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Partha Ray
Subhasankar Chattopadhyay

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NATIONAL INSTITUTE OF BANK MANAGEMENT
Pune, Maharashtra, 411048
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ABSTRACT

In comparing the historical experience of structural transformation in two large Asian economies, *viz*., India and China, we note that the high growth rate in India post-liberalization was marked by an absence of any rapid industrialization. The pace of structural change (i.e., economy moving from predominance of agriculture to industry and finally to services) has been much slower in India than in China. In fact, unlike China, India seemed to have skipped industrialization and seemed to have gone into services from agriculture. A stylization in terms of a reduced form VAR model with three variables, viz., GDP growth rate (growth), a structural change index (NAV); and weighted standard deviation of sectoral growth rates (SD), finds that while NAV matters more for China, its impact is quite small for India. We explore several hypotheses towards explaining the non-standard path of India's structural transformation and argue that India's experience may be explained in terms of several factors, such as, movements in inter-sectoral terms-of-trade dynamics; emergence of consumption as a primary growth driver; presence of structural constraints as captured by ease of doing business or logistic performance index; and inability of successful special economic zones. Finally, in terms of political economic structure, the heterogeneity and decentralization Indian economic decision making could have acted yet another impediment in India's path of industrialization.

Keywords: Structural change, Terms of trade, India, China, Industrialization

JEL Classification Number: E31; O11; O41

Partha Ray ***(Corresponding Author)***
National Institute of Bank Management, India
E-mail: pray@nibmindia.org

Subhasankar Chattopadhyay
Indian Institute of Management Indore, India
E-mail: subhasankarc@iimidr.ac.in

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1. Introduction

For a long time, the aggregative nature of the standard neo-classical growth theory – like that of Solow – did not prove suitable for investigation of structural changes associated with economic growth. The texts books of mainstream macroeconomics hardly have either a discussion of Kuznets' stylized facts or a theoretical framework to explain structural change.[1] Even the more recent endogenous growth theories, while being less aggregative in nature, tends to give scanty attention to structural change.

Traditionally two processes of structural change that are associated with the growth trajectory of any economy get frequent mention. First, one of the key characteristics of Kuznets' six facts of economic growth is rapid structural transformation of the economies that includes "the shift away from agriculture to non-agricultural pursuits and, recently, away from industry to services"; ….and "a related shift from personal enterprise to impersonal organization of economic firms, with a corresponding change in the occupational status of labor" (Kuznets, 1971). Second, structural transformation may be intimately interlinked with the Lewis process whereby in a dual economy with a traditional agricultural sector and unlimited labour supply, and a modern industrial sector, a shift of labour from the subsistence economy to the industrial sector could generate growth with some adverse consequence like rise in inequality (Lewis, 1954).

Empirical reality among the advanced countries of today bear testimony to the Kuznets process whereby at the initial stage of development, the share of agriculture goes down and that of industries goes up – finally at a later stage, the share of services sector goes up substantially. Thus, at the current juncture, most of the advanced economies are characterised as service oriented economy. Is this tendency valid for emerging market economies as well?

Towards probing into this question, this paper is about the structural transformation of two major bur dissimilar emerging economies, viz., China and India. The importance of these two economies have been increasing over the years by leaps and bounds with their joint share in global GDP (at PPP) rising from 7.5 per cent in 1990 to around 27 per cent in 2019. Even in terms of GDP at market exchange rate (MER), in 2019, China with a GDP of USD 14 trillion is the second largest economy (only next to the US) and India with a GDP of around USD 3 trillion is the fifth largest economy. While China's integration with the market economy started in early 1980's with Deng Xiaoping's policies of shading of earlier orthodoxies, India liberalization program began in early 1990s with Narasihma Rao - Manmohan Singh's policies towards liberalization. Naturally, the emergence of these two Asian giants generated huge interest in their growth processes (Basu, 2009; Binswanger-Mkhize, 2013; Kochhar et. al., 2006; Lamba and

[1] For example, popular texts of economic growth like David Romer's *Advanced Macroeconomics* (2018) or *Economic Growth* (2003) of Robert Barro and Xavier Sala-i-Martin do not mention structural change as a topic. An exception is Acemoglu's book *Introduction to Modern Economic Growth* (2009) that has devoted a chapter to the topic.

Subramanian, 2020; Panagariya, 2007; Zhang, 2008). It is also well-recognized that the infrastructure capital stock in China outweighs Indian stocks, reflecting perhaps the outperformance of dictatorships over democracy with respect to average long-run GDP growth (Schiffbauer and Shen, 2010).

However, apart from the political system, the structural transformation of these two economies have been quite different. Our study looks into this process of structural transformation from two aspects.

First, in tracing the differences in structural transformation between the two countries, we note that while China has followed a more traditional path of structural transformation, in case of India it seems that it became a service economy bypassing, to some extent, the process of industrialization. What are the dimensions of this structural transformation? What are the drivers of this process? The reasons adduced by this paper to such observation complements the existing studies (see below and section 3 for related studies).

Second, it has been empirically established that there is a strong interconnection between economic growth and structural change (Cortuk and Singh, 2011; Dietrich, 2012). While the former study has found a one-way causality from structural change to economic growth for India for the period 1988-2007, the latter finds a bi-directional causality for OECD countries for 1960 to 2004. Our paper argues that, sectoral growth imbalance could also be a strong candidate that can explain economic growth-structural change linkage. We do a VAR analysis to investigate this relation for India and China separately. Such a VAR analysis, highlighting the role of sectoral dynamics in explaining structural change, is absent in the existing literature that otherwise do a comparative study of India and China (Basu, 2009; Binswanger-Mkhize, 2013; Bosworth and Collins, 2008; Gaaitzen et al., 2012; Kamhon and Wang, 2013; Kochhar et. al., 2006; Lamba and Subramanian, 2020; Panagariya, 2007; Zhang, 2008).

The rest of the paper is organized as follows. While section 2 briefly discusses theoretical literature on structural change, differing dimensions of structural transformation in India and China are discussed in section 3. Section 4 presents a simple analytical model to understand the linkage between growth, structural change and sectoral growth imbalance, followed by a VAR model. Section 5 puts forward various conjectures for explaining India's unique experience of structural transformation. Concluding observations are presented in section 6.

2. Structural Change: Stylization and Theoretical Literature

A well-documented feature of economic growth across countries is the associated changes in the composition of sectoral output, employment and consumption structure (Kuznets, 1973; Maddison, 1980) known as the 'stylized facts' of structural change. Such stylized facts are best understood from the work of Herrendorf et al. (2014). They construct individual time series of sectoral employment and value added shares over the 19th and 20th century for Belgium, Finland, France, Japan, Korea, Netherlands, Spain, Sweden, United Kingdom, and United States. Increases in GDP per capita (in 1990 international dollars) is associated with decreases (increases) in both the employment and the value added share in agriculture (services). However, the behavior of the manufacturing is different – its employment and value added shares follow a hump shape: increasing for lower levels of development and decreasing for higher levels of development.

Interestingly, at low levels of per capita income, the value added share is much lower than the employment share in agriculture and shares are not zero for services. This implies that, at low levels of development, per capita income in agriculture is low and a large fraction of the workforce is employed in the agricultural sector. Surprisingly, even at low levels of development, services sector output tends to be considerable along with employment. From the value added share in services, one can identify an acceleration in the rate of increase when the value added share for manufacturing reaches its peak (see Figures 6.1 to 6.5 in Herrendorf et al., 2014).

