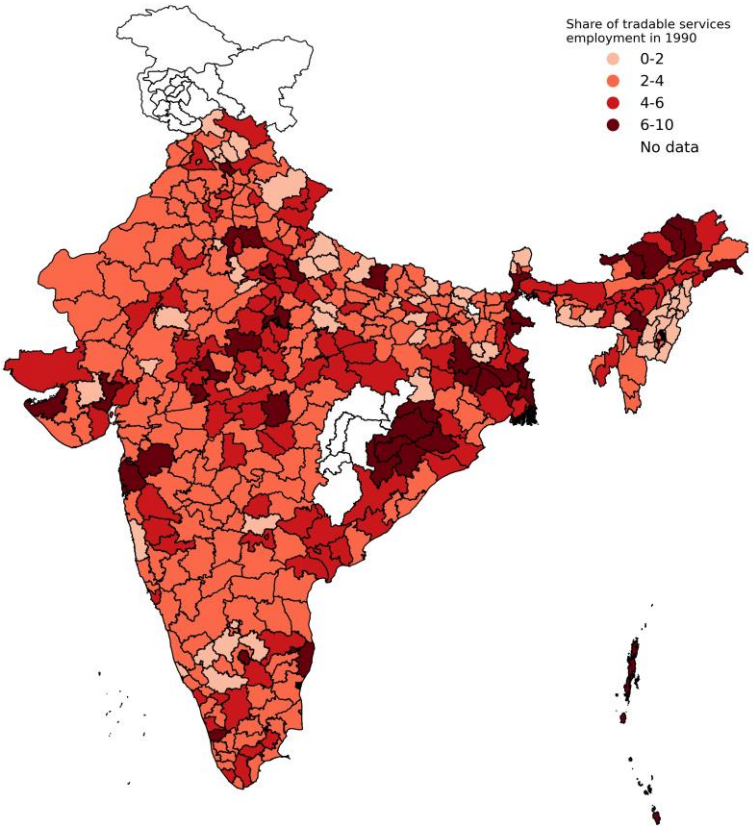
In short, Z_{rt} supposedly captures an exogeneous component (namely foreign demand) of the growth in the tradable service sector, by district.

Figure 1 visually depicts the instrumental variable. Figure 1.1 depicts our "shift" component, i.e., log global import demand (excluding India) for tradable services. As can be seen, global demand for all tradable services has been growing strongly in the time frame of our sample. Figure 1.2 shows the share of tradable service employment by district in India, i.e. the "share" component of the instrument. The districts with a higher share would have a stronger exposure to services trade and therefore be more affected by the increase in global demand.

Figure 1: Visual Depiction of the Shift-Share Instrumental Variable



(1.1) The evolution of global import demand for tradable services ("Shift")



(1.2) Tradable service employment share in 1990 ("Share")

3. Results

3.1 Baseline Results

Before discussing the regression results, we fist visually plot the OLS relationship between district-level log (non-tradable services employment) and log (tradable services employment) between 1998-2013 in Figure 2. As is visually clear, there is a strong positive correlation between the tradable and non-tradable services sector employment.

Figure 2: Binscatter plot of the Relationship between Log (Non-tradable Services Employment) and Log (Tradable Services Employment)

