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"Since the industrial revolution, no country has become a major economy without becoming an industrial power."

Lee Kuan Yew, delivering the Jawaharlal Memorial Lecture in New Delhi, 2005

I. Introduction

Early development thinking, exemplified most famously though not exclusively in the Lewis (1954) two-sector model, was fixated on the idea of sectoral transformation: resources moving from the agriculture/traditional sector to the manufacturing/non-traditional sector. There was never any doubt about the hierarchy (the latter was unquestionably superior to the former) and hence no doubt about the desirability of the transformation.

For many reasons – some of which are outlined in Krugman (1994) – development thinking over the last two decades moved away from discussions about sectors and sectoral transformation and towards a more explicit growth perspective. Cross-country growth and income regressions—which became a staple of the profession—were the exuberant empirical manifestation of this shift.

More recently, however, notions of structural transformation are being rehabilitated – but without abandoning the growth perspective altogether.[1] One particularly clear exposition of the marriage between these two perspectives can be found in Rodrik (2013 and 2014), from where we get the following simple equation:

$$\hat{y} = \beta(\ln y^*(\theta) - \ln y) + (\pi_M - \pi_T)d\alpha_M + \alpha_M\pi_M\beta_M(\ln y_M^* - \ln y_M)\text{-}$$

This equation has three parts. First, growth of gdp per capita (denoted by $\hat{y}$) can be viewed in a conventional conditional convergence perspective, with catch-up to the frontier ($y^*(\theta)$) depending on a number of fundamentals (policies, human capital, openness, institutions, etc). But this is a slow process because by definition fundamentals are slow to change. Moreover, this conditional convergence framework is inadequate because it has difficulty explaining growth miracles or accelerations—China being the classic outlier to many of these fundamentals.

Hence this framework needs to be supplemented with explicit structural transformation elements. These are captured in the second and third terms of the equation.

The second term captures structural change from low productivity, traditional sectors (T) to high productivity sectors (M), where π_i denotes productivity in sector i and α_M denotes the

[1] For an excellent synthesis of the recent work on this subject, see Herrendorf, Rogerson and Valentinyi's (2014) chapter in the Handbook of Economic Growth.

share of employment in the modern sector. This is the classic dualism model, which conceives of economic development primarily as a process of shifting resources from low to high productivity sectors, thereby raising economy-wide levels of productivity.

The third term is new and captures the phenomenon of unconditional convergence in the high productivity sector. Essentially, once resources move into this sector (α_M) they then experience unconditional or "automatic" catch-up, of rising productivity (represented by β_M, the convergence growth rate of the modern sector). This further increases economy-wide levels of productivity.

In other words, there are two gains to shifting resources from the traditional to the new sectors: first, a compositional gain, which is a gain in economy-wide productivity achieved by shifting the weight of the economy from low to high productive sectors; second, a subsequent dynamic gain as these resources experience rapid productivity growth. The contribution of Rodrik (2013) is to show empirically that the manufacturing sector does indeed exhibit this rapid growth or unconditional convergence toward the frontier: that is, manufacturing in poorer countries and less productive manufacturing activities experience on average more rapid growth than richer countries/more productive manufacturing activities.

No sooner have we adopted this framework, the question poses itself: are these compositional and dynamic gains restricted to manufacturing? In other words, whereas the first phase of thinking about structural transformation was informed by certitude about the hierarchy of sectors, today there is less ground for that certitude because the comparison is not between agriculture and manufacturing but between manufacturing and services (or at least certain service subsectors). The above question is especially important if – as we will argue shortly – developing countries are starting to de-industrialize prematurely, causing the manufacturing-led path of development to become less accessible for today's poor countries.

This paper is a modest initial attempt at shedding some light on the new structural transformation question, and in particular comparing manufacturing and services.

II. Desirable Features

We take up India as a case study for addressing this question because of the poor performance of manufacturing in India and the relatively strong performance of services – which in some ways mirrors the performance of many Sub-Saharan African countries (Ghani and O'Connell, 2014).

Lee Kuan Yew, the sage of Singapore, was clearly on to something when he challenged the Indian model of development. Historically, there have been three modes of escape from under-development: geology, geography, and "jeans" (code for low-skilled manufacturing). Countries in West Asia, Botswana and Chile today, and Australia and Canada further back in time, exploited their natural resources endowed by geology to increase their standards of

living. Some of the island successes (Barbados, Mauritius, and others in the Caribbean) have exploited their geography by developing tourism to achieve high rates of growth.

In the early stages of their success, East Asian countries relied on relatively low-skilled manufacturing, typically textiles and clothing (China, Thailand, Indonesia, Malaysia etc), to motor economic growth. Later on they diversified into more sophisticated manufacturing but "jeans" offered the vehicle for prosperity early on. No country has escaped from underdevelopment using relatively skill-intensive activities as the launching pad for sustained growth as India seems to be attempting.

Put differently, India seems to have defied its "natural" comparative advantage, which probably lay in the "jeans" mode of escape because of its abundant unskilled and low-skilled labor. Instead, it found or created—thanks to historical policy choices and technological accidents—such advantage in relatively skilled activities. That the relevant distinction is skill-based rather than sectoral is reflected in the fact that even within manufacturing, India has an atypically high share of skill-intensive sectors (Kochhar et. al., 2007).

The Indian experience, still a work-in-progress, raises the question of whether structural transformation necessarily requires manufacturing to be the engine of growth. But before we compare manufacturing with different sectors in terms of their potential for structural transformation, it is worth elaborating on the desirable attributes of such sectors.

In fact, building upon the Rodrik (2013 and 2014) framework, we would argue that there are five attributes that allow a sector to serve as an engine of structural transformation and thereby lead an economy to rapid, sustained and inclusive growth:

1. High level of productivity: As described above, economic development is about moving from low productivity to high productivity activities.

2. Unconditional Convergence (ie: faster productivity growth in lower productivity areas): This too has been discussed earlier. Recall that convergence ensures that the relevant sector acts as an "escalator" that automatically leads to higher levels of sectoral and hence economy-wide productivity. In fact one can distinguish between two types of unconditional convergence:

A. Domestic convergence: In large countries such as India, China, Brazil, and Indonesia, one would ideally like to see convergence within a country. That is, in poorer parts of the country, productivity growth should be more rapid than in richer parts. Otherwise there may arise severe within-country regional inequality.

B. International convergence: whereby less-productive economic units (whether they be firms, sectors or entire economies) in all countries catch-up with units at the international frontier (ie: those in the most productive countries).

3. Expansion: To ensure that the dynamic productivity gains from convergence spread through the economy it is necessary that the sector experiencing convergence absorb resources. Convergence accompanied by contraction will fail to ensure economy-wide benefits, because the country's resources that are outside of the sector in question will not experience higher, convergent productivity growth. Convergence, in the case of the industrial sector, should be accompanied by natural industrialization – not premature de-industrialization – if it is to lead to truly inclusive growth.

4. Alignment with comparative advantage: To ensure that expansion occurs and the benefits of fast-growing sectors are widely shared across the labor force, there should be a match between the skill requirements of the expanding sector and the skill endowment of the country. For example, in a labor abundant country such as India, the converging sector should be a relatively low-skilled activity so that more resources can take advantage of convergence.[2]

5. Tradability: Historically, countries that have had growth spurts have enjoyed rapid growth in exports, typically manufacturing exports (Johnson, Ostry and Subramanian (2010)). In contraposition, rapid growth has seldom been based on the domestic market. Part of the reason for this might be the fact that trade serves as a mechanism for technology transfer and learning, which may even have spillovers to related industries (Hausmann, Hwang, and Rodrik (2007)). But another important part is that trade and exports in particular provide a source of unconstrained demand for the expanding sector. In other words, expansion is less likely to be choked off by a narrowing market (and possibly deteriorating terms of trade).

After a brief discussion of our data, we will evaluate in succession the two sectors—manufacturing and services (including services disaggregated by subsector)—along these five dimensions in India, summarizing the evaluations in a "scorecard" for each sector.

III. Data

For our analysis we marshal data from a number of sources. Much of our national and state-level data for India pertaining to output, such as value added by state and industry, comes from the Reserve Bank of India (RBI) and the Ministry of Statistics and Programme Implementation (MOSPI). We calculate employment by industry – as well as a number of other employment, wage and education related variables of interest (such as skill intensity and skill premia) – using Schedule 10 of the National Sample Survey (Employment and Unemployment Surveys). For the years between 1983/4 and 2004/5, the NSS Employment

[2] There may be concerns that a country's pattern of specialization (in skilled or low-skilled activities) may in turn effect the skill endowment of the country. In particular, Blanchard and Olney (2013) show that increasing exports of low-skill products tends to *lower* average levels of human capital attainment through a Stolper-Samuelson effect. Nevertheless, in this paper we take the position that the aforementioned mechanism is likely to be a second-order effect in the development process. Indeed, the experience of East Asia shows that it is possible for countries to start by specializing in low-skill but dynamic activities and subsequently move to more skill intensive production once the growth process has picked up steam.

and Unemployment Survey data were procured indirectly through the Minnesota Population Center's Integrated Public Use Microdata Series (IPUMS), while the data for 2009/10 and 2011/12 came directly from MOSPI.[3]

We use factory-level panel data (and industry-level data when factory-level data is not available) from the Annual Survey of Industries (ASI) to compute employment, output and productivity in the registered manufacturing sector. We use the factory-level data from 1998/9 to 2009/10 and three-digit industry-level data from 1983/4 to 2004/5. Let us note that we shall generally refer to data gathered during the survey period (for example May 1st 1998 to April 31st 1999) by the corresponding fiscal year (in this case 1999). Finally, we follow the practice advised by Bollard, Klenow and Sharma (2013) and drop all values pertaining to registered manufacturing for the fiscal year 1997 due to incomparability in the sampling methodology and survey form for that year (see Bollard, Klenow and Sharma (2013) for more).

Our data on output and employment by sector for China come from the National Bureau of Statistics of China. The country-level data we use in our analysis come from three sources: GDP and PPP data come the Penn World Tables (PWT), output, employment and price levels by sector come from the Groningen Growth and Development Center (GGDC) databases, and all other country-level data come from the World Development Indicators (WDI).

IV. The Manufacturing Scorecard

1. Productivity Level

Table I below compares productivity levels (measured as value added per worker) in the various Indian sectors – including manufacturing – for two time periods: 1984 and 2010. Three features stand out. First, in India it is highly misleading to speak of manufacturing as a homogenous sector because of the clear difference between unregistered manufacturing – which is a very low productivity activity – and registered manufacturing – which is an order of magnitude higher. From the perspective of structural transformation, it is registered manufacturing, not manufacturing in general, that has the potential for structural transformation.

[3] The 2011/12 NSS wave produces values that are sometimes significantly different from previous years, which we believe may be due to data incompatibility issues. For this reason we drop the 2011/12 NSS data from most of our analysis. Furthermore, to the extent that the procedures we use for data cleaning, preparation and interpretation of sampling weights for the raw MOSPI data in the 2010 wave differ from those used by IPUMS on the earlier waves, there may be incompatibility between the 2010 NSS data and those from earlier waves. In the rest of the paper we try to ensure that the conclusions of our analysis are robust to any such incompatibility whenever possible (by, for example, showing results with and without the 2010 wave).

TABLE I: Labor Productivity in the Indian Economy by Year and Major Sector

	Level (2005 Rupees)		Growth	
	1984	2010	84-2010	00-10
Aggregate Economy	34,833	88,484	3.7%	4.0%
Non-manufacturing	33,018	84,087	3.7%	3.9%
Services	61,978	213,014	4.9%	6.3%
Manufacturing	48,817	125,349	3.7%	4.2%
Registered manufacturing (MOSPI)	117,984	360,442	4.4%	5.4%
Unregistered manufacturing	28,548	50,312	2.2%	1.22%
Registered/unregistered	4.2	7.7		

Second, the level of productivity in registered manufacturing is not only high relative to unregistered manufacturing, it is high compared to most other sectors of the economy. In 2010, it was nearly 8 times as productive as unregistered manufacturing; four times as productive as the rest of the economy and nearly twice as productive as services in the aggregate.

Third, even the absolute level of productivity in registered manufacturing is staggeringly high: about $7800 at market exchange rates and nearly three times as much at PPP exchange rates. If the entire Indian economy were employed in registered manufacturing, India would be as rich as say Korea.

Fourth, these differentials between registered manufacturing and the rest of the economy were prevalent (if not to the same extent) even in 1984.

Thus, on the first criterion of high levels of productivity, registered manufacturing scores spectacularly well.

2A. Domestic convergence

Before we describe our results, we want to clarify terminology. By "convergence," we mean that labor productivity growth is negatively correlated with the initial level of labor productivity. By "unconditional convergence" (UC), we mean that the above holds even without adding controls or other factors. For example, unconditional convergence across countries will not control for country characteristics, unconditional convergence across states will not control for state characteristics, and unconditional convergence across factories will not control for factory characteristics.

Table I shows that prima facie, registered manufacturing has been a dynamic sector because between 1984 and 2010, it not only exhibited high levels of productivity but also posted the highest rate of labor productivity growth, except for the services sector.

Even more than average productivity growth, we show below that registered manufacturing also exhibited strong unconditional convergence within India across the same broad time horizon. Indeed, in Figures 1 – 3, we see evidence of unconditional convergence across major states in India, across major states and industries, and across factories. Note that the figures are "partial residual plots": they graphically display the relationship between two variables while controlling for other variables when appropriate (in this case three-digit industry fixed effects in Figures 2 and 3). We also report the coefficient on the corresponding regression between productivity growth versus log of initial productivity. Significantly, unregistered manufacturing does not exhibit unconditional convergence across states in India.