Therefore, the explanation of structural change requires explanation of changes in the share of production, demand and employment from agriculture to manufacturing (and then to services). The models of structural change therefore are built around 'non-balanced' growth at the sectoral level (Kuznets facts), but aggregate variables must present a balanced growth to conform to the well-known Kaldor facts. The non-balanced growth at the sectoral level comes from demand-side and supply-side factors.[2]

The demand side factors essentially incorporate Engel's law through non-homothetic utility function (Foellmi and Zweimueller, 2008; Kongsamut et al., 2001; Ngai and Pissarides, 2007) assuming that no imbalances are occurring from the supply side. The supply side explanation mainly rests on the price (substitution) effects on consumption structure. It began with the work of Baumol (1967), who emphasized that 'uneven growth' (non-balanced growth) will be a general feature of growth process because different sectors will grow at different rates owing to different rates of technological progress. The price of produced goods for the sector growing at a higher rate would decline, inducing a substitution effect in favour of the same sector. Acemoglu and Guerrieri (2008) also emphasize supply-side causes of non-balanced growth along with relative price dynamics. A detailed discussion on the variations of these models can be found in Acemoglu (2009).

3. Dimensions of Structural Change in India and China

To assess structural changes in these two economies, we use a broad three sector classification, viz., (i) agriculture (ag); (ii) Industry (ind); and services (s), so that aggregate value added (VA) and employment (E) are given by:

$$(1a)\ VA = VA^{ag} + VA^{ind} + VA^{s}$$

$$(1b)\ E = E^{ag} + E^{ind} + E^{s}$$

"Agriculture" includes agriculture and allied activities. "Industry" comprises: (i) mining; (ii) manufacturing; and (iii) utilities. "Services" includes almost everything else, viz., (i) construction; (ii) trade, restaurants and hotels; (iii) transport, storage and communication; (iv) finance, insurance, real estate and business services; (v) government services, and Community, social and personal services.

We use Groningen Growth and Development Centre (GGDC) 10-sector database for the Asian countries to get the Value Added (at constant 2005 national prices) and Employment data (Timmer et. al., 2015). To measure the extent of structural change we, following Dietrich (2009), use a variant of the simple measure called "Norm of Absolute Values" (NAV). It is computed as follows:

[2] There is a large body of theoretical literature on structural change in output and employment composition. For an excellent survey of stylised facts and underlying theories, see Herrendorf *et al*. (2014).

$$(2)\ NAV = 0.5 \sum_{i=1}^{3} |X_{it} - X_{is}|$$

where *i* is the sector, *t* is the base year (say 1950) and *s* is (*t*+1), (*t*+2) … i.e., 1951, 1952, and so on. This gives us a continuously rising NAV indicating progress of structural change.[3]

We fix a base year and then the differences of the sector-shares between the base year and subsequent years are calculated. Then the absolute amounts of these differences are summed up and divided by two (since each change is counted twice). It (theoretically) ranges between 0 and 1, and a higher value indicates structural change is almost complete. It can be, therefore, used to compare the *pace* of structural change within a given timeframe.

3.1 Trends in Value Added

What have been the trends in the Value Added (VA) and employment shares in India and China post-1950 (1952-2010)? Figure 1 compares structural changes between India and China in terms of inter-temporal behavior of NAV (equation 2) as well as sectoral shares (VA^i / V ; for *i* = ag, ind, and s), given by the following:

$$(3)\ \frac{VA^{ag}}{VA} + \frac{VA^{ind}}{VA} + \frac{VA^{s}}{VA} = 1$$

China began with a much larger share of agriculture, but witnessed a faster fall in the share also. In India, on the contrary, this rate of fall has been slower (Figure 1). While the industry-share has tapered off in India only at around 25 percent, it is still rising in China. As we discuss below, such a tapering off happened quite early in India. While the crossover between agriculture and industry took place in India around 2004, it happened much earlier in China, around 1990. India's services-share has always been very high – it is even higher than industry throughout. It is also more than China across years. There is an acceleration in the services share in India post-1990s, but there seems to be no such phenomenon for China post-1980s. A comparison of NAV indices show that structural change in China is about 70 percent complete. However, it is just above 40 percent in India, indicating thus, the overall *pace* of structural change in India has been much slower.

3.2 Employment Structure

In a similar way, the employment structure is tracked in terms of employment-NAV and sectoral employment shares, i.e.,

$$(4)\ \frac{E^{ag}}{E} + \frac{E^{ind}}{E} + \frac{E^{s}}{E} = 1$$

The most interesting fact about the employment in India is its near-unchanged structure till about liberalization in early 1990s. The employment-NAV ratio was close to zero till mid-1980, implying that there was very little net inter-sectoral labor movement for a long time. Though the structure has started changing thereafter, the employment share of agriculture is still very high with low per-capita income – around 55 percent of agricultural workers share 15 percent of value added. On the other hand, the industrial employment never picked up in India – agriculture and services almost complement each

[3] Usually, NAV is calculated between two "successive" periods.

other in terms of employment. So, the change in the employment-structure is mostly due to a net increase in the employment in the services sector. This is the reason behind the emergence of a large urban informal sector in India where labor (primarily unskilled and semi-skilled) is drawn from the agricultural sector.

On the contrary, in China, the employment-structure started changing right from early 1960s, and the employment share in the agriculture sector has declined much faster. While structural change in employment in India is only 20 percent complete (reflecting the fact that most people are stuck in agriculture), it is close to 50 percent in China. The structural change in the output composition in India (VA-NAV = 0.4) has not been followed by a similar change in the employment structure (EMP-NAV = 0.2).

3.3 Output and Employment Structure: A Comparison

How do India and China compare with the pattern of structural change in advanced economies? Figure 3 plots the share of VA and employment against (log) per-capita income for India and China. The output share of agriculture follows the same pattern in China as in the advanced economies, but the share did not change for quite some time in India. Further, at comparable per capita incomes, advanced economies had better per capita income in the agricultural sector, i.e., agricultural population in India and China are poorer.

While the industrial sector's output and employment shares both peak at around 40 percent in advanced economies, the industrial output in India seems to have *already* peaked at around 25 percent of GDP. Further, the employment share in the industry has been more or less constant at around 10 percent – with increases in per capita income in India there has been no change in (the share of) industrial employment. Hence, strictly speaking, it may not be incorrect to conjecture that India has lost employment due to industrial sector's share not reaching up to a level that is seen in advanced economies. Interestingly, though the share of value added in China has reached to the level of that is seen in advanced economies (40 percent), the employment share (only 20 percent) falls much short of what it could have been.

What seems to set both India and China apart is the behavior of the services sector. Going by the stylized facts of advanced economies, the increase in the share typically starts accelerating around (log) per capita income of 9, but such acceleration happened in India around (log) per capita income of 5.5 (which was mid-1980s)[4] and in China around per capita income of 5 (which was in around 1978). Therefore, it seems that growth upsurge in India (popularly known as breaking away from the 'Hindu' growth rate) helped its services sector, without affecting the output and employment trends of the industrial sector in any way.[5] At the same time, the upsurge in growth seems to have helped both the sectors in China.

[4] It was complemented by an acceleration in the rate of fall in the agricultural share.

[5] Such phenomenon – known also as early de-industrialisation – is not uncommon. For instance, Mouelhi and Ghazali (2021) in the context of structural transformation in Tunisia, Morocco and Egypt (three middle income countries from MENA region), find that, though these countries made progress in structural transformation between 1970s and early 1990s, the transformation process stagnated at low-income levels and deindustrialisation occurred at an early stage of development.