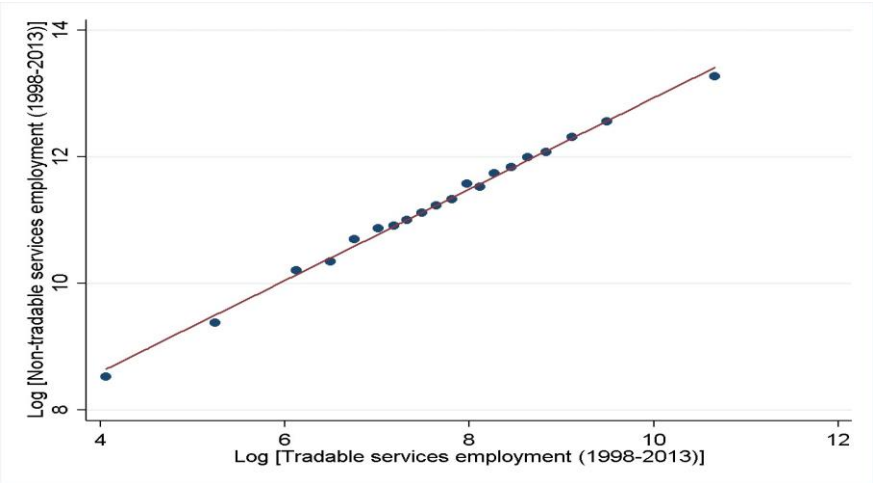


Table 3 shows the corresponding regression results from estimating our baseline equation 2. Our main explanatory variable is the district-level log of tradable service employment. We make use of two dependent variables. Columns (1)-(3) show the effects on the district-level log of non-tradable service employment, while columns (4)-(5) use the log number of firms in non-tradable services. In both cases, OLS coefficients in columns (1) and (4) are positive and statistically significant.

To address endogeneity concerns, we now turn to the instrumental variables approach.[2]

According to our main IV specification in column (2), we see that a 10percent increase in tradable services employment leads to a 4.23percent increase in non-tradable employment. Such an increase in tradable employment increases the number of firms in non-tradable services by 2.85percent, as shown in column (5), although the coefficient is now only significant at the 10percent level. Given the

[2] The first stages of our baseline have an F-statistic value of 10.9, above the rule of thumb value of 10 for weak instruments.

smaller coefficient and lower significance of the effect on the number of firms, it seems likely that the positive employment spillovers are more due to the expansion of existing firms (the intensive margin), rather than new firm creation (the extensive margin). Notably, the IV coefficients are larger than OLS, possibly due to measurement error related attenuation bias in the OLS regressions.

Furthermore, Goldsmith-Pinkham et al. (2020) have recently raised concerns that Bartik instruments may suffer from endogeneity of the lagged shares and recommend using control variables that help ensure that the initial distributions of tradable and non-tradable services are not biased. A natural candidate in our case is the level of education by district, which we proxy by the literacy rate. These results are shown in columns (3) and (6). Overall, the coefficients remain rather similar in statistical significance and magnitude compared to the baseline, but the effect on the number of firms is no longer significant.

Our employment estimate of 0.42 is larger, but comparable to Moretti (2010), who finds a coefficient of 0.33 in the US, but includes only manufacturing in the tradable sector. Our estimates are also higher than Frocrain and Giraud (2017), however, who find an elasticity of 0.23 for France for tradable services on non-tradable services.

Table 3: Impact of Tradable Services on Non-tradable Services

	(1)	(2)	(3)	(4)	(5)	(6)
	Employment			No. of Firms		
	OLS	IV	IV	OLS	IV	IV
Log tradable services	0.098***	0.423**	0.418**	0.079***	0.285*	0.279
	(0.017)	(0.190)	(0.203)	(0.017)	(0.170)	(0.181)
Education			0.001			0.001
			(0.007)			(0.005)
Observations	1,173	1,173	1,173	1,173	1,173	1,173
District FE	yes	yes	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes	yes

Note: Standard errors (in parentheses) are clustered at the district level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

3.2 Mechanisms

There are two main channels through which an increase in tradable activity can generate growth in non-tradable services. First, the effect could come from sectoral linkages. The growth in tradable services may lead to growth in input-supplying non-tradable services, or conversely, growth in tradable services could make tradable service inputs into non-tradable services cheaper or of higher quality. This in turn could spur non-tradable service growth in input-receiving sectors. Alternately, on the demand-side, tradable service growth may increase local income, which in turn increases consumer demand for non-traded services. Whether the sectoral linkages or demand-side mechanisms explain our main results is ultimately an empirical question.

We consider the sectoral linkages channel first. To explore this, we use the Indian input-output tables from 2006-07, that shows the linkages of non-tradable service sectors to and from tradable services, as a share of inputs to/from all the sectors in the economy. We use this to categorize non-tradable service sectors into four categories: (i) sectors that provide a below median (low) share of inputs *to* tradable services, (ii) sectors that provide an above median (high) share of inputs *to* tradable services, (iii) sectors that receive a below median (low) share of inputs *from* tradable services, and (iv) sectors that receive an above median (high) share of inputs *from* tradable services.