FIGURE I: Domestic Convergence in Registered Manufacturing - State level (1981 – 2010)

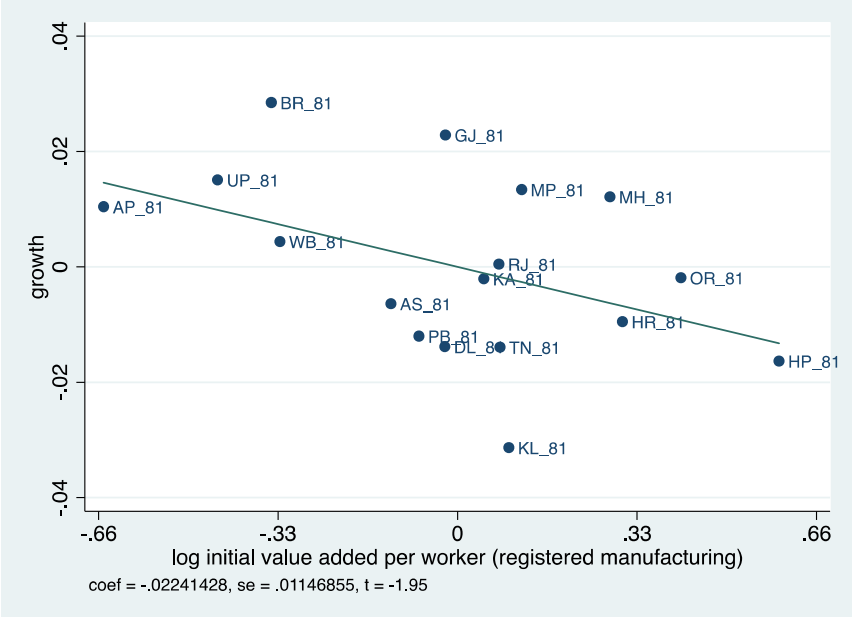


FIGURE II[4]: Domestic Convergence in Registered Manufacturing - State X Industry level (1981 – 2008) (with 3 Digit Industry Fixed Effects)

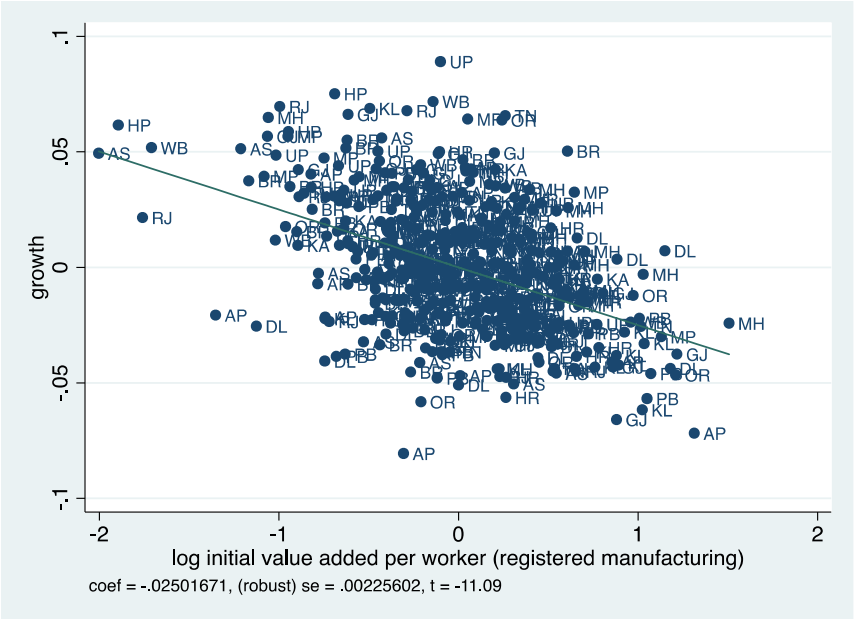
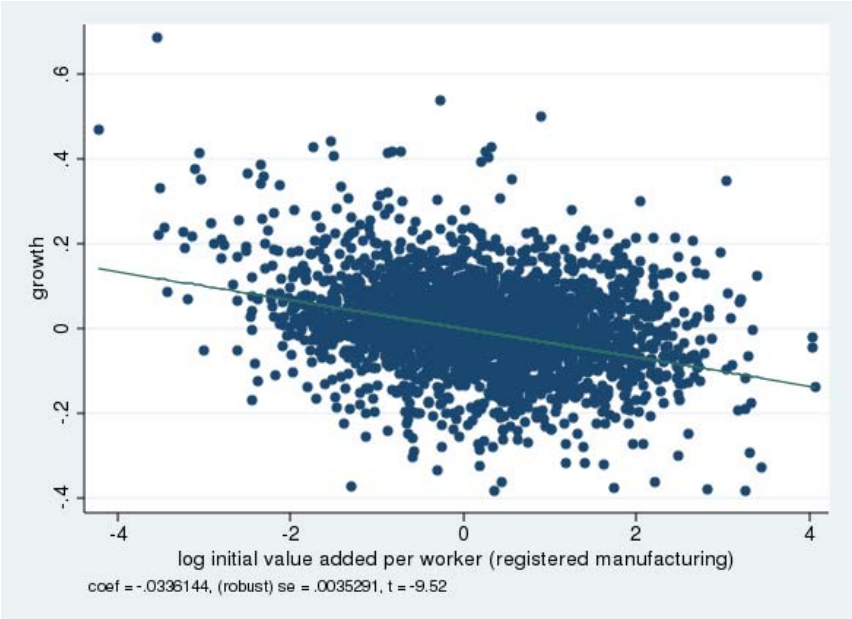


FIGURE III: Domestic Convergence in Registered Manufacturing - Factory level (1999 – 2010) (with 3 Digit Industry Fixed Effects)



[4] Note that the Figures II and III are "partial residual plots": they graphically display the relationship between two variables while controlling for other variables when appropriate (in this case three-digit industry fixed effects). We also report the coefficients on the corresponding regressions between productivity growth versus log of initial productivity.

This unconditional convergence within Indian (registered) manufacturing is robust to alternative samples, time periods and measures of defining productivity. In particular, the factory-level convergence results are not appreciably changed when the sample of factories includes only the largest census-sector factories (those which are consistently picked up by the ASI) or when outliers are not trimmed. Finally, the results are nearly the same when productivity growth is measured using the method of Levinsohn and Petrin (2003), which attempts to correct for the inherent bias in other methods of estimating total factor productivity at the factory level.

2B. International Convergence

With respect to registered manufacturing, it seems that states and firms within India are converging to the Indian frontier but that could mean little unless they are also converging to the international manufacturing frontier. Are they?

Rodrik (2013) shows that there is unconditional convergence across countries and sectors in manufacturing. But India is a negative outlier in the relationship in two senses: first, on average manufacturing sectors in India exhibit labor productivity growth that is 14 percent less than the average manufacturing sector across the world. China, in contrast, is a positive outlier, with its manufacturing sector posting labor productivity growth that is 17 percent greater than the average (a differential of 31 percent between India and China).

The second sense relates to convergence. In Rodrik's (2013) core specification, the average rate of convergence in manufacturing (across country-industries) in manufacturing is 2.3 percent. Indian industries converge much slower than average (.005%)—almost not at all. Chinese industries converge much faster than average (3.4 percent). Again, the differential between Chinese and Indian manufacturing in terms of convergence to the international frontier is striking.[5]

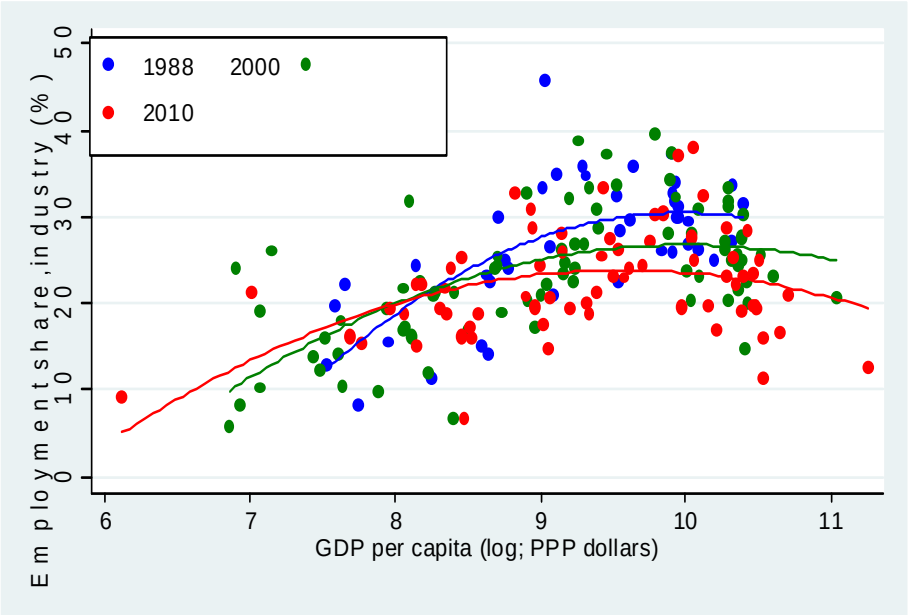
3. Expansion or Pre-mature non-Industrialization?

Globally, the phenomenon of "pre-mature de-industrialization" seems afoot. We illustrate this idea in Figure IV below. It plots the relationship between the share of a country's total employment in the industrial sector against its level of development, measured by its per capita GDP (PPP dollars). The sample includes all countries for which data are available in the World Bank's World Development Indicators (excluding the oil exporters). The relationship is shown for three different points in time, 1988 (blue), 2000 (green), and 2010 (red).

[5] More formally, when an India dummy and a China dummy are added separately, and each interacted with the convergence coefficient, the coefficient on the India dummy is -.14 (t-statistic of 1.97), and that on the India dummy interacted with the convergence term is .017 (t-statistic of 2.05). The corresponding coefficients for China are .166 (t-statistic of 2.65) and -.011 (t-statistic of 1.4). We are grateful to Dani Rodrik for providing these results.

The relationship is typically an inverted U, suggesting that over the course of development a country first industrializes, reflected in a rising share of resources – especially labor – devoted to this sector. Thereafter, the services sector becomes more important, so that de-industrialization begins, reflected in a declining share of employment in the industrial sector.

FIGURE IV: Premature De-indutrialization? Relationship between employment share in industry and GDP per capita (Over time, countries are specializing less in industry and de-industrializing earlier)



What is surprising is that the relationship has been changing dramatically over time. First, the curves are all shifting down over time, which means that at any given stage of development, countries are on average specializing less in this sector, devoting fewer labor resources to it.[6] Second, the curves are also shifting leftwards, which means that the point of time at which industry peaks (alternatively, the point at which de-industrialization begins) is happening earlier in the development process.

Fitting the data to a quadratic curve, we find that in 1988, for the world as a whole, the peak share of manufacturing (the top of the curve in the charts) was 30.5 percent and attained at a per capita GDP level of $21,700. By 2010, the peak share of manufacturing was 21 percent (a drop of nearly a third) and attained at a level of $12,200 (a drop of nearly 45%).[7]

[6] This pattern has also been carefully documented in two contemporaneous papers. Using different data, Felipe, Mehta and Rhee (2014) show that this downward trend holds whether measuring manufacturing shares in terms of employment or output (although the trend is stronger for employment shares). Rodrik (2015) finds the same thing, and, in addition to documenting interesting regional and skill-based patterns, also makes further contributions to the underlying theory behind premature deindustrialization.

[7] The sample used in this analysis is not the same across the different time periods due to data availability. However, repeating the analysis with only the subset of countries for which data are always available yields a

There is, therefore, something significant happening that is pushing the world toward less industry and initiating de-industrialization much earlier in the development process.

What about India? The phenomenon of de-industrialization is particularly salient in India for three reasons. Looming ahead is the demographic bulge, which will disgorge a million youth every month into the economy in search of employment opportunities. Rising labor costs in China create opportunities for low-skilled countries such as India as replacement destinations for investment that is leaving China. And a new government that has assumed power offers the prospect of refashioning India in the image of Gujarat – one of the few manufacturing successes, historically.

But a sobering fact looms for India. If globally, there is de-industrialization, India is de-industrializing big time. In fact, to call the Indian phenomenon de-industrialization is to dignify the Indian experience, which is more aptly referred to as premature non-industrialization because India never industrialized sufficiently in the first place.

To make the point first consider Figure V, which plots the share of manufacturing in total employment over time for South Korea, a poster child for manufacturing-led growth. South Korea's GDP per capita in 2005 PPP Dollars is also shown alongside the series for several years. The figure displays the typical shape: share of employment in manufacturing starts very low at around 5% and rises over time to almost 30% before starting to decline after a fairly high level of GDP has been reached.

In contrast, Figures VI and VIIa illustrate the Indian experience. The Figures show India's share of aggregate manufacturing and registered manufacturing (respectively) in total output and employment in India over time. Manufacturing as a share of output peaked at 17 percent of GDP in 1996.[8] Generally speaking we observe a constant or, if anything, a downward trend in both share of manufacturing in output and employment since 1981. The performance of registered manufacturing is not substantially different. The trends may have been increasing very slowly over some of the period, but the general trend is constant with a downward trend over the last few years for which data are available.

Note that in the Figures referenced above the share of manufacturing in output is calculated using value added in current INR. When calculating shares in constant INR, the trend over time is more positive than when using current INR but by and large the pattern is mostly flat

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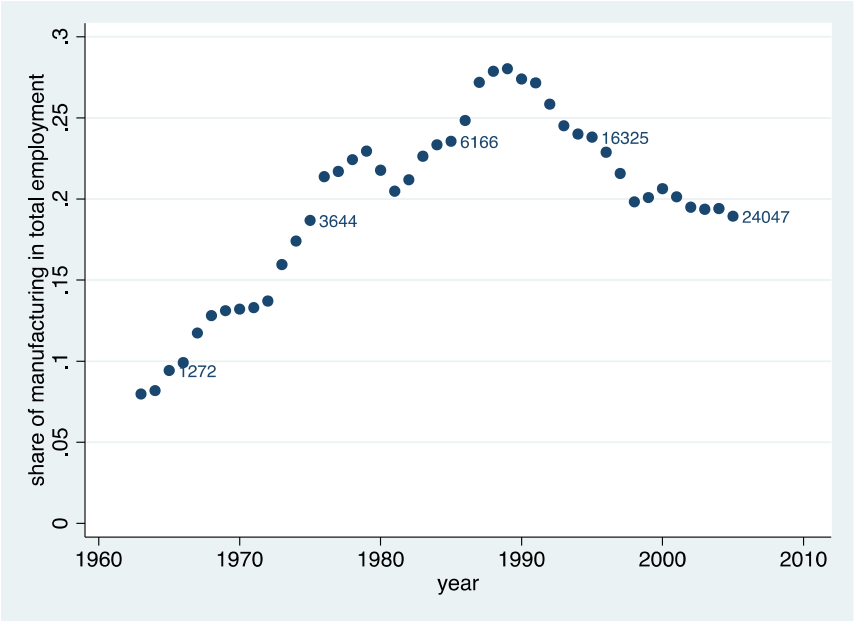
similar downward trend in the fitted curve over time – in fact the pattern seems to be even more dramatic in this sample (see Figure 1 in the Appendix). We should also note that these data relate to the industrial sector – not specifically manufacturing. One might imagine that there could be differences in the patterns between the two sectors over time because industry includes processed natural resources such as oil and gas, which have made a comeback in recent years, but Felipe, et al (2014) and Rodrik (2015) provide evidence to the contrary.

[8] As previously mentioned in the data section (section III), we drop all values pertaining to registered manufacturing for the year 1997 due to incomparability in the sampling methodology and survey form for that year (see Bollard, Klenow and Sharma (2013) for more).

and thus not very different (we document this fact through Figures 2 – 4 in the Appendix).[9] In other words, however one chooses to measure the share of manufacturing in output and employment, the pronounced inverted U shape that characterizes the cross-section and Korea is notably absent in India.

FIGURE V: Share of Manufacturing in Total Employment over Time: South Korea (GDP per capita in 2005 ppp $ show for select years)



[9] See Rodrik (2015) for more on the important differences that can arise when measuring manufacturing output shares with constant versus current series.