3.4 Recent Trends (2010 – 2018)

The story told so far has from early 1950s to 2010. This has been necessitated by the available of comparable data from the Groningen Growth and Development Centre's 10-sector database. For instance, World Bank database for India and China begins from 1960 for sectoral value added (also, the panel is unbalanced) and from 1991 for sectoral employment. Using this database would miss rapid changes in the agricultural sector (in both the countries) and ToT (Figure 7) between 1950 and 1960. Further, the very crucial fact that employment shares in India did not change till mid-1980s, but it did change for China, would have been missed too.

Has there any marked shift in recent period? This issue is even more necessary in view of the recent renewed emphasis of the Indian authorities on manufacturing.[6] The industrial employment share increased from 23.5 percentage in 2011 to about 25 percentage in 2018, and there has been only 0.5 percentage point increase after 2014. Further, there has been a decline in the industrial sector's value added after 2010. Finally, there has been no change in the *trend* of value added in agricultural and services sectors in India.

4. Sectoral Growth Dynamics and Structural Change

4.1 Sectoral Growth Dynamics

Sectoral growth dynamics affects structural change in two ways. Baumol (1967) suggested that structural change is a result of different sectors growing at different rates owing to different rates of technological progress. Technological progress might be faster in manufacturing than in agriculture or services. If sectors grow at different rates (i.e., there exists sectoral growth imbalance), each sector's share in GDP would also change leading to structural change. Naturally, the pace of structural change will then depend on the extent of growth imbalance.

For Baumol's theory to hold good, we need the following two conditions (denoting "g" as the growth rate)[7]

(5) $g^{ind} > g^{ag}$ for the initial phase of structural change;

(6) $g^{s} > g^{ind}$ for the latter phase.

Larger the difference between growth rates, faster the structural change. For India, the average growth rate of the services sector always exceeded industrial sector (for the entire period, Table 1), so the condition was not met. If we consider the growth rates till the break dates (1980 or 1991) [8], the condition was weekly met, so there was some increase in the industrial share till early 1990s. But post-1980, the rate of growth of services sector exceeded that of industrial sector by quite a margin (more so after 1991), so that the services sector share surged ahead. Therefore, it is no wonder that India's story of structural change is more of a story of going from agriculture to services directly.

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[6] Illustratively, the "Make in India" initiative was launched in September 2014 for transforming "India into a global design and manufacturing hub" (https://www.makeinindia.com/about).

[7] $g^{i} = (VA^{i} - VA^{i-1})/VA^{i-1} \; \forall \; i = ag, ind, s$

[8] See Kochhar et al. (2006) and Wallack (2003) for a discussion on 'structural breaks' in Indian growth.

However, this is not true for China. Until the Chinese reform in 1978, industrial sector expanded rapidly, enabling output and labour to move away from agriculture. Post-1978, services sector picked up and its growth became comparable to industry, making it further possible to shift output and employment out of industry.

The second important channel through which sectoral growth, more specifically agricultural growth, affects structural change is the hypothesis that a high agricultural growth and productivity is conducive to industrialization. 18th-century England was well placed for industrialization because of its high agricultural productivity as societies with a high agricultural productivity can afford to shift part of their labor force to industrial activities (Matsuyama, 1992). A critical mass of labour and output then generate externalities that further help the industrial sector grow at a rapid pace. Thus, higher the agricultural growth rate the better. Clearly, when compared to India, China did much better in agriculture, whichever period one considers. This might be another reason behind slow structural change in India.

4.2 Sectoral Growth Imbalance and Structural Change: Inter-linkage

The link between structural change and growth are typically explored through VAR models (Cortuk and Singh, 2011; Dietrich, 2012) where the causality between a structural change index (which captures structural change measured typically by the NAV) and GDP-growth is studied. Our discussion in the previous section suggests that sectoral growth imbalance might be another variable that can drive structural change.

Consider a two-sector economy comprising agriculture and non-agriculture (say industry). Then the GDP is given by,

(7) $Y = A + pI$, where 'p' is the relative price of industrial goods

Denote the proportional growth rate of GDP as 'g', agri-sector as 'α', industrial sector as 'β', relative price as 'θ', and share of agricultural sector in GDP as 'μ' [= A/(A+pI)]. Treat 'α' and 'β' as the average growth rates for the entire period (for instance α = 2.67, β = 5.89 for India – see Table 1).

Time differentiation of (1) gives,

(8) $g = \mu \alpha + (1 - \mu)(\beta + \theta)$

The empirical evidence on 'θ' during growth and structural change is mixed – it may increase, decrease, or there may not be any appreciable change (Cuadrado and Poschke, 2011). So, take θ = 0 for expositional simplicity. Hence,

(9) $g = \mu \alpha + (1 - \mu) \beta$

Though 'α' and 'β' are constants, 'μ' may not be constant, and hence, 'g' is not a constant.

We consider three possibilities: α = β, α > β and α < β.

- **(9a)** If α = β, g = α = β = constant, and μ = constant. A constant 'μ' implies an unchanging share of the agricultural sector and a constant GDP growth rate. The stylised facts of structural change require 'μ' to decrease over time. Since equal sectoral growth rates cannot lead to structural change in output composition, we rule out this possibility.
- **(9b)** If α > β, 'g' is variable but since 'μ' *rises* over time, this case is also ruled out.

- **(9c)** If $\alpha < \beta$, 'g' is variable and 'μ' decreases over time. Clearly this is a possibility.

From (9b) and (9c), *changing* GDP growth rates require *unequal* sectoral growth rates. From (9c), the industrial (non-agri) sector must grow at a higher rate to conform to the stylised facts of structural change. Further, the larger the sectoral growth imbalance, the faster the rise in 'μ', i.e., the faster the structural change. This simple analytical argument shows that sectoral growth imbalance is a potential candidate that should enter to the economic growth-structural change linkage. We measure the sectoral growth imbalance by weighted standard deviation of sectoral growth rates (SD). Since there would be no structural change unless SD is non-zero, we assume that it is SD that affects NAV, which in turn, affects the GDP growth rate. This argument helps us determine the order of variables in the ensuing VAR model.

4.3 A VAR Model

We run a Sims (1980)-type reduced form three-variable Vector Autoregressive (VAR) model with the following three variables, viz., (a) GDP growth rate (Growth), (b) a structural change index (NAV); and (c) weighted standard deviation of sectoral growth rates (SD), of the following form:

$$(10)\quad \boldsymbol{X_t} = \boldsymbol{A_0} + \sum_{\boldsymbol{i=1}}^{\boldsymbol{N}} \boldsymbol{A_i X_{t-i}} + \boldsymbol{e_t}$$

Where, $\boldsymbol{A_i}$'s are coefficient vectors and $\boldsymbol{X_t}$ = (Growth, NAV, SD)' and $\boldsymbol{e_t}$'s are reduced form error terms.

Note that, for the purpose of VAR, NAV is calculated between two successive years. Thus, an increase in the SD may cause GDP growth rate to either increase or decrease. Consider $\beta > \alpha$ in equation (9), which is the case for India and China: the non-agricultural growth rates exceed the agricultural growth rates. Now, the SD increases if $(\beta - \alpha)$ increases. Let us consider that 'β' is same but 'α' increases (decreases) which decreases (increases) the SD, but increases (decreases) the GDP growth rate. On the other hand, an increase (decrease) in 'β' with same 'α' increases (decreases) the SD as well the growth rate. In general, if the proportionate increase in the growth rates of slow-moving sectors are more than that of faster moving sectors, the SD and GDP growth rate will have a negative correlation and vice versa. The strength of correlation depends also on 'μ'. At earlier (latter) stages of structural change, when 'μ' is high (low), the marginal effect of a change in the growth rates of slow-moving (faster moving) sectors on GDP growth rate is larger. Further, by the definition of NAV, an increase in the SD would always increase the NAV.