To test for the sectoral linkages channel, in Table 4, we estimate separate regressions for district-level employment in each of these 4 categories in response to an increase in tradable services employment. In column 1, we find that district-level employment increased in non-tradable services sectors that provide a low share of inputs to tradable sectors, but there is no statistically significant change in the employment in non-tradable sectors that provide a high share of inputs to tradable sectors (column 2). Similarly, in columns 3 and 4, we find that district-level employment increases in non-tradable services sectors that receive a low share of inputs from tradable sectors, but there is no statistically significant change in the employment in non-tradable sectors that receive a high share of inputs from tradable sectors. Taken together, we find that in response to increased district-level employment growth in tradable services, there is an increase in district-level employment in non-tradable service sectors that have low input-output linkages with the tradable services sector.

Next, we consider the consumer demand channel. Following Fan et al. (2021), we analyze the group of non-tradable consumer services, which are largely demanded by local consumers and not used as inputs. As they discuss in their application to India, the expenditure share of consumer services increases with

income, but is virtually unrelated to demand from producers. In our case, consumer services following Fan et al. (2021) correspond to: (i) retail trade, except of motor vehicles and motorcycles, (ii) personal services, (iii) human health, (iv) residential care, and (v) accommodation and food services, which were largely drivers of the baseline results. We consider all other non-tradable services to be non-consumer services.

Table 4: Sectoral Linkages Channel: Impact of Tradable Services on Employment in Non-tradable Services

	(1)	(2)	(3)	(4)
	Input to		Input from	
	Low	High	Low	High
Log tradable services	0.0711**	0.0118	0.0574*	0.0450
	(0.0314)	(0.0212)	(0.0331)	(0.0318)
Observations	1,173	1,173	1,173	1,173
District FE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes

Note: Standard errors (in parentheses) are clustered at the district level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Column 1 includes district-level employment in health, education, accommodation and food services, legal and accounting activities. Column 2 includes district-level employment in veterinary, repair, residential care, wholesale and retail, transport, postal, finance, real estate activities and rental leasing, employment activities, and travel agency. Column 3 includes district-level employment in health, education, real estate activities and rental leasing services, and legal and accounting activities. Finally, column 4 includes district level employment in veterinary, repair, personal and residential care, wholesale and retail, transport, postal, finance, real estate activities and rental leasing, employment activities, and travel agency, and accommodation and food services.

As shown in Table 5, the effects of tradable services on non-tradables are indeed driven by consumer services. The coefficients on employment and firms are statistically significant, with coefficients of 0.51 and 0.39 respectively. Conversely, the effects on non-consumer services are smaller and insignificant. As consumer services tend to not have input-output linkages with tradable services, this provides additional suggestive evidence for the consumer demand channel.

Table 5: Impact of Tradable Service on (Non-tradable) Consumer Services

	(1)	(2)	(3)	(4)
	Consumer Services		Non-consumer Services	
	Employment	No. of Firms	Employment	No. of Firms
Log tradable services	0.511**	0.386*	0.340	0.103
	(0.250)	(0.215)	(0.221)	(0.204)
Education	-0.003	0.003	0.011	0.005
	(0.009)	(0.007)	(0.009)	(0.006)
Observations	1,173	1,173	1,173	1,173
District FE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes

Note: Standard errors (in parentheses) are clustered at the district level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Consumer services are: (i) retail trade, except of motor vehicles and motorcycles, (ii) personal services, (iii) human health, (iv) residential care, and (v) accommodation and food services. Non-consumer services are all other non-tradable services.

Finally, to further assess the consumer demand channel, we examine the impact of tradable service employment on consumption expenditure by category, at the household level in Table 6. To be consistent with previous literature, following the analysis on district-level household expenditure in India in Fan et al. (2021), we use state fixed effects instead of district fixed effects. Column (1) shows that a 10percent increase in tradable service employment leads to a 3.6percent increase of household expenditures on education, which is significant at the 1percent level. This is consistent with the argument that spillovers from tradable service growth on education are due to increases in local final demand from consumers. We find similar effects for other important non-tradable services, although differences in sector classifications do not allow us to test each of the sectors driving our results separately. Column (2) analyzes medical services, but these are insignificant. Column (3) shows a highly significant coefficient of 0.53 for entertainment. Similarly, the effects on consumer services and the total of these services are also large (at 0.26 and 0.29 respectively) and statistically significant. Lastly, column (6) shows positive and significant effects on the overall monthly per capita expenditure (MPCE) of households.

In sum, we find suggestive evidence that the consumer demand channel rather than sectoral linkages channel, plays a larger role in explaining the relationship between the district-level growth in non-tradable and tradable services employment.