FIGURE VI: Share of Manufacturing in Total Output and Employment over Time: All India

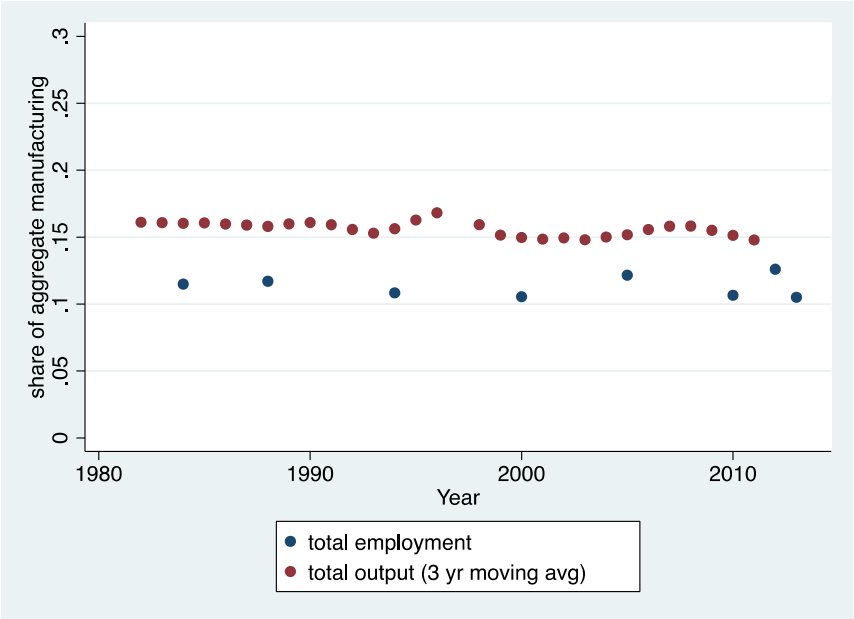


FIGURE VII a: Share of Registered Manufacturing in Total Output and Employment over Time: All India

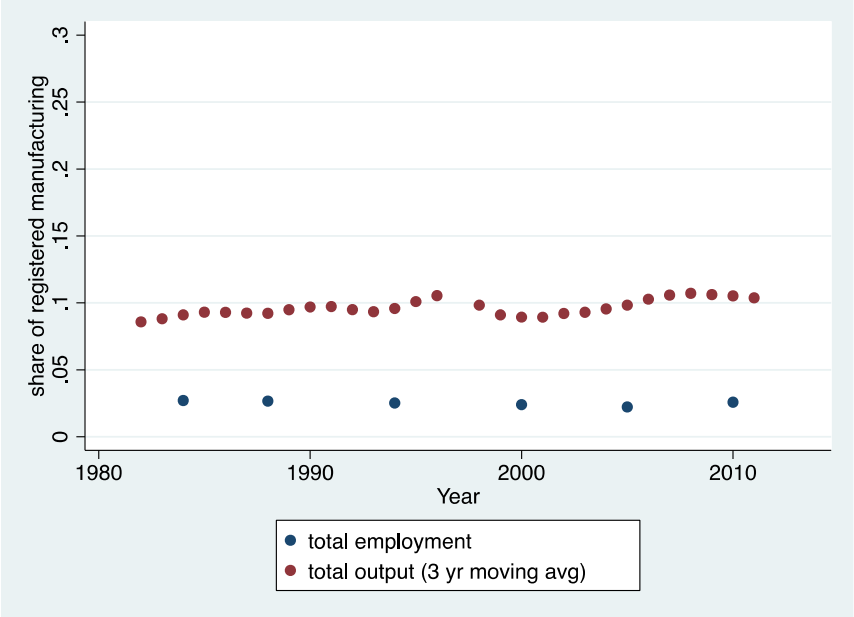


FIGURE VII b: Share of Registered Manufacturing in Total Output Over Time: By State

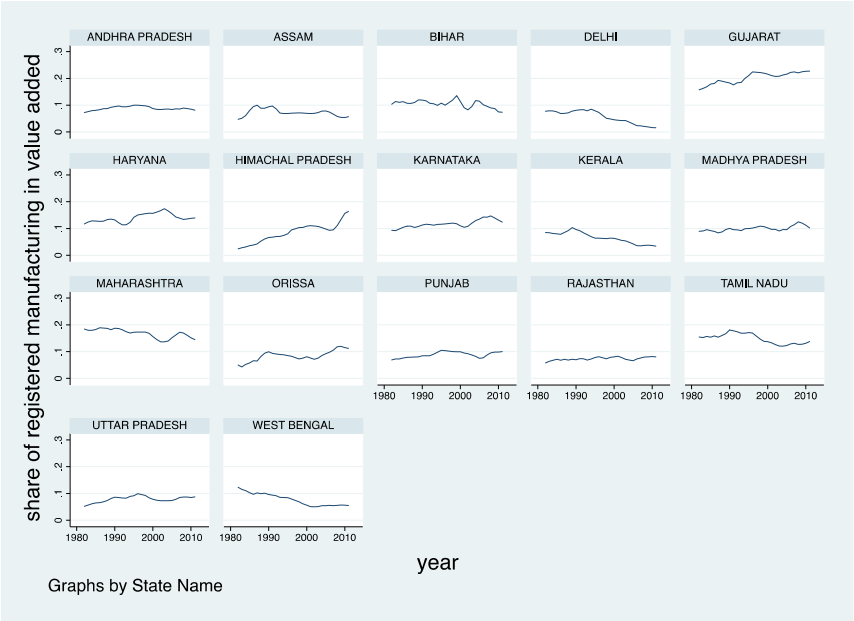
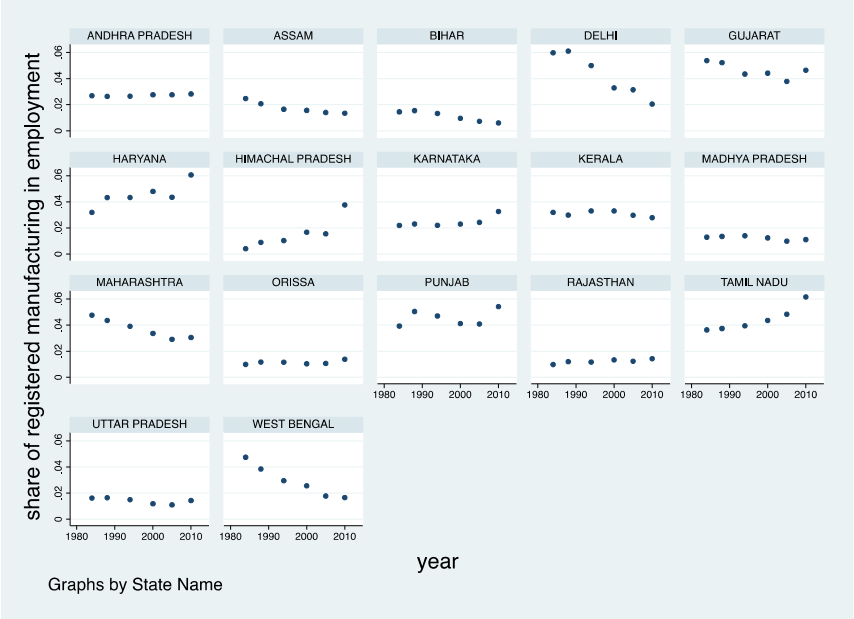


FIGURE VII c: Share of Registered Manufacturing in Total Employment Over Time: By State



But what has been the counterpart development among Indian states? The evolution of the share of registered manufacturing in output and employment over the last three decades is shown for major Indian states in Figures VII b and c. For some states the employment shares show a marked upward trend (most notably for Tamil Nadu, Himachal Pradesh and Haryana), but most exhibit no movement or striking downward trends (e.g.: West Bengal, Delhi, Maharashtra). Much the same can be said for the temporal evolution of output shares.

Tables II a and b below provide additional data, showing the year in which the share of registered manufacturing peaked – in first value added (in current INR) and then employment terms –, the peak share of registered manufacturing (in value added or employment), and the per capita GDP associated with peak registered manufacturing levels.

TABLE IIa: Premature Non-Industrialization among Indian States (by Value Added)

State	Year in which registered manufacturing in value added peaked	Share of registered manufacturing in value added at peak	NSDP per capita at peak (2005 INR)	GSDP per capita at peak (2005 USD PPP)
GUJARAT	2011	22.7%	52,291	5,357
MAHARASHTRA	1986	18.9%	15,864	1,400
TAMIL NADU	1990	18.1%	15,454	1,417
HARYANA	2003	17.3%	32,869	3,309
HIMACHAL PRADESH	2011	16.4%	46,207	4,733
KARNATAKA	2008	14.7%	34,752	3,523
BIHAR	1999	13.6%	9,215	905
MADHYA PRADESH	2008	12.5%	18,707	1,897
WEST BENGAL	1982	12.3%	9,348	909
ORISSA	2009	12.0%	22,779	2,353
ALL INDIA	2008	10.7%	30,483	3,091
PUNJAB	1995	10.5%	25,995	2,506
KERALA	1989	10.3%	14,418	1,322
ANDHRA PRADESH	1996	10.0%	16,904	1,641
UTTAR PRADESH	1996	10.0%	11,679	1,134
ASSAM	1987	10.0%	12,904	1,164
DELHI	1994	8.5%	39,138	3,742
RAJASTHAN	2001	8.3%	15,816	1,522

TABLE IIb: Premature Non-Industrialization among Indian States (by Employment)

State	Year in which registered manufacturing in employment peaked	Share of registered manufacturing in employment at peak	NSDP per capita at peak (2005 INR)	GSDP per capita at peak (2005 USD PPP)
TAMIL NADU	2010	6.2%	44,033	4,633
DELHI	1988	6.1%	31,531	2,989
HARYANA	2010	6.1%	54,861	5,773
PUNJAB	2010	5.4%	44,611	4,694
GUJARAT	1984	5.4%	15,167	1,343
MAHARASHTRA	1984	4.8%	15,212	1,347
WEST BENGAL	1984	4.7%	10,371	919
HIMACHAL PRADESH	2010	3.8%	42,998	4,524
KERALA	1994	3.3%	18,926	1,809
KARNATAKA	2010	3.3%	36,214	3,811
ANDHRA PRADESH	2010	2.8%	36,228	3,812
ALL INDIA	1984	2.7%	11,800	1,045
ASSAM	1984	2.5%	13,238	1,172
UTTAR PRADESH	1988	1.6%	9,372	888
BIHAR	1988	1.5%	4,768	452
RAJASTHAN	2010	1.4%	23,908	2,516
MADHYA PRADESH	1994	1.4%	13,191	1,261
ORISSA	2010	1.4%	22,677	2,386

From the tables, a few points are striking. Gujarat has been the only state in which registered manufacturing as a share of GDP surpassed twenty percent and came anywhere close to levels achieved by the major manufacturing successes in East Asia. Even in Maharashtra and Tamil Nadu, manufacturing at its peak accounted for only about 18-19 percent of state GDP. The peak shares in employment terms are even less significant: no major India state has achieved more than 6.2% of employment from registered manufacturing in the last 30 years, and many major states peaked at less than half that.

Second, in most states (with some exceptions such as Himachal Pradesh and Gujarat), registered manufacturing as a share of value added is now declining and, for many states, has

been doing so for a long time. The peak share of manufacturing in output for many states was reached in the 1990s (Andhra Pradesh and Tamil Nadu) or even in the 1980s (Maharashtra). Interestingly, peak employment shares seem to be following a slightly different story, with less marked declines observable for most states (although this may be due to compatibility issues with our 2010 NSS data). Nevertheless, a glance at Figure VII c should make it clear that most states have not been experiencing secular growth in employment shares over time (the only exceptions are Himachal Pradesh, Tamil Nadu, Haryana and – possibly – Karnataka). Many of the states that do exhibit peak years in 2010 (such as Andhra Pradesh, Rajasthan and Orissa) seem to have employment shares that have been mostly flat, reflecting neither relative growth nor decline.

Third, and this is perhaps the most sobering of facts, manufacturing has even been declining in the poorer states: states that never effectively industrialized (West Bengal and Bihar) seem to have started de-industrializing.

Some comparisons are illuminating. Take India's largest state Uttar Pradesh. It reached its peak share of manufacturing in output at 10 percent of GDP in 1996 at a per capita state domestic product of about $1200 (measured in 2005 purchasing power parity dollars). A country like Indonesia (with a comparable population to Uttar Pradesh) attained a manufacturing peak share of 29 percent at a per capita GDP of $5800. Brazil (again, with almost the same population as Uttar Pradesh) attained its peak share of 31 percent at a per capita GDP of $7100. So, Uttar Pradesh's maximum level of industrialization was about one-third that in Brazil and Indonesia; and the decline began at 15-20 percent of the income levels of these countries.

The phenomenon of premature de-industrialization is strikingly on display in the partial residual plots of Figures VIII and IX. Figure VIII depicts the relationship between the peak employment share in registered manufacturing for a state (between 1981 and 2010) on its per capita NSDP, controlling for the year in which the state peaked. It shows that poorer states have lower levels of peak manufacturing share. Figure IX is a regression of peak share on peak year (i.e.: the year that that share was reached), controlling for the state's per capita NSDP. The figure shows that late "peakers" do so at much lower levels of manufacturing.

FIGURE VIII: Partial Residual Plot of Peak Employment Share of Registered Manufacturing vs Log Per Capita Net State Domestic Product - Controlling for Peak Year

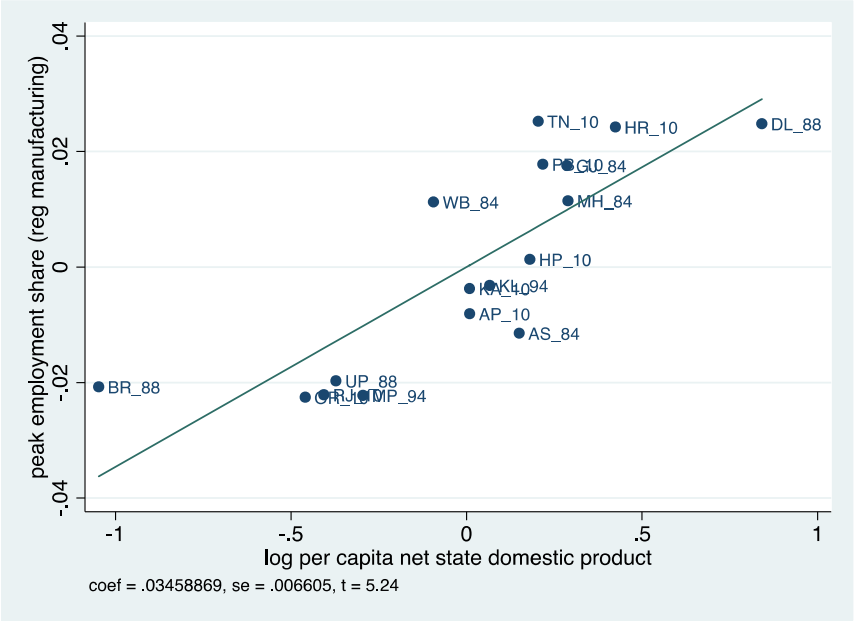
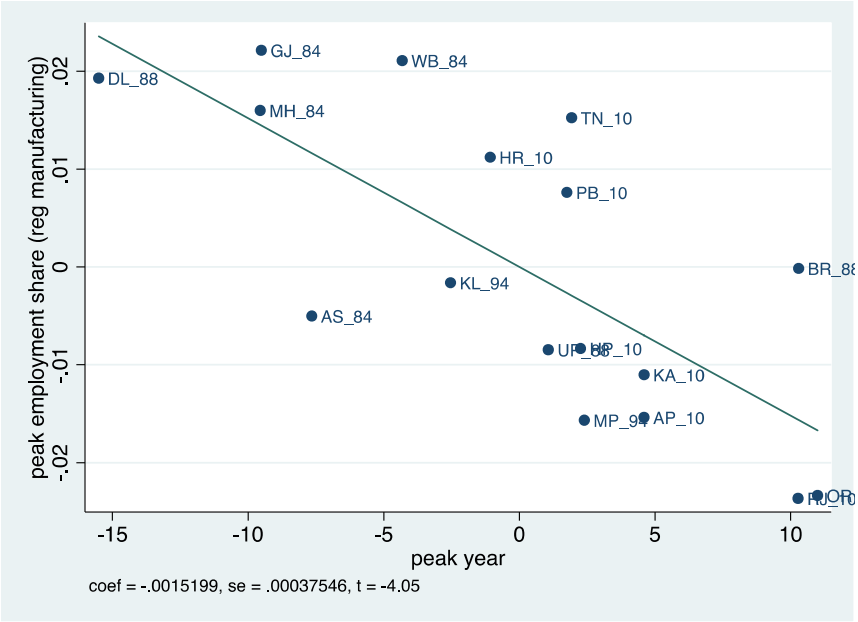