Since, the regressor-matrix is same for all the equation, OLS will yield consistent estimates. We estimated the VAR equations using three lags (as per Hannan-Quinn information criteria) over the period 1953 – 2010 and focused our attention on variance decomposition patterns from the impulse responses. However, impulse response and variance decompositions are sensitive to the ordering of the variables. The rationale behind the ordering of variables has already been explained earlier.[9] Table 2 presents the

[9] Residual Correlation Matrix for the two VAR innovations are as follows (with subscripts C and I representing China and India respectively):

variance decomposition of growth for India and China, respectively. The variance decompositions show that an innovation to NAV affects growth in India and China differently. While NAV matters more for China, for India, its impact is quite small. This implies that, going by our simple model, India's structural change is driven at the margin by increase in the growth rates of the agricultural sector (which is the slow-moving sector) and China's structural change is driven at the margin by increase in the growth rates of the faster-moving sectors (initially by the industrial and later by the services sector).

5. Why is India's Structural Change Different? Some Conjectures

5.1 Differences in Industrialization Strategy

In hindsight, it seems paradoxical that a key difference between the Chinese and Indian industrialization strategy has been the role of public sector, on the one hand, and capital goods sector, on the other. While the Indian model was dominated by public sector corporations in heavy industries in mid 1950s, China perhaps got the benefit of a late start in later 1970's with the economy moving from "labor intensive light consumer goods across China's rural and urban areas, relying first mainly on imported machinery" to "the rapidly and enormously expanding domestic market for intermediate goods, machinery and transportation", that led to momentum jump in the consumption and production of coal, steel, cement, chemical fibers, machine tools, highways, bridges, tunnels, ships and others (Wen, 2016).

The Indian industrialization strategy that really took its shape since the mid 1950's owes its origin to the Second Five Plan (1956 – 1961). The philosophical foundation of the Second Plan model was provided by Statistician Prasanta Chandra Mahalanobis, who, had developed a simple two-sector model akin to Soviet-type plan model (Mahalanobis, 1955).[10] Under the implicit assumption of India's inability to adopt an export-led growth and presence of a foreign exchange constraint, the basic strategy of the Second Plan model was to give a fillip to the investment goods sector which in turn would generate some sort of self-reliant economic growth. Consequently, several big public sector enterprises were established during the late 1950s and 1960s covering various areas of the economy. In fact, the standard model of Indian industrialization during this period are encoded in various Industrial Policy Resolutions (e.g., those passed in 1956, 1977 and 1980) and the Monopolies and Restrictive Trade Practices Act 1969, which discouraged private sector big business and gave rise to a cobweb of controls that came to be known as "license-permit Raj".[11] The control industrialization regime was

Since correlation between NAV and SD are high for both the countries, we looked for variance decomposition using alternative ordering of (Growth, SD, NAV). While the numbers changed with the alternative ordering, the result that NAV matters more in China than in India is valid even with the alternative specification.

[10] Mahalanobis model was influenced by Soviet economist G. Feldman, whose 1928 paper emphasized "industrialization, heavy industry, machine building, electrification…" as the key to a higher growth trajectory (Feldman, 1928 / 1964).

[11] The Industrial Policy Resolution 1956 classified Indian industries into three sectors, viz., public sector (17 Industries); mixed sector (i.e. public & private) (12 Industries); and private sector with related provisions for public sector, small scale industries, and foreign investment. It was modified through subsequent Industrial Policy

complemented by a restrictive trade and foreign exchange policy as well. By early 1980s, it became apparent that the control regime sacrificed efficiency without necessarily making substantial gains in the equity front.[12] In fact, by the time India started to dismantle its control regime in early 1990's, it was lagging China by nearly a decade. Besides, Indian economy was plagued by several structural constraints, to which we now turn.

In popular narrative, there are two diametrically opposing views about China's industrialization – one views it as a "gigantic government-engineered bubble" and the other sees it a "destiny" (Wen, 2016). Wen (2016) in an interesting analysis has seen China's industrialization since late 1970s in continuation to a number of earlier failed attempts to industrialize and in that sense there are remarkable similarities between the failed attempts of industrialization between China and India.[13] Following major planks of Chinese industrialization strategy are worth noting: focus on the grassroots, bottom-up reforms; promotion of rural industries despite their primitive technologies; encouraging manufactured goods; providing enormous government support for infrastructure; allow private ownership in an otherwise socialist regime; and moving up the industrial ladder in various dimensions (e.g., from light to heavy industries, from labour- to capital-intensive production). The success of the grand strategy of economic opening up in China since the 1980s got reflected in the fact that over the last 100 years, China became the only economy that grew at an average rate of 10 per cent per annum during the 27 year period, 1980 – 2007. With hindsight it is interesting to note that the engines of Chinese growth have been triggered by investment and foreign trade and not consumption (unlike India). Three related developments seemed to have shaped emergence of foreign trade as an engine of growth in China, viz., (a) its entry to the World Trade Organization (WTO) in 2001; (b) its emergence as a preferred hub of global supply chains and advent of a "made in China" model all across the world; and (c) establishment of number of different types of successful special economic zones along the coastal regions.

5.2 Structural Constraints in Indian Industrialization

After lagging China in terms of industrialization by ten years, India's liberalization program started in early 1990s. Why did India fail to industrialize even after nearly thirty years? A catchall explanation of this phenomenon can be sought in relative roles of structural constraints in both the economies.

Resolutions of 1973, 1977 and 1980. These were accompanied with a draconian foreign exchange regime (under the Foreign Exchange Regulation Act 1973)

[12] This is best reflected in the writings of Jagdish Bhagwati, a critique of the Indian public-sector led industrialization strategy, who said: "Indian planning has been described as "bureaucratic socialism" and some of us called the "socialist pattern of society" - the asserted objective of the planners - as "socialist patter". The ethos was simply interventionist. …. no one realized at the time that our advocacy of licensing and controls to guide resource allocation would degenerate into excessive knee-jerk interventions. Our ideas therefore led to institutions (such as the Licensing Committee at the Ministry of Commerce…..); and in turn, those institutions led to interests (i.e., lobbies)" (Bhagwati, 2006).

[13] These are: (i) 1861 and 1911 when nearly a decade earlier than Meiji restoration in Japan, the Qing monarchy initiated a series of programs to modernize its agrarian economy; (ii) the Xinhai Revolution (after 1911) that emphasized science and technology; and (iii) post-1949 attempt of the communist regime to attempt a Soviet style industrialization strategy (Wen, 2016).

A standard way to look at structural constraints in these economies can be traced to World Bank's Doing Business Indicators (DBI) (https://www.doingbusiness.org/).[14] Table 3 below reports the available data on DBI scores (and not rankings) over two time points 2014 and 2019. A look at the data confirms that in terms of the aggregate score, China is significantly above India. The superior performance of China is also reflected in many of the sub-components of DBI even if we take care of change in methodology in compilation of DBI. There has, however, been significant improvements in some of the indicators for India in recent years. Illustratively, as per recent data, it is easier to get a construction permit in India vis-à-vis China; same is true for getting credit, getting electricity and protecting minority investors as well.