Table 6: Impact of Tradable Services on Consumption Expenditure

	(1)	(2)	(3)	(4)	(5)	(6)
	Education	Medical	Entertainment	Consumer	Total Services	MPCE
Log of tradable services	0.360***	0.114	0.532***	0.257***	0.287***	0.149***
	(0.0793)	(0.105)	(0.107)	(0.0859)	(0.0764)	(0.0300)
Education	0.0268***	0.00712	-0.00774	0.0115*	0.0173***	0.00469**
	(0.00605)	(0.00808)	(0.00742)	(0.00631)	(0.00561)	(0.00213)
Observations	330,915	330,915	330,915	330,915	330,915	330,915
State FE	yes	yes	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes	yes

Source: NSSO EC 1999-2012. Includes controls at household level for owning land (to proxy wealth) and household size, to normalize expenditures per person. Dependent variables and land owned are transformed using the inverse hyperbolic sine function. Observations are weighted by the sample multiplier. Education expenditure comprises library charges, tuition and related fees, private tutor/coaching and other educational expenses. Medical expenditure includes all medical expenditure, except medicine. Entertainment expense includes i) cinema and theatre, ii) mela, fair, picnic, iii) club fees, iv) goods for recreation and hobbies, v) photography, and vi) other entertainment. Consumer services are comprised of i) domestic servant, cooks sweeper, ii) barber, beautician and related, iii) washerman, laundry, ironing, iv) tailor, v) priest, vi) legal expenses, vii) postage telegram, viii) telephone charges, and ix) repair charges for non-durables and other consumer services excluding conveyance. Total services are the total of education, medical, entertainment and consumer services.

Note: Standard errors (in parentheses) are clustered at the district level. *** $p< 0.01$, ** $p< 0.05$, * $p< 0.1$.

3.3 Heterogeneous Effects

Women's labor force participation may have benefited disproportionately from structural transformation into the services sector. On the one hand, this is attributable to their comparative disadvantage in performing manual labor-intensive

tasks associated with the manufacturing sector.[3] On the other hand, large numbers of women in developing economies are employed in non-traded services, such as teaching, residential care, social work, nursing, and personal services, and may have gained through increased consumer demand resulting from the growth in tradable services (as we show earlier). Therefore, analyzing the heterogeneous effects of the growth in non-tradable services by gender is critical, especially in the Indian setting where women face substantial barriers to labor force participation (Chiplunkar and Goldberg, 2021).

In Table 7, we analyze the effects of district-level increases of employment in tradable services on employment and number of firms in non-tradable services sector for women and men separately. To this end, in columns (1) and (2) respectively, we only keep either female employees or male employees in the sample, before aggregating at the district level. For the number of firms in columns (3) and (4), we only keep either female-owned or male-owned businesses. Overall, the effects for women are much stronger. Column (1) shows a coefficient on non-tradable employment of 0.91, compared to 0.43 for men, as shown in column (2). The gender difference is even more pronounced when analyzing the number of firms in columns (3)-(4), with a coefficient of 1.38 for female-owned business, albeit only significant at the 10percent level. Conversely, the coefficient for male-owned businesses is close to zero and insignificant. These results suggest that district-level growth in tradable services employment increases both female employment and female owned firms (entrepreneurship). This is important because Chiplunkar and Goldberg (2021) show that promoting female entrepreneurship can in turn lead to higher female labor force participation because women entrepreneurs hire more females.

[3] For example, Pitt et al. (2012) show that men in Bangladesh obtain less schooling and sort into production occupations with lower returns to skill (and higher rewards for brawn), while the average payoffs to schooling are higher for women who specialize in skill-intensive activities. Similarly, Munshi and Rosenzweig (2006) find that lower-caste networks in India continue to channel boys into local language schools that lead to traditional blue-collar occupations, while lower-caste girls who did not benefit from these networks owing to low labor market participation rates switched rapidly to English schools that have become more widespread. Juhn et al. (2013) find that the adoption of computerized production processes – induced by trade liberalization associated with the North American Free Trade Agreement (NAFTA) – among Mexican establishments raised the relative wage and employment of women by lowering the need for physically demanding skills.