FIGURE IX: Partial Residual Plot of Peak Employment Share of Registered Manufacturing vs Peak Year- Controlling for Log Per Capita Net State Domestic Product



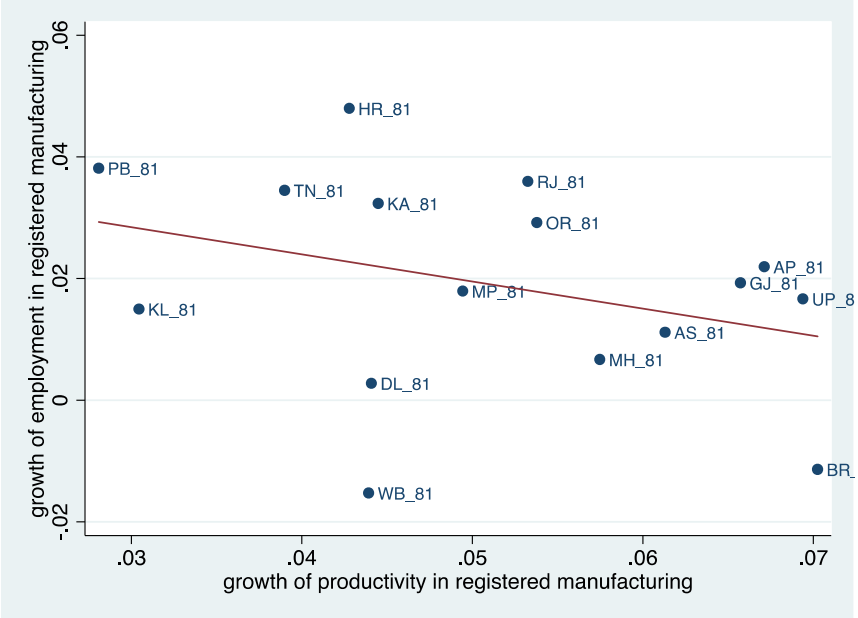
Thus far, we have shown that, for all but a few states, Indian manufacturing is certainly not growing and is probably shrinking. But the puzzle we wish to highlight and the one that speaks to the question of the desirable characteristics of structural transformation is that this shrinking is accompanied by high productivity growth and even convergence. In other

words, de-industrialization coexists with convergence and productivity growth and is not the consequence of poor productivity performance.

State and firm-level evidence illustrate this puzzle. Figure X plots employment growth in registered manufacturing against productivity growth across the Indian states. Figure XI plots growth in the number of registered factories against productivity growth. If faster productivity growth were drawing resources into the sector, we would expect to see a positive correlation, but expansion and productivity growth do not seem to move together.[10]

Table III provides factory-level evidence. In column 1 we regress employment growth against productivity growth at the factory level, controlling for State, Industry, Year and IndustryXYear Fixed Effects, and now find that the association is significantly negative. To be clear, we are not arguing for a causal interpretation of any of these coefficients – we merely wish to document the fact that rising productivity seems to coexist with declining resource use – at all levels.

FIGURE X: Growth of Employment in Registered Manufacturing vs Growth of Productivity in Registered Manufacturing (excluding Himachal Pradesh)



[10] The apparent negative correlation is not significant at conventional levels, at least at the state level. Also of note is that both figures exclude Himachal Pradesh, which is a huge positive outlier in terms of productivity, employment and factory growth in the registered manufacturing sector.

FIGURE XI: Growth in Number of Registered Manufacturing Factories vs Growth of Productivity in Registered Manufacturing (excluding Himachal Pradesh)

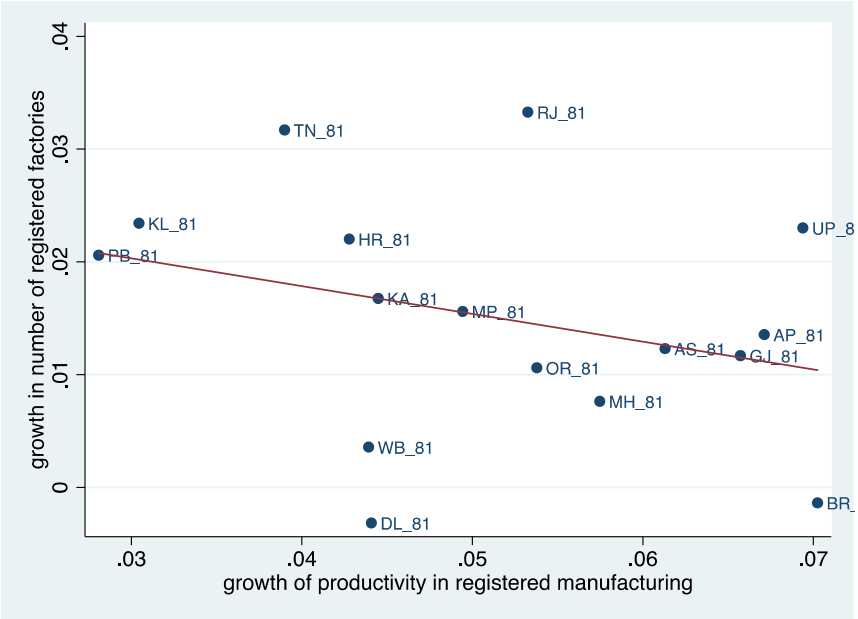


Table III: Employment and Wage Growth Regressed Against Productivity Growth – Factory Level

	(1)	(2)
	Employment growth (1999-2010)	Wage growth (1999-2010)
Productivity growth (1999-2010)	-0.069***	0.115***
	(0.027)	(0.019)
Constant	0.029***	-0.015**
	(0.019)	(0.038)
Observations	1257	1256

Standard errors in parentheses
State, Industry, Year and IndustryXYear FE included. Only Major Indian States.
* p < 0.10, ** p < 0.05, *** p < 0.01

The above caveat notwithstanding, manufacturing does not seem to satisfy requirement 3 of a dynamic sector also growing in size and attracting resources.

One possible consequence of manufacturing failing to satisfy requirements 2b and 3 is that, in contrast to China, there is no evidence of convergence between States in India in overall per capita GDP. Figures XII and XIII plot per capita GDP or NDP growth for China and India over the period 1980-2010 (roughly) against its initial level (in logs). The contrast is striking: in China, the poorer the initial level of per capita GDP, the faster the subsequent

growth so that poorer provinces start catching up with richer ones. In India, there is no convergence; poorer states are not likely to grow faster than richer ones on average. Regional disparities have thus persisted within India. This lack of unconditional convergence is true for short and long term time horizons.

FIGURE XII: China: Domestic Convergence in GDP Per Capita - Province level (1980 – 2012)

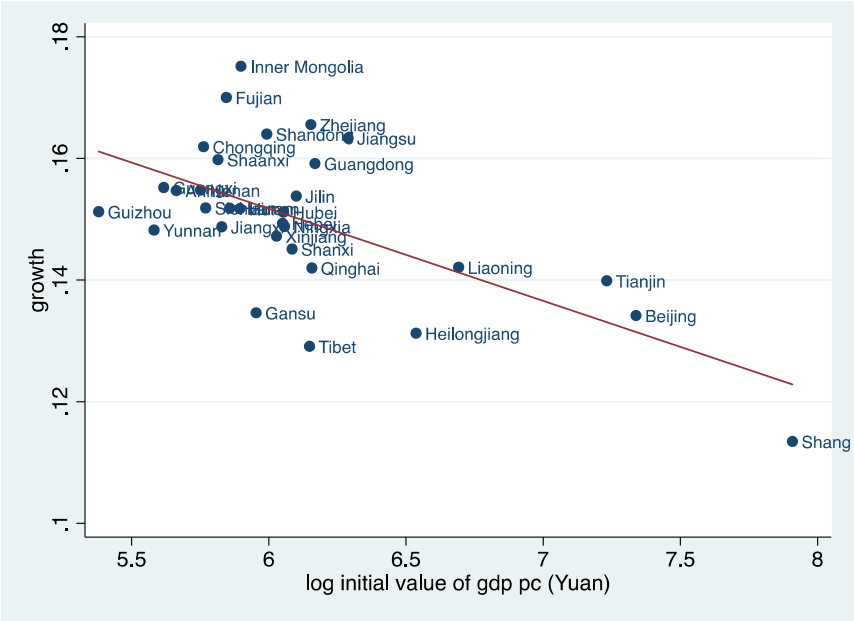
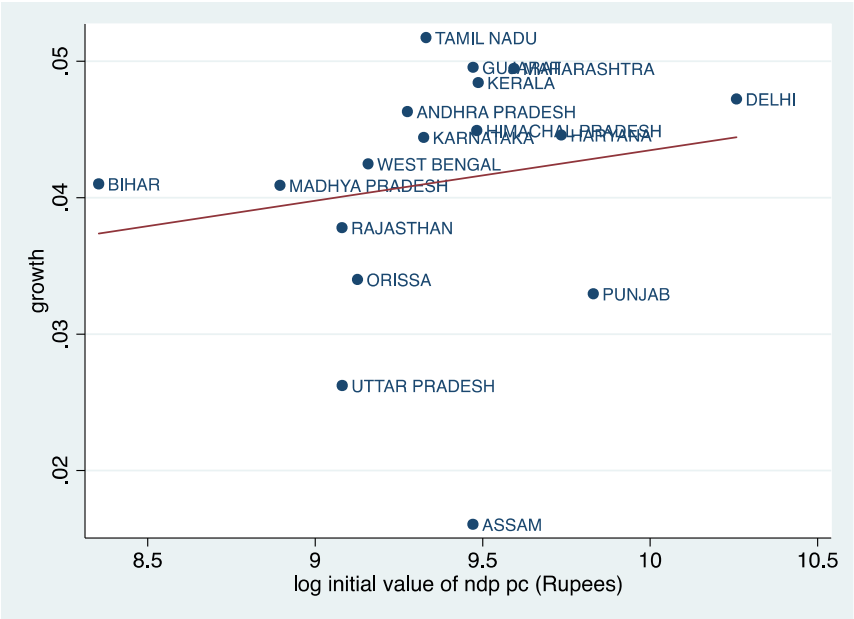


FIGURE XIII: India: Domestic Convergence in NDP Per Capita- State level (1981 – 2010)



Had manufacturing attracted resources while exhibiting domestic convergence in productivity, the sector would have expanded in poorer states increasing overall levels of income in these states and contributing to a narrowing of the income distribution across India. Instead it seems that manufacturing has failed to be such an escalator of progress.

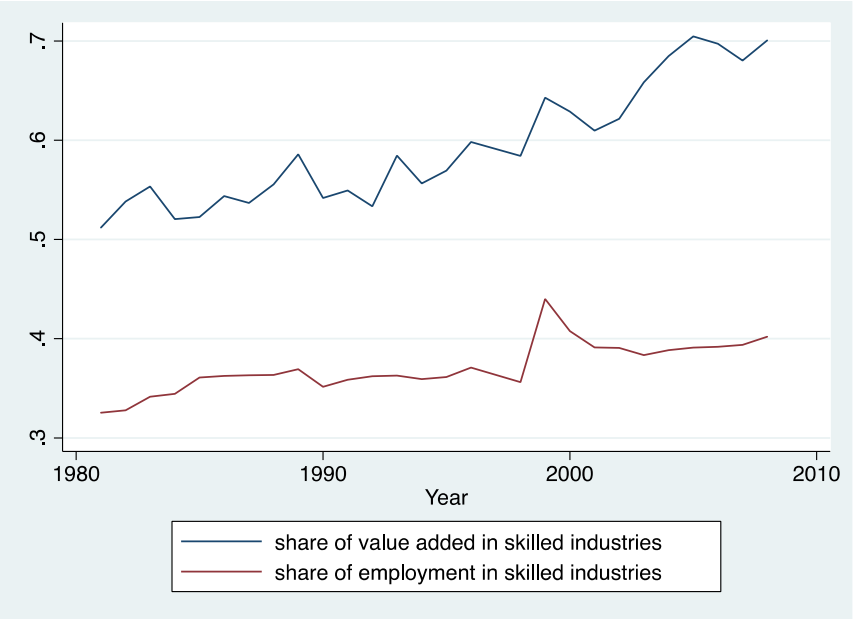
Among economists there is not yet consensus on why manufacturing has not been this escalator in India, and providing a complete explanation is beyond the scope of this paper, which is mainly concerned with first documenting broad facts and patterns. Most explanations that have been put forth for manufacturing's lackluster performance fall under five broad categories: distortions in labor markets; distortions in capital markets; distortions in land markets; poor infrastructure; and inappropriate specialization away from India's natural comparative advantage and toward skill intensive activities.

The first four categories of explanations (especially labor market distortions) have already received (or are presently receiving) considerable attention in the academic literature as well as the popular press, so we limit our brief discussion below to some evidence that is suggestive of the last of these explanations – inappropriate specialization – on which less has been written. We should make clear, however, that we do not mean to discount the explanations not discussed.

That inappropriate specialization could also be a potential explanation for Indian manufacturing's failure to be an engine of growth is suggested by a number of pieces of evidence. Figure XIV depicts the evolution in the shares of value added and employment in relatively skill-intensive industries, where skill-intensive industries are defined to be those industries with an above median fraction of workers with a secondary education according to the 2004/5 NSSO Employment and Unemployment Survey.[11] From the figure we see that there has been a steady increase in the shares of value added and employment in skill-intensive sectors. Between 1980 and 2008, the share of value added in skill intensive industries has risen from about 50 to 70 percent, while the corresponding change in the share of employment has been from about 32 percent to above 40 percent.

[11] The "skill intensive" measure was created at the 2 digit NIC Code level. Some caution is suggested in interpreting the figures pre and post 1998, as the categorization of NIC codes changed in 1998 and the concordance matching industry codes from one regime to the next is imperfect. We do not think this changes the interpretation of the data, however, as broadly upward trends are observed from 1980 to 1998 and from 1999 to 2008, particularly for Value Added. Finally, we end the series in 2008 and not 2010 because the NIC code categorization underwent another major change in 2008, with similar difficulties in matching industry codes across the classification regimes.

FIGURE XIV: Share of Value Added and Employment in "Skilled" Industries (1980 – 2008)



Of further note is that productivity growth is positively correlated with rising skill premia at the state-level, as illustrated in Figures XV and XVI, and in Tables 1A and 1B in the appendix.[12] [13] Rising skill premia coinciding with productivity growth suggests – though in the absence of causal evidence we recognize that it does not prove – that Indian manufacturing is far from the Lewis situation of unlimited supplies of labor. In that canonical model, real wages do not rise or rise very little in response to productivity growth. But because India's pattern of specialization is in skill intensive industries (itself the cause of historical choices and distortions), sustained growth seems to run relatively quickly into inelastic supplies of skilled labor supply, leading to rising wages and declining profits. To put it starkly, China's labor-intensive model for growth is only now—after 35 years and a 40-fold increase in productivity—outgrowing the Lewis model and encountering labor constraints. The Indian model based on skilled labor has for the same 30-35 years been continuously in a

[12] We measure the secondary (tertiary) skill premium as the average wage of those with secondary (tertiary) school education to those with primary school education.