Apart from DBI, China's performance turns out to be much better in terms of several other indicators like World Bank's logistic performance index (LPI), World Economic Forum's global competitiveness index (GCI), as well as Harvard University's economic complexity index (ECI) (Table 4).

How then could India be successful in services and not in manufacturing? The need for physical infrastructure is much less for services vis-à-vis industries. Besides, services like information technology or financial services had a boost with the advent of hyper-globalization in the new millennium. Illustratively, the case of special economic zone (SEZ) may make the issue structural constraints impeding manufacturing in India in context.

Conceptually, a SEZ has a few specific features: (a) a geographically delimited area; (b) a single management or administration; (c) benefits based on physical location within the zone; and (d) having a separate customs area and streamlined procedures (Zeng, 2011). It is well known that a key element of Chinese export-led industrialization strategy has emanated from various special economic zones (SEZ) spread over the coastal provinces. Over the years, various types of SEZs have emerged across China, viz., Economic and Technological Development Zones (ETDZs); High and New Technology Industrial Development Zones; Export-oriented Manufacturing Zones; Bonded Areas; Cross Border Economic Cooperation Zones (CBEZs); Tourism and Leisure Zones and others.[15] The SEZs have made significant contribution in Chinese manufacturing growth in terms of testing the market economy and new institutions in China and bringing newer technological change and modern management practices (Zeng, 2011). In contrast, while the first Indian SEZ had come up as early as in the mid-1960s, the Kandla port SEZ (in Western province of Gujarat), by and large SEZs in India are identified with tax and foreign exchange control relaxations. Moreover, in later years, the SEZs became a machinery for land grabbing in an otherwise land scarce economy and the implementation of the new Special Economic Zones (SEZs) Act 2005 became a victim of bureaucratic turf war (Sampat, 2017).

[14] Despite various limitations, over the years, DBI has emerged as a key metric for assessing structural constraints of an economy; see, however, McCormack (2018) for a critique on DBI. Additionally, since there have been methodological changes in compiling DBI, comparing DBI across time has to be done with care.

[15] As at the end of 2015, China had five SEZs, 131 national-level ETDZs, 105 national-level High and New Technology Industrial Development Zones, 15 national-level Bonded Areas, 14 national-level CBEZs, 15 national-level Export-oriented Manufacturing Zones, and 29 other types of national-level zones.

5.3 Political economy of growth

Comparing the political economy of a democratic India with an authoritarian China is a daunting task. Issues of political economy are also much broader and to a great extent are beyond the scope of the present paper. Nevertheless, certain aspects of political economy had important bearing on the structure of the economy.

First, compared with a federal democratic India with multiple political parties (often with differing ideologies at the central and provincial levels) and linguistic states, China was much more centralized.[16]

Second, at the time of initiating liberalization program (i.e., early 1980's for China and early 1990's for India) there was a major difference in the structure of the two countries, *viz*., the state of agriculture was much better in China with adequate land reforms and less variation in the land tenancy legislations (Desai, 2005).

Third, it is important to note that China began its economic reforms when international relations were dominated by the Cold War and China (with a better administration and centralized party) was able to strike a better bargain in favour of their domestic businesses in the western markets, while by the time India started opening up, it faced increasingly competitive environment (Siddiqui, 2019).

Finally, there is a complicated question of corruption affecting industrialization in the two countries. While as per the corruption perception index of Transparency international India and China had followed similar downward patterns, arguments exist in either side. Bardhan (2014) noted succinctly:

> "There are some reasons why incentives for corruption may be somewhat less in China: the punishment is severe (in many cases, execution); Chinese politicians, unlike their Indian counterparts, do not have to procure funds for the increasingly expensive general elections; …. so the Chinese local official, even while stealing, may take care not to steal too much. On the other hand, democratic India has more institutionalized mechanisms for checking corruption (the Right to Information Act, free media and a more vigorous tradition of investigative journalism, an active NGO movement as watchdog, etc.). In fact the connection between business and politics being tighter and less subject to public scrutiny in China, 'crony capitalism' is much more evident there. In India in the allocation of scarce public resources (land, mining rights, telecommunication spectrum, etc.) there have been many accusations of official corruption".

Thus, from pure political-economy consideration, the centralized administrative structure and relatively speaking a non-democratic structure could have been helpful for China to bring about its manufacturing growth faster.

6. Conclusions

While it may be difficult to summarize the stylized facts of structural transformation of two Asian giants, two broad trends do emerge.

[16] Interestingly, in commenting on China, Deng (2000) noted, "Most of China had a nationwide market, a single government (which was active in maintaining food supply, famine relief, and price control), a standardized written language, a uniform calendar and system of weights and measures, a dominant Confucian code of conduct, a nationwide transport network, and the mechanisms for social mobility and inter-regional migration" (p. 6).

First, high growth rate in India post-liberalization did not translate into a rapid structural transformation, as it did for China after the reforms in 1978. This is about the overall pace of structural change – moving rapidly from agriculture-based economy to an industrial one and then a service economy. The pace of structural change has been much slower in India than in China. Second, in retrospect it seems that unlike China, India had skipped industrialization and had gone into services from agriculture.

While the second point has received some attention in the literature, the first one seemed to have been somewhat neglected. We argue that both these facts are intertwined and to understand the non-standard path of India's structural change, one cannot focus only on the inability of the industrial sector to pick up.

We explore several hypotheses towards explaining the non-standard path of India's structural transformation. Illustratively, it can be traced to sectoral growth and inter-sectoral terms-of-trade dynamics. While rapid growth in agricultural sector and consequent increases in the agricultural terms-of-trade in China has helped rapid transformation of the economy, these two factors behave completely differently in India.

Though a late starter in liberalization, India could not industrialize successfully even after 30 years. Instead, liberalization mostly helped the services sector to take off. Such a kind of services-driven growth could have failed to generate enough jobs for unskilled and semi-skilled labor. While Chinese growth has been sustained by investments and foreign trade, culminating into what is now known as "made in China", India's growth has been mostly driven by domestic consumption, where growth of a middle class out of the services sector could have played a significant role in creating a pool of consumers.

Why has India failed to industrialize? Presence of "structural constraints" could have impeded India's growth. Notwithstanding some recent improvements, India has been consistently lagging behind China in terms of World Bank's Doing Business Indicators. Other indicators, like World Bank's logistic performance index, World Economic Forum's global competitiveness index, and Harvard University's economic complexity index, also tell us similar story. Further, India could not have reaped the benefit out of Special Economic Zones like China. Finally, in terms of political economic structure, the heterogeneity and decentralization Indian economic decision making could have acted yet another impediment in India's path of industrialization.[17]

Structural transformation is often context-specific. Despite the standard paths dictated by historical experience of Western capitalist development, there can be aberrations. Our illustration of structural transformation in two Asian giants is perhaps indicative of such specific irregularity.

[17] Interestingly, in comparison with the then USSR, China was far decentralized.

References

Acemoglu, D. (2009). *Introduction to Modern Economic Growth*, New Jersey: Princeton University Press.