Table 7: Impact of Tradable Services on Non-tradable Services, by Gender

	(1)	(2)	(3)	(4)
	Employment		No. of Firms	
	Women	Men	Women	Men
Log tradable services	0.910**	0.425**	1.376*	0.160
	(0.411)	(0.206)	(0.709)	(0.193)
Education	0.012	0.001	0.027	0.001
	(0.013)	(0.007)	(0.019)	(0.006)
Observations	1,173	1,173	1,173	1,173
District FE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes

Note: Standard errors (in parentheses) are clustered at the district level. *** $p< 0.01$, ** $p< 0.05$, * $p< 0.1$.

Lastly, we now turn to the heterogeneous effects by firm size. The average size of establishments in tradable services, such as ICT, is comparable to the manufacturing sector across countries at different levels of per capita income. However, the average services establishment in non-traded services is relatively small. In developing economies, informality plays an important role here because many services firms across, for example, small-scale retail and personal services are unregistered. Even when the analysis is restricted to formal firms, non-tradable services, such as retail, vehicles trade, real estate, have the smallest average firm size, which is about four to five times smaller than a manufacturing firm in the same country (Nayyar et al., 2021b). Therefore, analyzing the heterogeneous effects by firm size is important, especially in the Indian context where informal establishments constitute a large share of value added in non-traded services, such as retail, real estate, and personal services (Nayyar, 2012b).

In Table 8, we examine a sub-sample analysis for the employment effects by firm size. In doing so, we consider four size groups, non-tradable service sector firms with 1-10 employees (column 1), 11-30 employees (column 2), 31-50 employees (column 3) and more than 50 employees (column 4). As can be seen, the only significant effects are among the smallest group of firms, with a coefficient of 0.39. Hence, the employment effects from tradable service growth are most relevant for the smaller non-tradable service firms.

Table 8: Impact of Tradable Services on Non-tradable Employment by Size

	(1)	(2)	(3)	(4)
	1-10	11-30	31-50	> 50
Log of tradable services	0.391**	0.284	0.512	0.413
	(0.177)	(0.297)	(0.424)	(0.700)
Observations	1,173	1,173	1,173	1,173
District FE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes

Note: Standard errors (in parentheses) are clustered at the district level. *** p< 0.01, ** p< 0.05, * p< 0.1.

4. Conclusion

Structural transformation toward high-end services and increased trade have been important growth drivers in India and beyond. However, tradable services growth can also have positive spillover effects on non-tradable services, which cannot benefit directly from globalization and trade-enhancing technological advances. In particular, these effects may have important distributional outcomes between men and women. While similar linkages between manufacturing and services have been well explored, spillovers between tradable and non-tradable services have been understudied.

We find that a 10percent increase in tradable services employment leads to a 4.2percent increase in non-tradable services employment. There is also an increase in the number of firms in non-tradable services by 2.8percent, but this result is less statistically significant. The employment impact is much larger for female workers; a 10percent increase in tradable services employment leads to a 9.1percent increase in non-traded services employment for women compared to 4.2percent for men. Similarly, we also find larger effects on the number of female-owned firms, compared to male-owned firms. Further, we find that the effects are only significant for small non-tradable service firms. Our evidence also suggests that this positive impact is likely due to an increase in consumer demand for local non-tradable services that results from the growth in tradable services employment.

Our paper makes an important contribution to the literature by showing that international trade can benefit non-tradable services. This is enabled through increased household demand for non-tradable services, resulting from the growth of

tradable services. The result does not preclude other ways in which non-tradable services can benefit from international trade. For instance, employment in non-tradable services can benefit from increased household demand resulting from the growth of other traded sectors, such as manufacturing or agriculture. Non-tradable services can also be indirectly exported through forward linkages with these goods-producing sectors. Future research on the role of the services sector in India's structural transformation can assess these relationships.

An avenue for future research can be to also examine the impact of growth in tradable services on non-tradable services in terms of output and productivity. However, this would require moving beyond the Economic Census data that only contain information on the number of workers. Services firms, however, are not covered adequately in India's official statistics. The absence of good and comprehensive data for services firms, especially in a panel format, poses difficulties to estimate the technical efficiency or total factor productivity. The absence of regular data on informal firms is also particularly problematic for the services sector. Informal firms are, by definition, excluded from administrative data sources, such as tax records or business registers. Further, the informal sector surveys conducted by the National Sample Survey Organization are few and far between. These issues are symptomatic of gaps in the coverage and reporting of data on services firms in other countries too. Better and more complete data are crucial to fully grasp the growing contribution of the services sector to growth and structural transformation.

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