[13] Tables 1A and 1B report regression results of skill premia growth against productivity growth. We report data for two different time ranges: 1) 1984 to 2005, and 2) 1984 to 2010. The data used to generate skill premia for the first range come from the NSSO's Employment and Unemployment Surveys, made available through IPUMS. The second time range includes, in addition, data from the NSSO's 2010 Employment and Unemployment Survey. The data from this last wave are raw MOSPI data and may differ in the procedures used to clean the data and interpret sampling weights from the data we procured through IPUMS for 1984 - 2005. Therefore, we report the results for both series. We also include values with and without Assam, an outlier in the relationship. By and large, coefficient magnitudes are robust to these different specifications, although statistical significance is affected in some specifications for secondary skill premia (the results regarding tertiary skill premia are very robust).

non-Lewis situation. This may partly explain why manufacturing has not been able to expand nor has it been able to converge to the international frontier.

FIGURE XV: Growth of Secondary Skill Premium vs Growth in Registered Manufacturing Productivity (1983 – 2010)

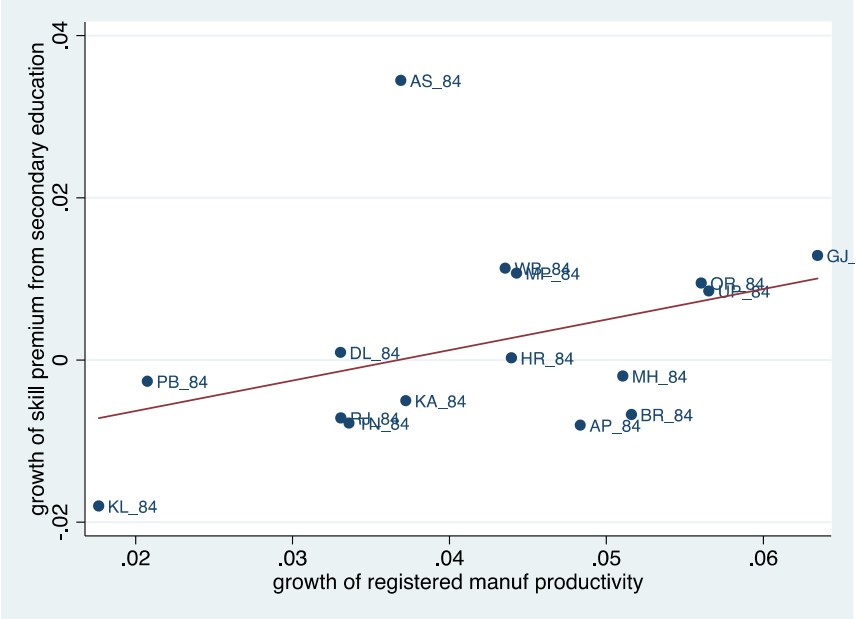
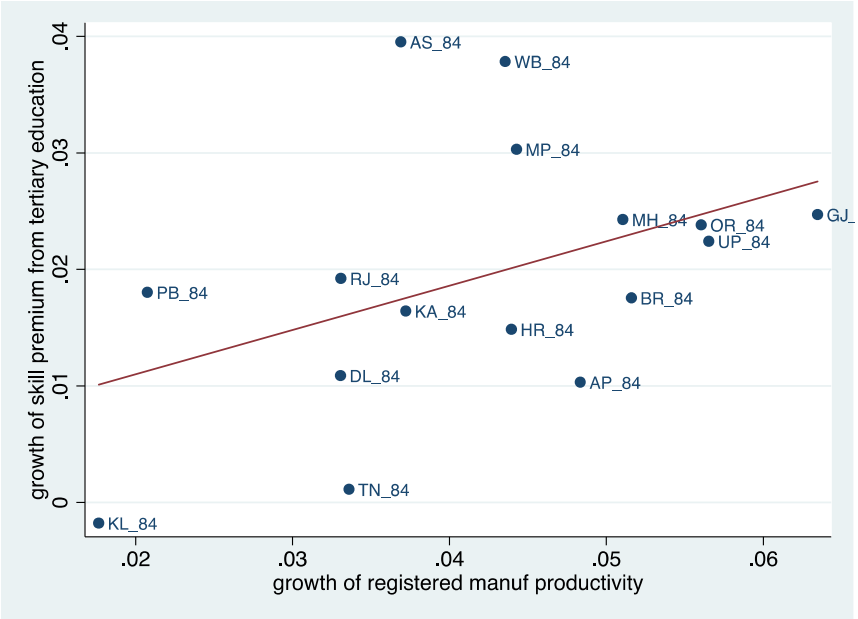


FIGURE XVI: Growth of Tertiary Skill Premium vs Growth in Registered Manufacturing Productivity (1983 – 2010)

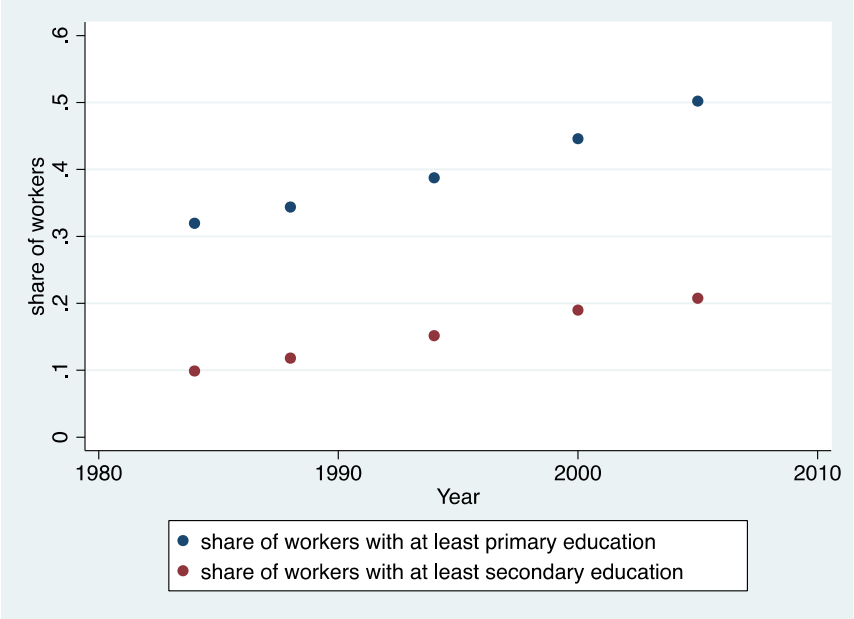


4. Alignment with comparative advantage

As we argued in Section 3, in order for a sector to offer transformational possibilities, it must not only be characterized by high levels and growth rates of productivity, it must also absorb resources from the rest of the economy. But in order to do so, the sector's use of inputs must be aligned with the country's comparative advantage. That will allow the abundant factor of production to benefit from productivity growth and convergence, and in so doing make the growth not only rapid and sustainable but also inclusive.

In India, the most abundant factor of production is certainly unskilled labor. Figure XVII depicts the share of workers with at least primary education and the share of workers with at least secondary education in India over time using data from the NSS. Although average educational attainment has climbed steadily, in 2005 it was still the case that only a slim majority of those employed had a primary education, while only 20% of workers had a secondary education.

FIGURE XVII: Educational Attainment of Indian Workers over Time



With this skill base (or lack thereof), the dynamic sector in India must at least initially be relatively unskilled labor intensive. Is this true of Indian manufacturing? No. Kochhar et. al. (2006) found that Indian manufacturing was unusually skilled labor intensive among comparable countries. We provide another way of gauging the relative skill intensity of Indian manufacturing in Table IV, which reports average educational attainment in manufacturing and other sectors. In particular, we use data from the 2004/5 NSSO Employment and Unemployment Survey to compute the share of employees with at least primary and secondary education for major sectors (and subsectors) of the Indian economy.

TABLE IV: Average Skill Level by Subsector in the Indian Economy (NSSO 2004/5)

Sector/Subsector	Share of Employees with at least Primary Education	Share of Employees with at least Secondary Education
Agriculture, forestry and fisheries	0.445	0.139
Mining	0.501	0.221
All manufacturing	0.628	0.248
Registered manufacturing (workers in factories with >10 workers)	0.768	0.432
All Services	0.778	0.478
Transportation and communications	0.715	0.330
Wholesale and retail trade	0.721	0.346
Financial services and insurance	0.976	0.836
Real estate and business services	0.935	0.775
Public administration and defense	0.897	0.665
Education	0.963	0.888
Health and social work	0.924	0.767
Electricity, gas and water	0.856	0.558
Construction	0.518	0.144

It turns out that registered manufacturing is indeed a sector that is relatively skilled labor intensive. As the table shows, the share of workers with at least secondary education is substantially higher in registered manufacturing than in agriculture, mining or unregistered manufacturing and also greater than in several of the service subsectors. In some ways, this should not be surprising. High labor productivity in this sector (Table I) is at least in part a consequence of higher skills in the work force. What it does suggest, however, is that registered manufacturing does not really satisfy requirement number four. The skill intensity of the sector is not quite aligned with India's comparative advantage.

V. The Services Scorecard

We can repeat this scorecard analysis for the services sector in India. But before we do so, it is important to recognize that services in the aggregate is not a useful category of analysis because it is an amalgam of different and disparate species of economic activity, from government services and construction that are non-tradable to finance and business services that largely are tradable; from certain activities that are labor intensive to others such as telecommunications that are highly capital and skilled labor intensive. Any meaningful analysis of services must distinguish between different service subsectors - although the degree of disaggregation will of course be determined by data availability.

We will work with the six different subsectors shown in Table V and repeat the analysis undertaken above for registered manufacturing.

1. Productivity Level

Table V provides comparative data on the levels of productivity for these service subsectors as well as for manufacturing (both registered and unregistered). The first point to note is the astounding variation within services, reinforcing the case for disaggregation. In 1984 for example, the level of productivity in the real estate and business services sectors was 25 times as much as in public administration (essentially government) and close to 20 times as much as in retail etc. The productivity levels in two—financial services and business services—out of six service subsectors exceed that of registered manufacturing.

TABLE V: Labor Productivity in the Indian Economy by Year and Sector (including service subsectors)

	Level (constant 2005 Rs.)		Growth	
	1984	2010	1984-2010	2000-2010
Services	61,978	213,014	4.9%	6.3%
Manufacturing	48,817	125,349	3.7%	4.2%
Registered manufacturing (MOSPI)	117,984	360,442	4.4%	5.4%
Unregistered manufacturing	28,548	50,312	2.2%	1.2%
Services Subsectors				
Trade, Hotels, and Restaurants	56,284	144,108	3.7%	7.3%
Transport, Storage and Communications	68,823	172,058	3.6%	4.5%
Financial Services and Insurance	198,584	706,297	5.0%	-1.6%
Real Estate and Business Services, etc	1,012,017	875,073	-0.6%	3.2%
Public Administration and Defense	41,154	231,109	6.9%	7.0%
Construction	62,773	95,866	1.6%	2.1%

2A. Domestic convergence

As we did for the case of registered manufacturing in Section IV 2A above, we now examine whether there was unconditional convergence within India for service subsectors over the last 3 decades. The results are presented in Table VI (with corresponding graphs – Figures 5 to 11 – provided in the appendix). Notably, we do find unconditional domestic convergence in nearly all the service subsectors, and across many time horizons (not reported here). In fact, we find that the speed of domestic convergence for most service subsectors is similar to that in registered manufacturing (about 2%) and, in some cases, substantially higher. For

example, Real Estate and Business Services seem to converge at double the rate at which registered manufacturing converges.

TABLE VI: Unconditional Convergence in Service Subsectors Across Indian States (1984-2010): (regressions include productivity growth against log of initial productivity)

	(1)	(2)	(3)	(4)	(5)	(6)
Log of initial productivity	Trade, Hotels and Restaurants	Transport, Storage and Communication	Financial Services and Insurance	Real Estate and Business Services	Public Administration	Construction
Trade, Hotels and Restaurants	-0.022***					
	(0.006)					
Transport, Storage and Communication		-0.025**				
		(0.011)				
Financial Services and Insurance			-0.022*			
			(0.012)			
Real Estate and Business Services				-0.044***		
				(0.004)		
Public Administration					-0.031***	
					(0.009)	
Construction						-0.035***
						(0.009)
Constant	0.273***	0.317**	0.308**	0.609***	0.401***	0.405***
	(0.062)	(0.117)	(0.141)	(0.056)	(0.096)	(0.101)
Observations	17	17	17	17	17	17

Standard errors in parentheses
Only Major Indian States
* p < 0.10, ** p < 0.05, *** p < 0.01

2B. International Convergence

In Section IV 2B, we referred to Rodrik (2013), which provides evidence using data from UNIDO that industries in the (organized) manufacturing sector consistently exhibit global convergence in labor productivities, although Indian manufacturing industries converge to

the global frontier much more slowly than the average, if at all. What about the service subsectors we've been studying?

Using data on sectoral productivities from the World Bank's World Development Indicators (WDIs), Ghani and O'Connell (2014) argue that services in the aggregate have also exhibited convergence to a similar or even greater degree as manufacturing – at least for recent time periods (approximately 1990 to 2005). Below we attempt to augment this interesting finding in two ways.

First, we have argued that services should be disaggregated whenever possible, as we might well expect convergence behavior to vary by subsector due to significant differences in sectoral characteristics such as tradability. The second important issue that we attempt to address in our convergence analysis is the problem of PPP adjustments. It is not clear that the sectoral output values included in the WDIs are adjusted with sector-specific PPP conversion factors; rather, the WDIs may use sector-invariant country-level PPP conversion factors. But this is very important if we believe that sector-level prices vary systematically with the level of development – as they do according to the Balassa-Samuelson effect, for example.

Indeed not only will the prices of non-tradable goods be higher in richer countries than in poorer ones, it is also easy to imagine scenarios in which the Balassa-Samuelson effect also implies that the growth rates of prices may differ in such a way as to cause the appearance of convergence in services even though none exists. For example, if we assume that there is convergence in productivities in tradable sectors such as manufacturing, as shown by Rodrik (2013), then that fact (ie: that productivities grow faster for tradable goods in poorer countries than in richer ones), coupled with the Balassa-Samuelson effect, would imply that prices of non-tradables grow faster in poorer countries than in richer ones. In other words, the inter-country price gap in non-tradables will tend to erode as the inter-country difference in tradable productivities tends to erode. If not accounted for by country-sector-specific prices, this effect would cause value added per worker in non-tradable sectors to appear to grow faster, even if true productivity was unchanged in the non-tradable sectors.