Acemoglu, D., & Veronica, G. (2008). Capital Deepening and Nonbalanced Economic Growth. *Journal of Political Economy*, 116 (3), 467-497. doi: 10.1086/589523

Bardhan, P. (2014). 'China and India: The pattern of recent growth and governance in a comparative political economy perspective, in Shenggen Fan, Ravi Kanbur, Shang-Jin Wei, and Xiaobo Zhang (eds.): *The Oxford Companion to the Economics of China*, Oxford Scholarship Online, Retrieved from https://www.oxfordscholarship.com/view/10.1093/acprof:oso/9780199678204.001.0001/acprof-9780199678204-chapter-6

Basu, K. (2009). China and India: Idiosyncratic Paths to High Growth. *Economic and Political Weekly*, 44 (38), 43-56.

Baumol, W. J. (1967). Macroeconomics of Unbalanced Growth: The Anatomy of Urban Crisis. *American Economic Review*, 57 (3), 415–426.

Bhagwati, J. (2006). A Conversation with Jagdish Bhagwati on Indian Politics, Globalization, Socialism, Entrepreneurship, and African Aid' by H. D. Vinod, *Indian Journal of Economics and Business*, Economics Department, Fordham University, New York. retrieved from https://pdfs.semanticscholar.org/885e/d31caccc633899757cd62cc3c02f23dcccef.pdf?_ga=2.258724681.2119481705.1596603341-1350446089.1592447015

Binswanger-Mkhize, H. P. (2013). The Stunted Structural Transformation of the Indian Economy. *Economic and Political Weekly*, 48 (26 & 27), 5–13.

Bosworth, B., and Collins, S. M. (2008). Accounting for Growth: Comparing China and India. *Journal of Economic Perspectives*, 22 (1), 45–66.

Alvarez-Cuadrado, F., & Poschke, M. (2011). Structural change out of agriculture: labor push versus labor pull. *American Economic Journal: Macroeconomics*, 3, 127–158.

Deng, K. G. (2000). A Critical Survey of Recent Research in Chinese Economic History. *Economic History Review*, 53(1).

Desai, M. (2005). India and China: An Essay in Comparative Political Economy, in Tseng W., and Cowen D. (eds.) (2005). *India's and China's Recent Experience with Reform and Growth*, London: Palgrave Macmillan.

Dietrich, A. (2012). Does growth cause structural change, or is it the other way round? A dynamic panel data analysis for seven OECD countries. *Empirical Economics*, 43, 915-944. doi: 10.1007/s00181-011-0510-z

Feldman, G. (1928). On the Theory of Growth Rates of National Income, in Spulber, N (1964) (ed.): *Foundations of Soviet Strategy for Economic Growth*, Bloomington, Indiana: University of Indiana Press.

Foellmi, R. & Zweimuller, J. (2008). Structural change, Engel's consumption cycles and Kaldor's facts of economic growth. *Journal of Monetary Economics*, 55 (7), 1317-1328. doi: 10.1016/j.jmoneco.2008.09.001

Gaaitzen J., Erumban, A., Timmer, M., Voskoboynikov, I, and Wua, H. (2012). *Journal of Comparative Economics*, 40 (2), 211–227.

Herrendorf, B., Rogerson, R., & Valentinyi, A. (2014). Growth and Structural Transformation, in Aghion, P. & Durlauf, P. (eds.), *Handbook of Economic Growth*, Vol 2, Oxford, North Holland, Elsevier.

Kamhon, K., and Wang, Y. (2013). Comparing China and India: A factor accumulation perspective. *Journal of Comparative Economics*, 41, 879–894.

Kochhar, K., Kumar, U., Rajan, R., Subramanian, S., & Tokatlidis, I. (2006). India's Pattern of Development: What Happened, What Follows?. Journal of Monetary Economics, 53 (5), 981-doi: 1019. 10.1016/j.jmoneco.2006.05.007

Kongsamut, P., Sergio, R. & Danyang X. (2001). Beyond Balanced Growth. *Review of Economic Studies*, 68 (4), 869-882. doi: 10.1111/1467-937X.00193

Kuznets, S. (1973). Modern Economic Growth: Findings and Reflections. *American Economic Review*, 63 (3), 247-58.

Lamba, R., & Subramanian, A. (2020). Dynamism with Incommensurate Development: The Distinctive Indian Model. *Journal of Economic Perspectives*, 34 (1), 3–30.

Lewis, W. A. (1954). Economic development with unlimited supplies of labour. *The Manchester School,* 22 (2), 139-191.

Maddison, A. (1980). Economic Growth and Structural Change in Advanced Countries, in I. Levenson & J. Wheeler (eds.), *Western Economies in Transition: Structural Change and Adjustment Policies in Industrial Countries*, Westview Press, Boulder, CO, 41–60.

Mahalanobis, P. C. (1955). The approach of operational research to planning in India. *Sankhyā,* 16, 1–2, 3–62.

McCormack, G. (2018). Why 'Doing Business' with the World Bank May Be Bad for You. *European Business Organization Law Review*, 19, 649–676. doi: 10.1007/s40804-018-0116-4

Mouelhi, R. B. A., & Ghazali, M. (2021). Structural transformation in Egypt, Morocco and Tunisia: Patterns, drivers and constraints. *Economics of Transition and Institutional Change*, 29 (1), 35-61. DOI: 10.1111/ecot.12258

Ngai, L. R. & Christopher, A. P. (2007). Structural Change in a Multisector Model of Growth. *The American Economic Review*, 97 (1), 429-443. doi: 10.1257/aer.97.1.429

Panagariya, A. (2007). Why India Lags Behind China and How It Can Bridge the Gap. *The World Economy*, 30 (2), 229-237. doi: 10.1111/j.1467-9701.2007.00880.x

Sampat, P. (2017). Infrastructures of Growth, Corridors of Power: The Making of the SEZ Act 2005, in R. Nagaraj & Sripad Motiram (eds.): *Political economy of contemporary India*, Cambridge University Press, New York.

Schiffbauer, M., and Shen, L. (2010). Democracy vs. dictatorship: Comparing the evolution of economic growth under two political regimes. *Economics of Transition*, 18(1), 59–90.

Siddiqui, K. (2019). Economic Transformation of China and India: A Comparative Political Economy Perspective. *Asian Profile*, 47, 3, 43-59. doi: 10.1080/08911916.2015.1095050

Timmer, M. P., de Vries, G. J., & de Vries, K. (2015). Patterns of Structural Change in Developing Countries, In J. Weiss, & M. Tribe (eds.), *Routledge Handbook of Industry and Development*. Routledge, 65-83.

Wallack, S. J. (2003). Structural Breaks in Indian Macroeconomic Data. *Economic & Political Weekly*, 38 (41), 4312-15.