Problems such as these are difficult to address given current data availability, but the Groningen Growth and Development Centre (GGDC) provides a number of databases that make it feasible to attempt to address such issues. First, the GGDC provides country and sector specific PPP conversion factors for a number of sectors in 37 countries for the year 2005. Using those conversion factors, we are able to generate sector-specific PPP-adjusted productivity for service subsectors in 2005. We then use the GGDC's sector-specific series on employment and value-added in constant local currencies to generate productivity growth rates in constant local currency units which we use, along with the 2005 PPP-adjusted sector-specific productivity values, to impute PPP-adjusted productivity values in other

years.[14] Because of unmatched countries in the various datasets, we are left with a miniscule sample: only 27 countries.[15] Furthermore, like Ghani and O'Connell, our analysis is confined to a relatively short period: 1990 – 2005.

Putting aside the above caveats momentarily, the results in Table VII are interesting. We see that some service subsectors (Finance, Insurance, and Real Estate; Construction; and, to a small degree, Transport, Storage and Communication) do seem to exhibit international convergence, while others (Trade, Hotels and Restaurants; Community, Social and Personal Services) do not. Surprisingly, the set of sectors exhibiting convergence seems to include even some apparently non-traded sectors, such as construction.

But again, it may be that these results are peculiar to the sample of countries included, which is small and over representative of high-income countries. It is therefore possible that the service subsectors which exhibit convergence only do so among high-income countries. Certainly it seems to be the case that convergence in service subsectors is stronger within region, as the inclusion of region fixed effects demonstrates (see Table 3 in the Appendix).

It is also true that the time period in question (1990 – 2005) was a period of uncommonly high growth globally and saw more convergence in global incomes than has generally been observed in earlier periods. Whether any service subsectors exhibit convergence over other periods (as Rodrik (2013) shows is the case for manufacturing) is not a question we can answer with the data available to us at present.

Finally, we should note that in trying to get around certain problems (e.g.: the different sectoral price levels), our methodology may introduce other sources of error. For example, as we mentioned in footnote 13, if sectoral PPP conversion factors change greatly over time, our process of imputing PPP-adjusted VA in earlier time periods may be problematic. Another puzzling outcome of our analysis is that convergence in manufacturing (not reported here) is only weakly significant in this sample, which may also be due to problems with the data, sample or methodology, given the robust findings regarding manufacturing convergence in Rodrik (2013).

Given these caveats and keeping in mind that the above analysis of international convergence in service subsectors is a first attempt in tackling this important and empirically challenging problem, we can tentatively conclude that some service subsectors do appear to exhibit convergence (especially Finance, Insurance, and Real Estate), while others do not. Indeed, it appears that the subsectors exhibiting international convergence are largely the same ones that also exhibit high productivity levels, growth and domestic convergence, just like manufacturing.

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[14] It is often assumed that PPP conversion factors do not vary greatly over short and medium range periods, and the technique just described leans heavily on this assumption (in particular, we assume that there is more important variation in PPP conversion factors across sectors than over time, at least for the period 1990 – 2005).

[15] The list of countries included in this analysis is given in Table 2 of the Appendix.

TABLE VII: Unconditional Convergence in Service Subsectors across Countries (1990-2005): (regressions include productivity growth against log of initial productivity)

Log of initial productivity	(1) Trade, Hotels and Restaurants	(2) Transport, Storage and Communication	(3) Finance, Insurance, and Real Estate	(4) Community, Social and Personal Services	(6) Construction
Trade, Hotels and Restaurants	-0.008**				
	(0.003)				
Transport, Storage and Communication		-0.008			
		(0.005)			
Finance, Insurance, and Real Estate			-0.024***		
			(0.006)		
Community, Social and Personal Services				-0.004	
				(0.006)	
Construction					-0.013**
					(0.005)
Constant	0.091***	0.125**	0.266***	0.048	0.142***
	(0.030)	(0.053)	(0.067)	(0.069)	(0.050)
Observations	27	27	27	9	27

Standard errors in parentheses
* p < 0.10, ** p < 0.05, *** p < 0.01

3. Expansion of Services?

In Section IV 3, we presented evidence that the share of output and employment from manufacturing in India had hardly changed in 30 years. If anything, Indian states were starting to de-industrialize – even before reaching 20% (or, in some cases, 15%) of output from manufacturing. In the Tables and Figures below we present analogous evidence for services in India – both in aggregate and for particular service subsectors.

From Table VIII b and Figure XVIII, we can see that – in contrast to registered manufacturing – the share of output from aggregate services rose dramatically over the last 30 years, from about 35% to more than 50% of GDP. The share of aggregate services in employment, in contrast, increased in a far more modest fashion (see Table VIII a). In other

words, services are becoming an ever more important source of wealth – although they are not providing substantially more direct employment than they did three decades ago.

This pattern (i.e.: fairly substantial increases in the share of output from services and more modest increases in the share of employment from services) can be seen in Tables VIII a and VIII b and in Figure XIX for most of the service subsectors we examine, although some subsectors have had higher relative employment growth than others. For example, Real Estate and Business Services has seen rapid growth in its employment share, although it still accounts for only 1% of total employment. Construction has also seen steady relative growth in employment, and today provides employment to a considerable 8% of the total employment pool.

TABLE VIII a: Growth in Employment Shares of Economy Subsectors

	Initial Level of Productivity	Employment Shares		Annual Growth
	1984	1984	2010	1984-2010
Registered Manufacturing	117,984	0.027	0.026	-0.2%
Aggregate Services	61,978	0.201	0.219	0.3%
Trade, Hotels, and Restaurants	56,284	0.074	0.093	0.9%
Transport, Storage and Communications	68,823	0.028	0.038	1.2%
Financial Services and Insurance	198,584	0.006	0.007	0.7%
Real Estate and Business Services, etc	1,012,017	0.002	0.011	7.1%
Public Administration and Defense	41,154	0.030	0.018	-1.9%
Construction	62,773	0.031	0.080	3.7%

TABLE VIII b: Growth in Output Shares of Economy Subsectors

	Initial Level of Productivity	Output Shares		Annual Growth
	1984	1984	2010	1984-2010
Registered Manufacturing	117,984	0.091	0.105	0.6%
Aggregate Services	61,978	0.358	0.528	1.5%
Trade, Hotels, and Restaurants	56,284	0.120	0.152	0.9%
Transport, Storage and Communications	68,823	0.056	0.075	1.1%
Financial Services and Insurance	198,584	0.035	0.058	2.0%
Real Estate and Business Services, etc	1,012,017	0.053	0.108	2.8%
Public Administration and Defense	41,154	0.036	0.047	1.1%
Construction	62,773	0.056	0.087	1.7%

FIGURE XVIII: India: Share of Aggregate Services in Total Output and Employment over Time

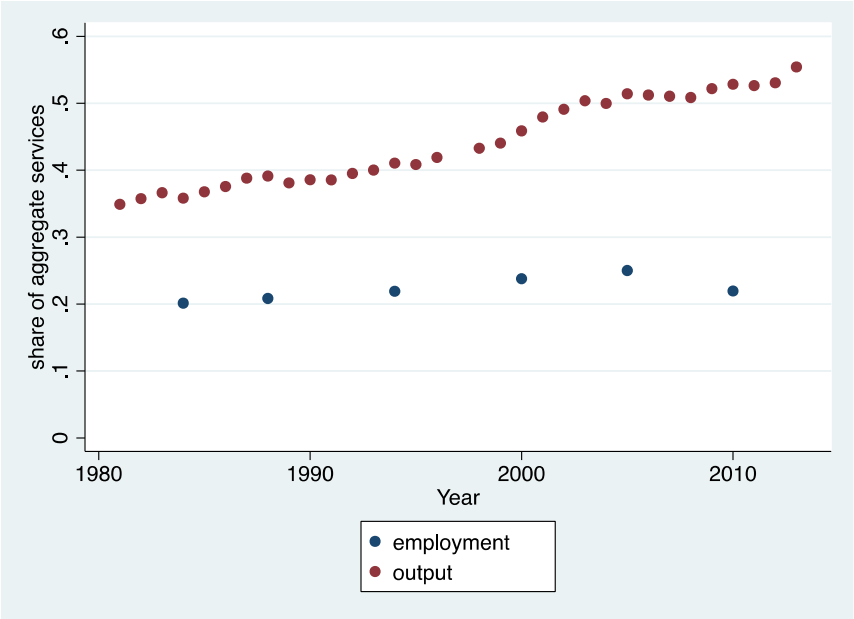
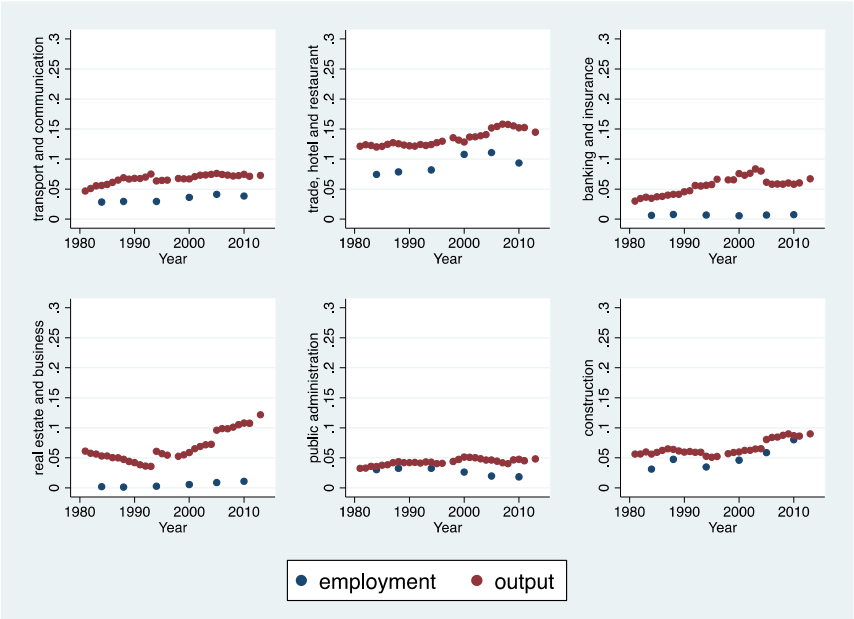


FIGURE XIX: India: Share of Service Subsectors in Total Output and Employment over Time



A final point about expansion in services. In Section IV 3, we showed that, for the case of registered manufacturing, faster employment growth did not correlate with productivity growth. Table IX below shows that the same is true for most service subsectors, but to an even greater degree: for all but one service subsector, the correlation between employment growth and productivity growth is significantly negative. In other words, it is the service subsectors with the slowest productivity growth that that are absorbing labor the fastest.

TABLE IX: Employment Growth Regressed Against Productivity Growth for Service Subsectors – State Level

	Employment Growth (1984-2010)					
Productivity Growth (1984-2010)	Trade, Hotels and Restaurants	Transport, Storage and Communication	Financial Services and Insurance	Real Estate and Business Services	Public Administration	Construction
Trade, Hotels and Restaurants	-0.197 (0.147)					
Transport, Storage and Communication		-0.673*** (0.157)				
Financial Services and Insurance			-0.573*** (0.154)			
Real Estate and Business Services				-0.527** (0.183)		
Public Administration					-0.588*** (0.119)	
Construction						-0.610*** (0.093)
Constant	0.042*** (0.006)	0.063*** (0.006)	0.058*** (0.008)	0.087*** (0.007)	0.042*** (0.008)	0.073*** (0.003)
Observations	17	17	17	17	17	17

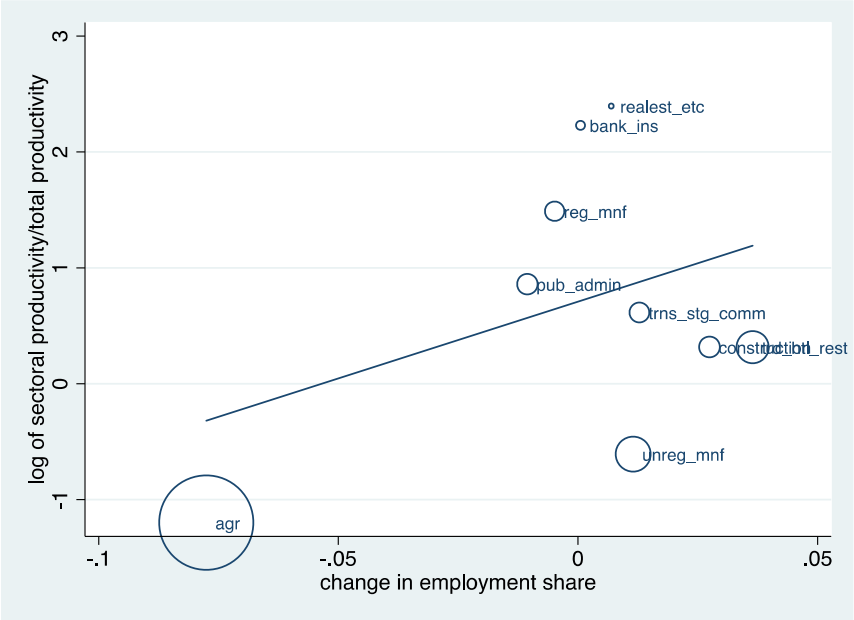
Standard errors in parentheses
Only Major Indian States
* p < 0.10, ** p < 0.05, *** p < 0.01

This might still be alright if the sectors that are absorbing labor have high productivity *levels*, even if they do not tend to have high productivity *growth rates*. In that case there will at least be a one time positive effect on productivity as resources are transferred from lower to higher productivity sectors. To examine this question we borrow a method that McMillan and Rodrik (2011) use to analyze the role of structural change in improving productivity: for each sector in a country, they graph the logged ratio of sectoral productivity to economy-wide productivity (at a given endpoint in time) against the sectoral change in employment share over some time period. If the correlation is positive, that means that the higher productivity sectors are absorbing more labor, which implies that the process of structural

change is productivity enhancing. If the correlation is negative, structural change is productivity reducing, as resources are moving into lower productivity sectors.

We replicate the analysis from McMillan and Rodrik (2011) for India using data directly from national sources (their data are from the GGDC) and distinguishing between the registered and unregistered manufacturing sectors, which their data do not allow them to do. We are also able to conduct the analysis at the sub-national level, exploring the role of structural change in productivity growth for certain States. The relevant results are provided in Figure XX and XXI, which displays the relationship between the sectoral productivity ratio (in 2005) and the change in employment share over the period 1984 – 2005, which is a somewhat longer period from that studied by McMillan and Rodrik (2011).[16] The size of the circles represents the employment share of the sector in the beginning period (i.e.:1984).

FIGURE XX: Sectoral Productivity vs Change in Employment Share (1984 – 2005) for All India



[16] In the Appendix (Figure 12), we also report the same relationship over the period 1984 – 2010, which is the longest period over which we can conduct this analysis. The results in Figure 12 and Figure XX are qualitatively similar, although the reduction in the employment share for agriculture is much larger over the longer period, owing to a substantial decline in the employment share of agriculture between 2005 and 2010 in our data (see Figure 13). We believe this dramatic decline may reflect a real change or it may simply be due to the fact that our 2010 NSS data are possibly incomparable with the previous rounds of the NSS available to us (see the data section for more on this). It is our uncertainty over this aspect of the data quality that causes us to focus on the shorter time period and to relegate Figure 12 to the Appendix. However, the conclusions of our analysis would not be substantially changed if we were to use Figure 12 instead of Figure XX in the main body of the text.

FIGURE XXI: Sectoral Productivity vs Change in Employment Share (1984 – 2005) for Selected States

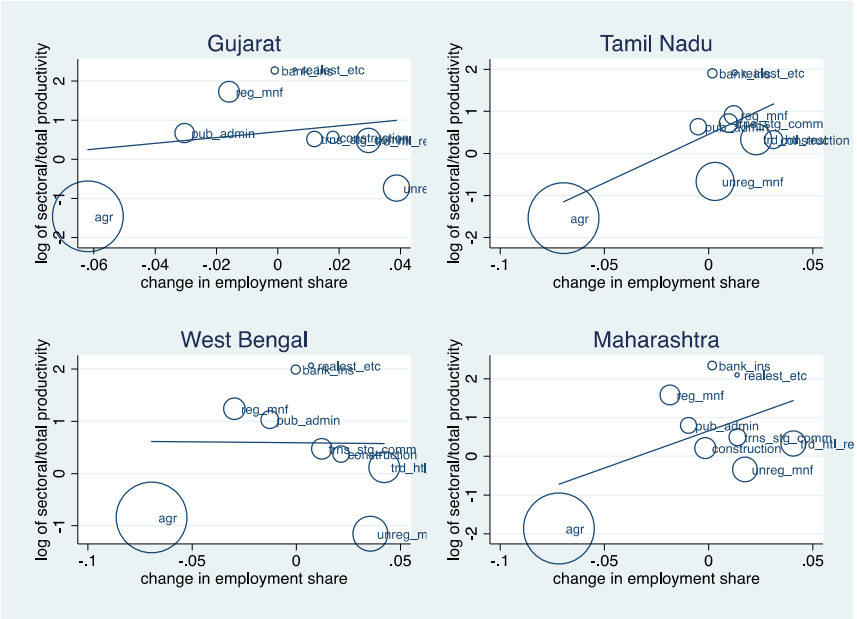


Figure XX shows that agriculture was the sector with by far the largest employment share in the beginning period, the lowest productivity levels (in the end period), and also the largest decline in employment share over the period. This alone is enough to conclude that structural change has been positive for India over the period: resources have left agriculture for higher productivity sectors, which is reflected by the positive slope of the best-fit line. However, the Figure also demonstrates that the effect of structural change in contributing to productivity growth was far more muted than it might have been.

First, among service subsectors, it can be seen that the least productive subsectors saw the largest gains in employment shares – which is not what one would hope for from productivity enhancing structural change. Second, it is evident that even if the manufacturing sector in aggregate did have modest gains in employment share over the period, the unregistered manufacturing sector saw a much greater gain in employment share than the registered manufacturing sector (which appears to have declined slightly over the period). This shows once again the great importance of distinguishing between registered and unregistered manufacturing: registered manufacturing is very high in productivity but is not absorbing labor, while unregistered manufacturing is absorbing labor but is the least productive sector apart from agriculture. Without making this distinction, one might conclude that the effect of structural change on productivity growth was more positive than it really was. Some these points are made most starkly if one looks at the same graph while excluding agriculture (Figure 13 in the Appendix). Then the best fit line is clearly negative, suggesting that – agriculture aside – labor has been moving more quickly into less productive sectors.

Looking at the state level analysis provides an even more nuanced picture. Figure XXI, depicts the productivity effects of structural change for four major states: Gujarat, Tamil Nadu, West Bengal and Maharashtra. In Gujarat and West Bengal, the correlation between sectoral productivity and change in employment share is close to zero, suggesting that structural change has not been productivity enhancing over this period. For Maharashtra and Tamil Nadu (especially), structural change seems to have been more positive.

4. Alignment with comparative advantage?

We argued above that, in a low-skilled labor abundant country like India, a sector must make use of this dominant resource in order to offer the greatest possibilities for expansion and structural transformation. In Table IV, which provides information on average educational attainment by sector, we saw that Registered Manufacturing was a fairly skill-intensive sector with high average educational attainment.

The same table also shows that services in aggregate are no less skill-intensive: on average, 78% of workers in the service sector have at least a primary education (77% in registered manufacturing), and 48% have at least a secondary education (43% in registered manufacturing). Furthermore, a large number of service subsectors – including 1) Banking and Insurance, 2) Real Estate and Business Services, 3) Public Administration, 4) Education, and 5) Health and Social Services – have significantly higher educational attainment (90% or more of workers have at least primary education) than registered manufacturing. What this implies is that many service subsectors (precisely the high productivity, high growth subsectors, for the most part), have a limited capacity to make use of India's most abundant resource, unskilled labor. This may explain why the share of employment from services (especially the high growth service subsectors) has risen so modestly, even while the share of output from services has grown so substantially.

VI. Summary Scorecard and Conclusions

Table X below provides a summary scorecard comparing registered manufacturing and selected service subsectors. From the comparison, there does not seem to be anything distinctive or superior about registered manufacturing. Like manufacturing, several of the service subsectors share its virtues of high productivity, domestic convergence and international convergence[17]. They also share its major shortcoming: they are all fairly skill intensive in their resource requirements, which is out of kilter with the skill profile of the Indian labor force. Their potential to generate widely shared or inclusive growth is thus likely to be limited – and indeed seems to have been so given the lack of expansion we observed above.

[17] Although this last characteristic is subject to the substantial caveats outlined in Section V 2B, namely the limited time period and small sample size on which the international convergence analysis is conducted.

One sector that markedly stands out from the others in the table below is construction: it appears to exhibit both types of convergence, does not require high education levels and has grown significantly in its resource use over the last three decades. However, the sector is not tradable and in any case is low productivity, so that moving labor resources to the sector does not considerably improve overall welfare.

TABLE X:

India: Services vs Manufacturing Scorecard

Feature	*Registered Manufacturi ng*	*Trade, Hotels, and Restaurants*	*Transport, Storage and Communications*	*Financial Services and Insurance*	*Real Estate and Business Services, etc*	*Construction*
1. High productivity	Yes	No	Not really	Yes	Yes	No
2A. Unconditional domestic Convergence	Yes	Yes	Yes	Yes	Yes	Yes
2B. Unconditional international convergence	Yes, but not for India	No	No	Yes	Yes	Yes
3. Converging sector absorbs resources	No	Somewhat	Somewhat	No	Somewhat	Yes
4. Skill profile matches underlying endowments	Not really	Somewhat	Somewhat	No	No	Yes
5. Tradable and/or replicable	Yes	No	Somewhat	Yes	Somewhat	No

So, in some ways, the choice for India is not manufacturing versus services but comparative advantage deifying (unskill intensive) versus comparative advantage defying (skill intensive) development.

There is a positive and a policy question.

While India's skill-intensive pattern of development has no doubt been costly, there has been a significant upside. Amartya Sen has drawn attention to the disappointing post-Independence performance of the Indian state in delivering education, reflected in very slow improvements in literacy rates, especially amongst women. While the supply of educational services by the state was inadequate, Sen raised the puzzle as to why there was not greater demand for education and hence greater pressure on the state to meet this demand. One answer to this puzzle is that the private returns to literacy and basic education must have

been low. There is now evidence that the increasing opportunities that are spurring economic growth also contribute to raising these returns, leading to a greater demand for educational services—public and private—and hence in educational outcomes (Munshi and Rosenzweig, 2003). This has put pressure on the supply of education. The government's failures to provide good schools are well-known, but growth has changed the picture dramatically, largely because it has increased the returns from education—and hence the demand for it. Evidence is provided by the work of economists Kartik Muralidharan and Michael Kremer who show that private schools are mushrooming in rural India (many prominently advertising "English Medium") because of teacher absenteeism in public schools. One also hears of companies creating training centers to build skills in the cities (such as the Infosys institute in Mysore) because institutions of higher education are notoriously inadequate. Whatever the cause, average educational attainment in India has improved at a steady rate (recall Figure XVII). This endogenous increase in human capital could be one of the offsetting benefits of the comparative advantage-defying, skill-intensive growth model.

The policy question is the following. Insofar as the government retains influence over shaping the pattern of development, should it try to rehabilitate unskilled manufacturing or should it accept that that is now unachievable and create the groundwork for sustaining the skill intensive pattern of growth? Attempting the former would be a history-defying achievement because there are not many examples of reversals of de-industrialization. A lot would have to change in India—from building the infrastructure that supports unskilled labor-intensive manufacturing to reforming the panoply of laws and regulations—or perhaps addressing corruption in the manner of their enforcement—that may discourage hiring unskilled labor and achieving scale in the formal sector.

Sustaining a skill intensive pattern on the other hand would require a greater focus on education (and skills development) so that the pattern of development that has been evolving over time does not run into shortages. The cost of this skill intensive model is that one or two generations of those who are currently unskilled may be left behind without the opportunities to advance. But emphasizing skills will at least ensure that future generations can take advantage of lost opportunities.

Either way, the problem confronting India is really about how to make it a Lewisian economy that has unlimited supplies of labor. India can either try to create the conditions to ensure that its existing unlimited supplies of unskilled labor are utilizable. Or, it can try to make sure that the currently inelastic supply of skilled labor is made more elastic. Alternatively, it can try to do both – although either one would be a major challenge on its own.

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Appendix

TABLE 1A: Growth of Secondary Skill Premium vs Growth in Registered Manufacturing Productivity

	(1)	(2)	(3)	(4)
	growth in skill premium 1984-2005	growth in skill premium 1984-2010	growth in skill premium 1984-2005	growth in skill premium 1984-2010
growth in reg manuf productivity 1984-2005	0.298*		0.204	
	(0.156)		(0.144)	
growth in reg manuf productivity 1984-2010		0.375		0.453***
		(0.239)		(0.146)
Constant	-0.00977	-0.0138	-0.00592	-0.0194**
	(0.00934)	(0.0105)	(0.00844)	(0.00644)
Observations	16	16	15	15

Standard errors in parentheses

All specifications exclude Himachal Pradesh. Columns 3 and 4 also exclude Assam.

* p < 0.10, ** p < 0.05, *** p < 0.01

TABLE 1B: Growth of Tertiary Skill Premium vs Growth in Registered Manufacturing Productivity

	(1)	(2)	(3)	(4)
	growth in tertiary skill premium 1984-2005	growth in tertiary skill premium 1984-2010	growth in tertiary skill premium 1984-2005	growth in tertiary skill premium 1984-2010
growth in reg manuf productivity 1984-2005	0.365***		0.316**	
	(0.109)		(0.109)	
growth in reg manuf productivity 1984-2010		0.381*		0.430**
		(0.215)		(0.183)
Constant	0.00356	0.00338	0.00553	-0.000191
	(0.00653)	(0.00940)	(0.00639)	(0.00807)
Observations	16	16	15	15

Standard errors in parentheses

All specifications exclude Himachal Pradesh. Columns 3 and 4 also exclude Assam.

* p < 0.10, ** p < 0.05, *** p < 0.01

TABLE 2: List of Countries Included in Analysis of International Convergence in Service Subsectors (i.e.: Table VII):

Country Names		
Argentina	Spain	Japan
Australia	Finland	Korea
Austria	France	Luxembourg
Belgium	United Kingdom	Mexico
Brazil	Greece	Netherlands
Chile	Indonesia	Portugal
China	India	Sweden
Germany	Ireland	United States
Denmark	Italy	South Africa

TABLE 3: Within Region Convergence in Service Subsectors across Countries (1990-2005): (regressions include productivity growth against log of initial productivity with Region Fixed Effects)

	(1)	(2)	(3)	(4)	(6)
Log of initial productivity	Trade, Hotels and Restaurants	Transport, Storage and Communication	Finance, Insurance, and Real Estate	Community, Social and Personal Services	Construction
Trade, Hotels and Restaurants	-0.013***				
	(0.003)				
Transport, Storage and Communication		-0.013*			
		(0.007)			
Finance, Insurance, and Real Estate			-0.025***		
			(0.005)		
Community, Social and Personal Services				-0.004	
				(0.006)	
Construction					-0.021***
					(0.006)
Constant	0.143***	0.167**	0.270***	0.050	0.226***
	(0.032)	(0.069)	(0.060)	(0.068)	(0.063)
Observations	27	27	27	9	27

Standard errors in parentheses; Region FEs included.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

FIGURE 1: Premature De-indutrialization? Relationship between employment share in industry and GDP per capita (constant sample of countries over time)

(Over time, countries are specializing less in industry and de-industrializing earlier)

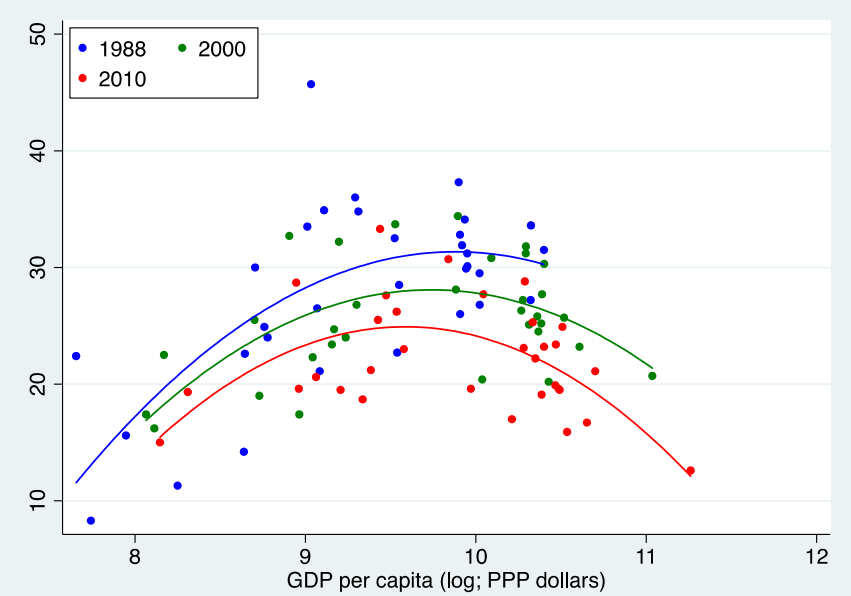

FIGURE 2: Share of Manufacturing in Employment and Total Output (current and constant INR) Over Time: All India

FIGURE 3: Share of Registered Manufacturing in Employment and Total Output (current and constant INR) Over Time: All India

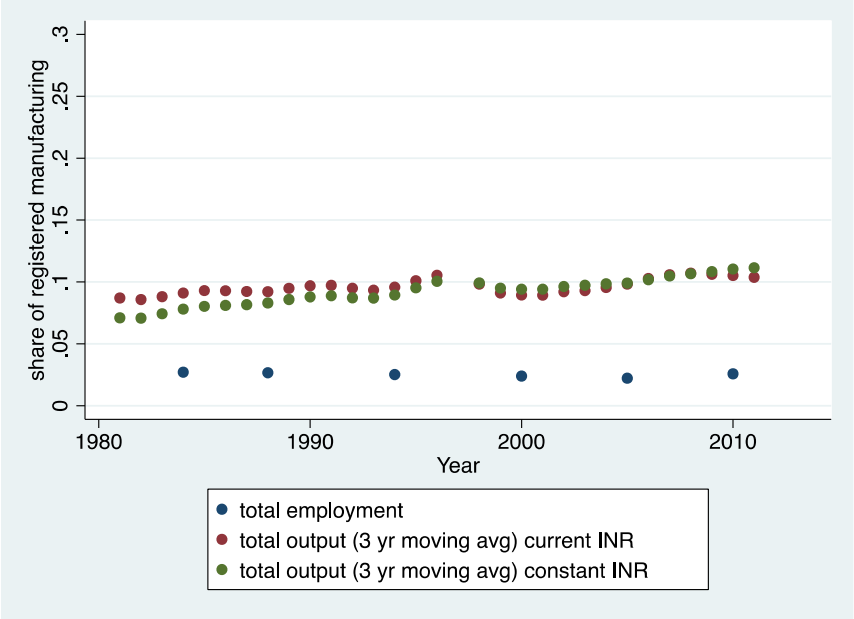

FIGURE 4: Share of Registered Manufacturing in Total Output (constant INR) Over Time: By State