Wen, Y. (2016). China's Rapid Rise: From Backward Agrarian Society to Industrial Powerhouse in Just 35 Years. Federal Reserve Bank of St Louis, *Regional Economists*. Retrieved from https://www.stlouisfed.org/publications/regional-economist/april-2016/chinas-rapid-rise-from-backward-agrarian-society-to-industrial-powerhouse-in-just-35-years

Zeng, D. Z. (2011). How Do Special Economic Zones and Industrial Clusters Drive China's Rapid Development?. World Bank Policy Research Working Paper No. 5583. Retrieved from http://documents.worldbank.org/curated/en/310891468018256346/How-do-special-economic-zones-and-industrial-clusters-drive-Chinas-rapid-development

Zhang, Y. L. B. (2008). Development Path of China and India and the Challenges for their Sustainable Growth. *The World Economy*, 31 (10), 1277-1291. doi: https://doi.org/10.1111/j.1467-9701.2008.01128.x

Table 1: Relative Sectoral Growths 1952-2010 (average, %)

	India					*China*		
		Break 1980		*Break 1991*		*Break 1978*		
	Whole	*till 1979*	*1980-2010*	*till 1991*	*1992-2010*	*Whole*	*till 1978*	*1979-2010*
Agriculture	2.67	1.88	3.35	2.43	3.16	3.59	2.53	4.45
Industry	5.89	5.30	6.41	5.61	6.46	13.31	16.15	11.00
Services	6.13	4.93	7.18	5.23	7.99	9.12	7.31	10.59
GDP Growth Rates	4.87	3.55	6.03	4.06	6.54	7.37	4.98	9.31
Source: 10-sector GGDC database and authors' calculations								

Table 2: Variance Decomposition of Growth in India vis-à-vis China in a Three Variable VAR

Year	*India*			*China*		
	GROWTH	*NAV*	*SD*	*GROWTH*	*NAV*	*SD*
1	100.00	0.00	0.00	100.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
2	82.46	3.37	14.17	84.44	14.57	0.99
	(9.20)	(5.24)	(8.15)	(8.22)	(8.09)	(2.70)
3	80.99	4.29	14.72	72.27	26.17	1.57
	(9.70)	(5.90)	(8.50)	(11.07)	(11.12)	(3.75)
4	74.54	6.34	19.12	62.94	25.79	11.27
	(10.43)	(6.72)	(9.56)	(11.44)	(11.14)	(7.64)
5	73.18	6.69	20.13	56.61	23.23	20.16
	(10.62)	(7.04)	(9.56)	(11.64)	(9.90)	(9.61)
6	73.18	6.73	20.10	54.27	24.52	21.21
	(10.82)	(7.16)	(9.69)	(11.92)	(9.91)	(9.98)
7	71.43	6.64	21.93	53.84	24.60	21.56
	(11.28)	(7.16)	(10.16)	(12.06)	(10.06)	(10.25)
8	71.39	6.64	21.98	53.87	24.59	21.54
	(11.45)	(7.23)	(10.33)	(12.13)	(10.03)	(10.38)
9	71.18	6.62	22.20	53.76	24.98	21.26
	(11.68)	(7.30)	(10.57)	(12.21)	(10.06)	(10.35)
10	70.89	6.63	22.48	53.12	25.94	20.94
	(11.93)	(7.37)	(10.85)	(12.35)	(10.25)	(10.46)

Notes:
(1) Estimation period: 1953 – 2010.
(2) Figures within brackets are Monte-Carlo Standard errors from 10,000 replications.
Source: Authors' calculations

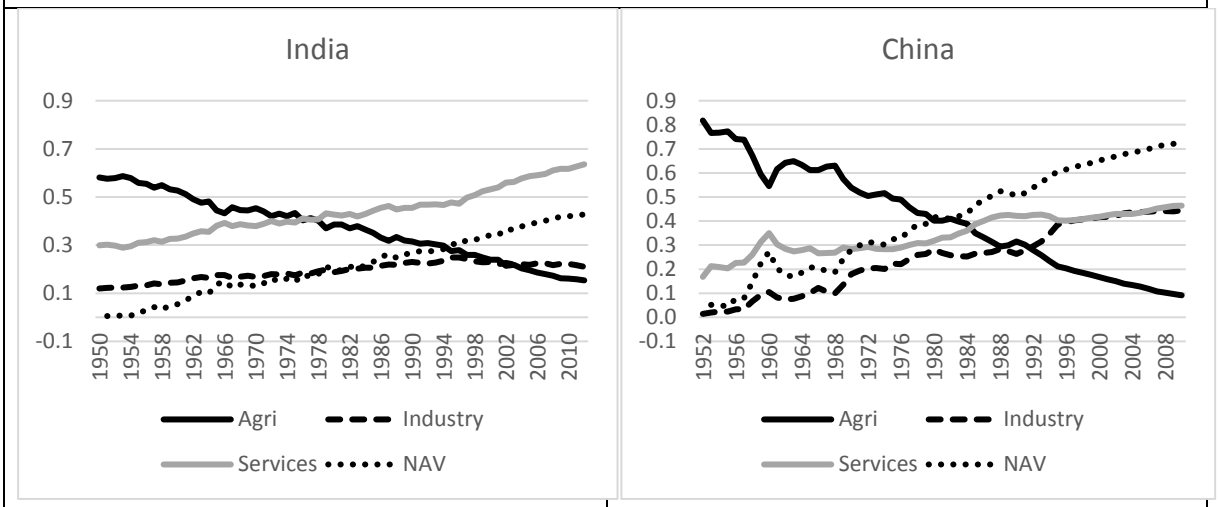
Table 3: World Bank's Doing Business Indicator - Scores: China and India

	2014		*2019*	
Economy	*China*	*India*	*China*	*India*
1. Ease of doing business score (DB17-20 methodology)			74.0	67.5
2. Ease of doing business score (DB15 methodology)	60.0	51.9		
3. Ease of doing business score (DB10-14 methodology)	61.0	52.5		
4. Starting a business	72.2	59.1	93.4	81.0
5a. Dealing with construction permits (DB16-20 methodology)			65.2	72.1
5b. Dealing with construction permits (DB06-15 methodology)	*29.9*	*22.4*		
6a. Getting electricity (DB16-20 methodology)			92.0	89.2
6b. Getting electricity (DB10-15 methodology)	*66.2*	*68.2*		
7a. Registering property (DB17-20 methodology)			80.8	47.9
7b. Registering property (DB05-15 methodology)	*74.4*	*54.0*		
8a. Getting credit (DB15-20 methodology)	50.0	65.0	60.0	80.0
8b. Getting credit (DB05-14 methodology)	*62.5*	*81.3*		
9a. Protecting minority investors (DB15-20 methodology)	52.0	70.0	62.0	80.0
9b. Protecting minority investors (DB06-14 methodology)	*50.0*	*60.0*		
10a. Paying taxes (DB17-20 methodology)			67.9	65.4
10b. Paying taxes (DB06-16 methodology)	*60.9*	*53.8*		
11a. Enforcing contracts (DB17-20 methodology)			79.0	41.2
11b. Enforcing contracts (DB04-15 methodology)	*67.0*	*29.0*		
12. Resolving insolvency	55.3	32.4	55.8	40.8
Source: World Bank				

Table 4: Rankings of China versus India as per select Indices

	China	*India*
1. World Bank's Ease of Doing Business Index (DBI): 2020	31	63
2. World Bank's Logistic Performance Index (LPI): 2018	27	42
3. World Economic Forum's Global Competitiveness Index (GCI): 2019	28	68
4. Harvard University's Economic Complexity Index (ECI): 2019	19	45