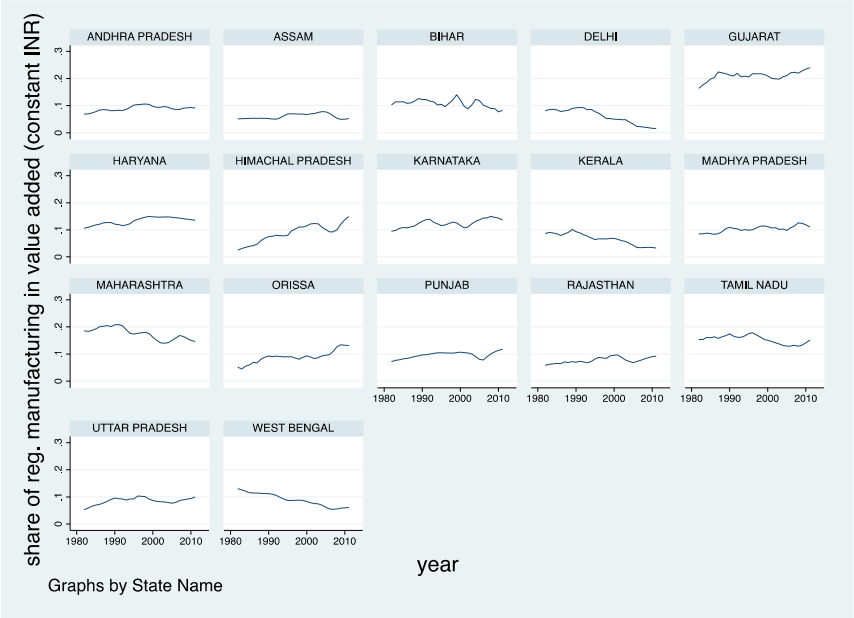

FIGURE 5: Domestic Convergence in Aggregate Services - State level (1984 – 2010)

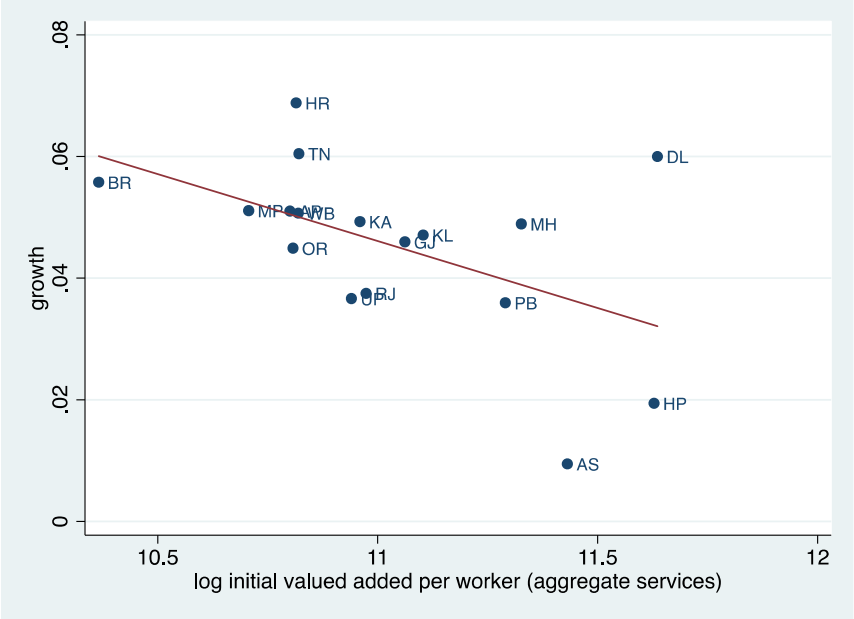

FIGURE 6: Domestic Convergence in Trade, Hotels and Restaurants - State level (1984 – 2010)

FIGURE 7: Domestic Convergence in Transport, Storage and Communication - State level (1984 – 2010)

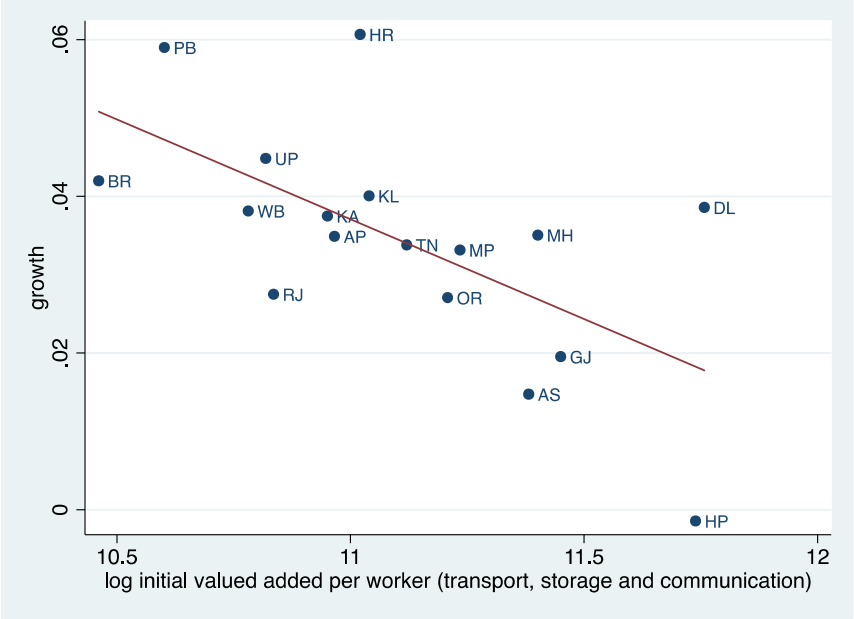

FIGURE 8: Domestic Convergence in Financial Services and Insurance - State level (1984 – 2010)

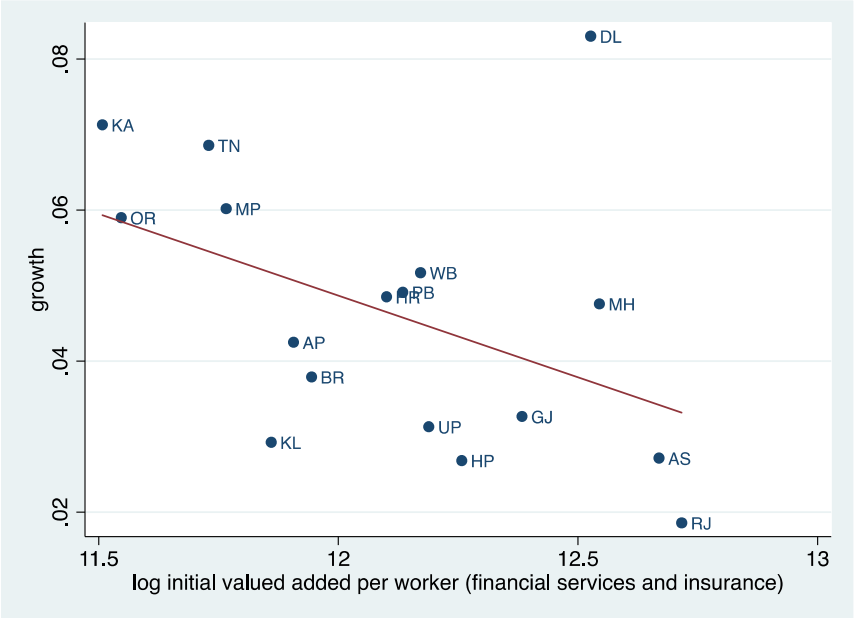

FIGURE 9: Domestic Convergence in Real Estate and Business Services - State level (1984 – 2010)

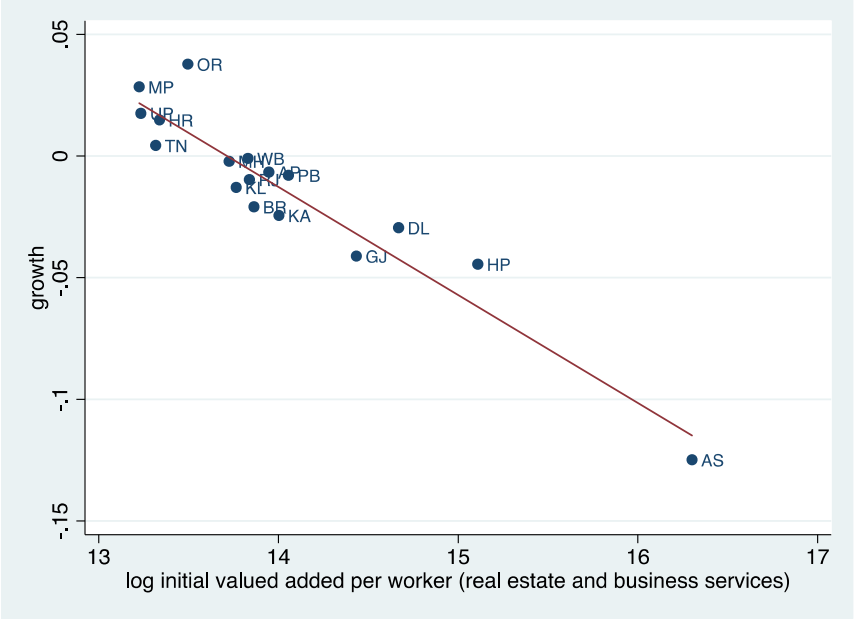

FIGURE 10: Domestic Convergence in Public Administration and Defense - State level (1984 – 2010)

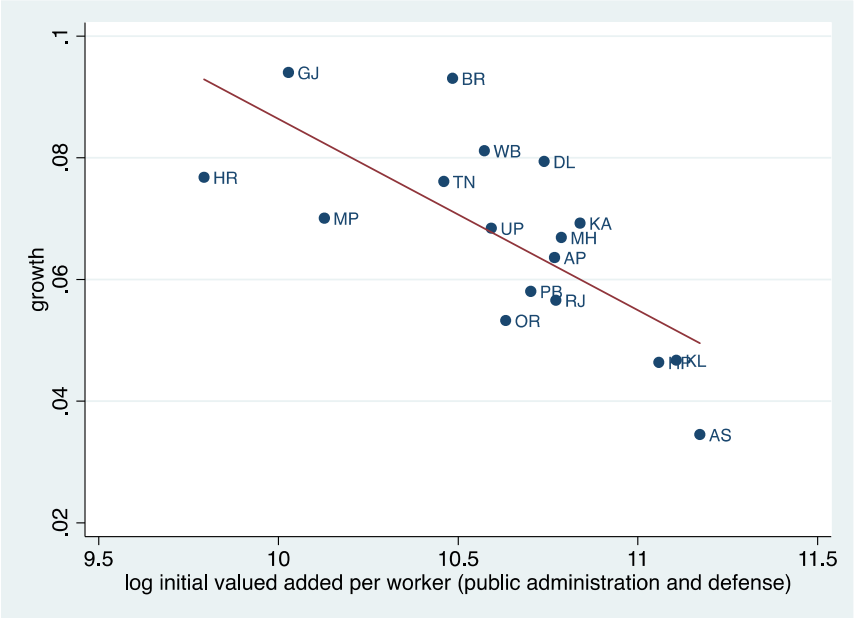

FIGURE 11: Domestic Convergence in Construction - State level (1984 – 2010)

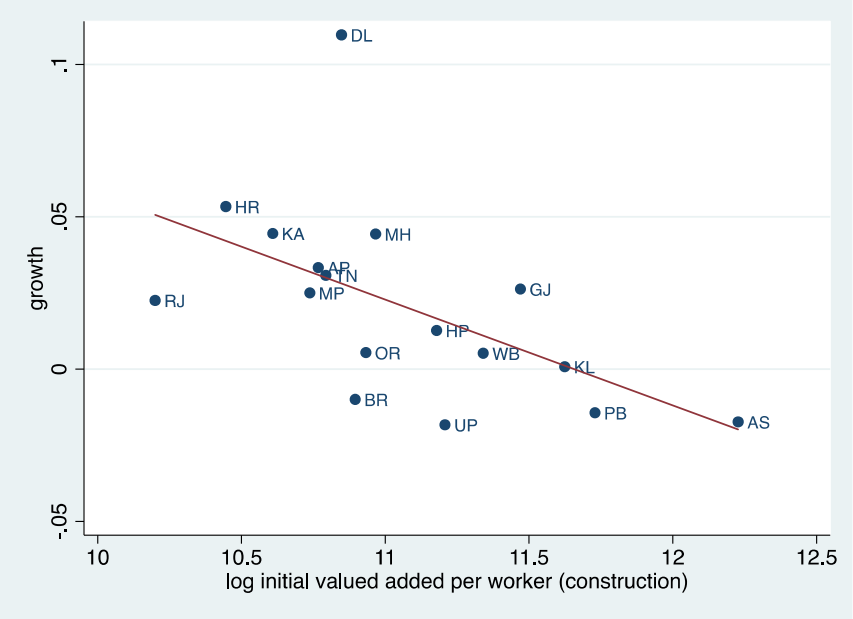

FIGURE 12: Sectoral Productivity vs Change in Employment Share (1984 – 2010) for All India

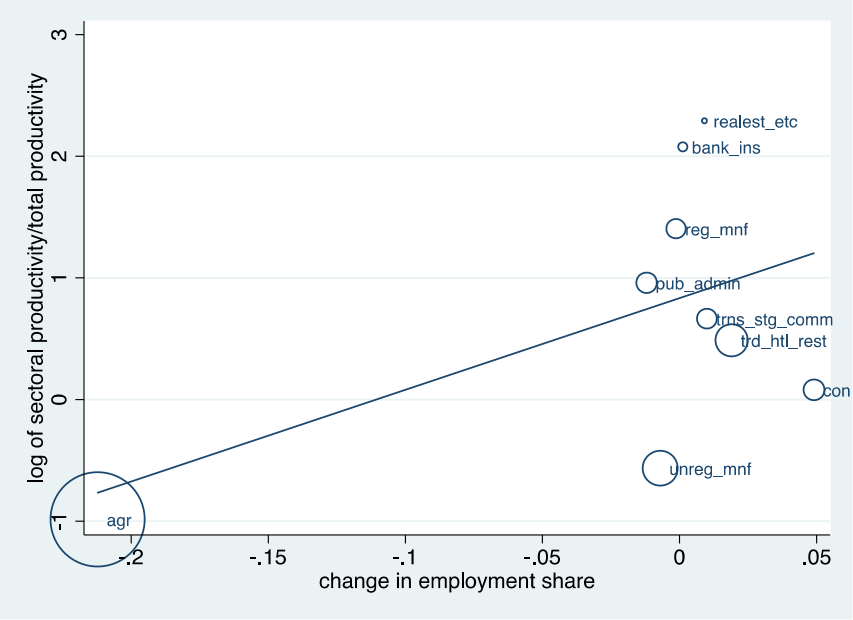

FIGURE 13: Sectoral Productivity vs Change in Employment Share (1984 – 2005) for All India – Without Agriculture