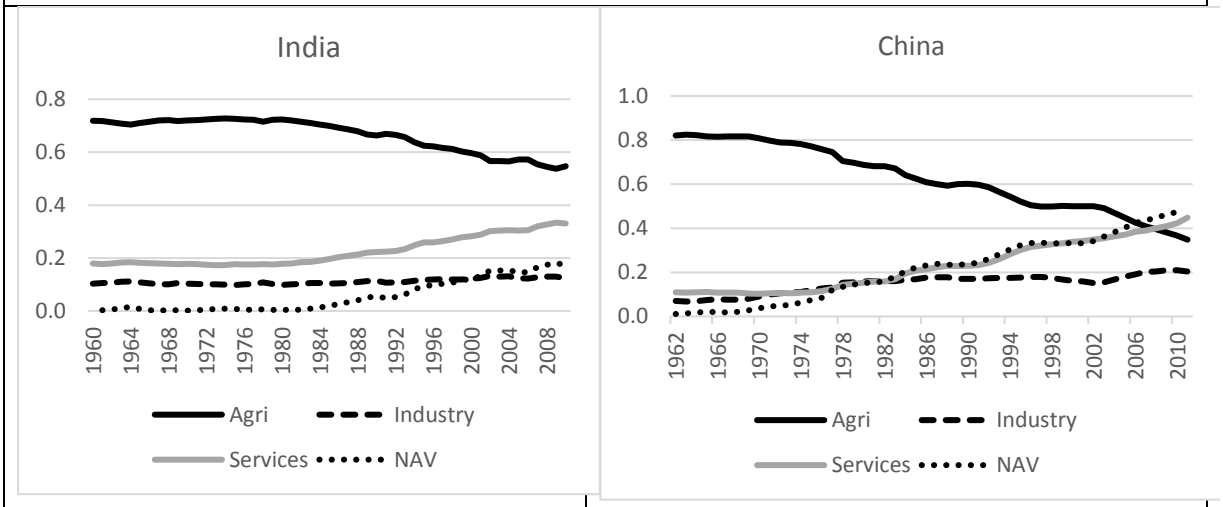
Figure 1: Trends in VA Shares



Note: 1959-61 is the Great Chinese Famine years

Source: GGDC 10-sector database and authors' calculations.

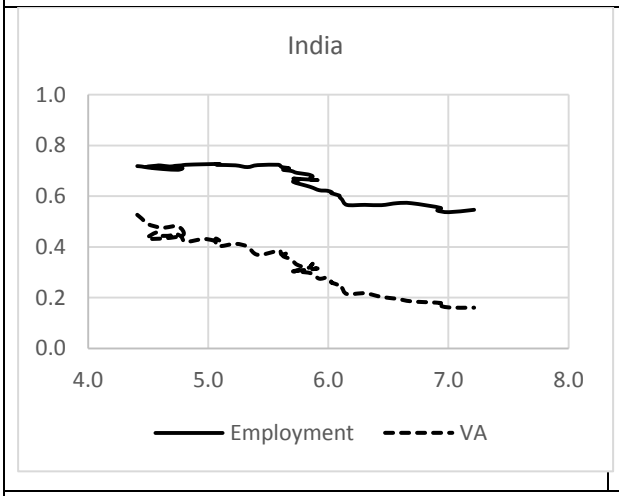
Figure 2: Trends in Employment Shares

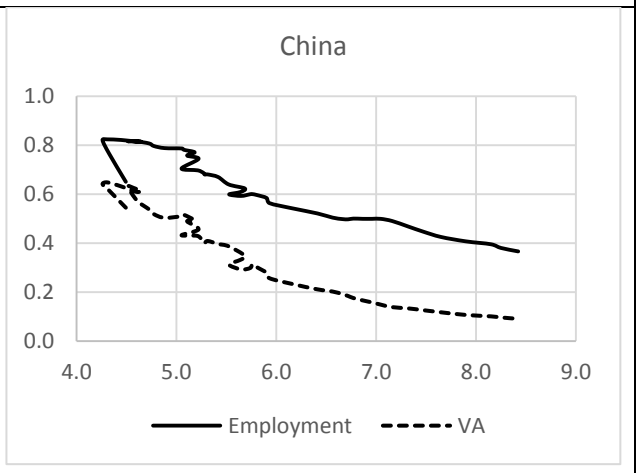


Source: GGDC 10-sector database and authors' calculations

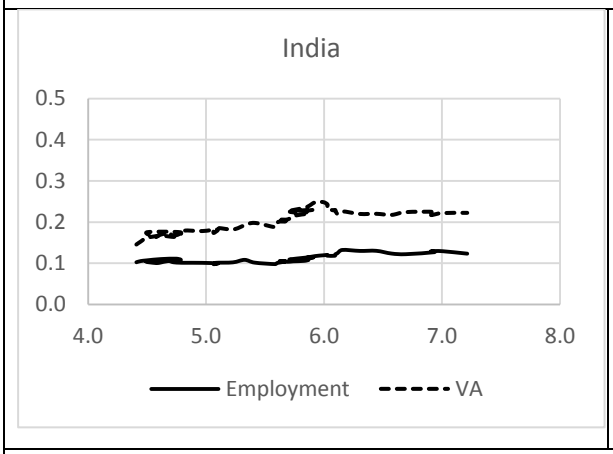
Figure 3: Employment and VA Shares (against Log of GDP per capita, 1990 international $)

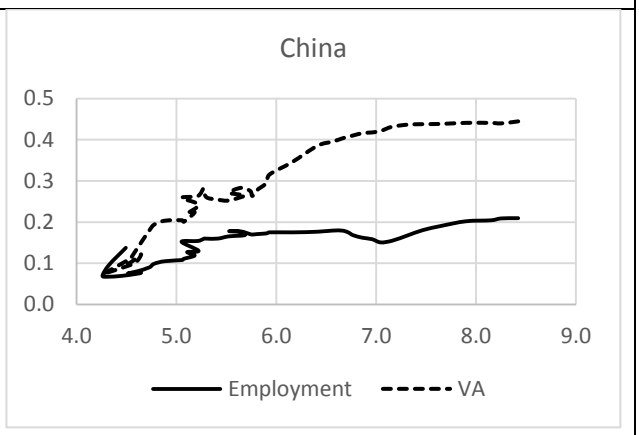
3a. Agriculture



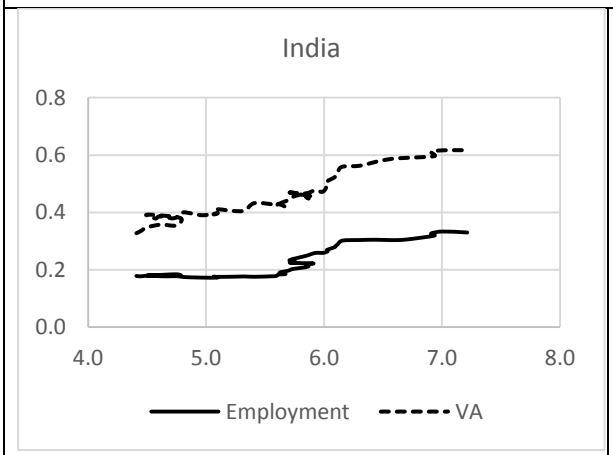


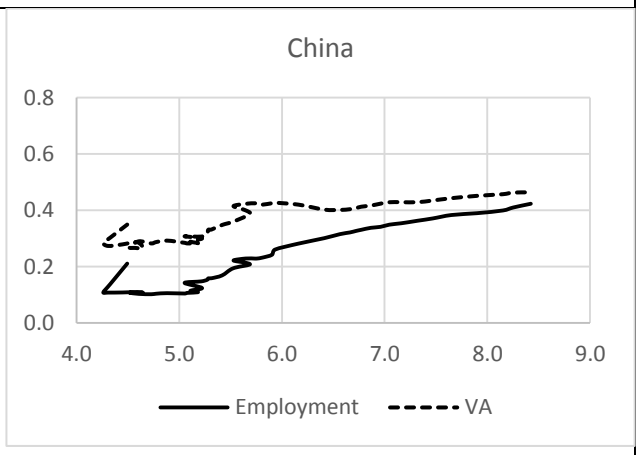
3b. Industry





3c. Services





Source: 10-sector GGDC database and authors' calculations