

RETESTING THE DUAL SECTOR MODEL IN INDIA AND BRAZIL

Ms. JIADE XIAO,

Graduate Student, Korbel School of International Studies

2201 South Gaylord Street, *University of Denver.*

Denver, CO 80208.

Email: Jiade.Xiao@du.edu.

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ABSTRACT

Indian and Brazil are developing countries and emerging markets, enjoying economic development in the recent decades. The development experience of both countries may provide persuasive evidences in supporting or disapproving the economic theories. Arthur Lewis' structural-change theory focuses on the transition of economic structure with the character from depending heavily on agricultural sector to the character with more contribution from industrial sector occurring in the developing countries. His model of dual sector, as an important part of the structural-change theory, argues that the labor moving from agricultural sector to industrial sector associated with the migration from rural area to urban area contributes to the economic development as well as the alleviation of overpopulation in agricultural sector and the stagnation of marginal product resulted from the population growth and technology advancement in the developing countries. This paper explores the adaptability of the assumptions and the arguments of the Arthur Lewis' Model in India and Brazil in the structural change between the agricultural and industry sectors. There is quite some evidence supports the argument of dual sector model, though the model is not fully explanatory on the economic development of the two developing countries.

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Introduction

Arthur Lewis' Model was considered as one of the most popular and most explainable model for the development of the developing countries in 1960s and 1970s (Todaro, 2000), which still has legacies for the research of economic development of developing countries today. This paper will explore the explanatory power of the Arthur Lewis' Structural Adjustment Model based on the case study of Brazil and India. India and Brazil are two typical developing countries experiencing economic development in the recent decades. Despite the similarities shared by the two countries in colonial history, in the memberships of BRICS, there are a lot of differences between the two countries on culture, regime types in modern history, economic and welfare policies, population density and etc. These differences increase the credibility of the evidence for the test on the dual sector model on the two countries. The paper includes three sections besides the introduction. In the first section, the paper reviews the Arthur Lewis model of dual sector with its assumption, its main argument and its limitations. In the second section, the paper provides empirical evidences of India and Brazil supporting or opposing the dual sector model, and discusses the adaptability as well as limitations of the model in the two countries. In the last section, the paper draws conclusion with the discussion of possible implementation of the analysis.

Arthur Lewis' Dual Sector Model

Arthur Lewis' Dual Sector Model is the most well-known section of his Structural Adjustment Model. This model is firstly published in "Economic development with unlimited supplies of labor" by *The manchester school* in 1954. The model is inspired but not limited to neo-classical economic theory. This model focuses more on a closed economy with merely focus on closed domestic economy with very limited interest in trade, also this model

creatively put surplus labor as the main source of capital creation and economic development, which provides possible approach for the developing countries to adopt.

Assumptions of Arthur Lewis' Dual Sector Model

First, Arthur Lewis defines two sectors in economic structure, including the primary as the subsistence or agricultural sector and the secondary sector as capitalist or industrial sector, and he assumes that there are only these two sectors in an economy.

Second, Arthur Lewis assumes that there would be unlimited supply of labor in the economics with particularly large population compared to capital and natural resources, where the marginal productivity of labor is negligible, zero, or even negative in many sectors (1954). This idea was originally adopted from the classics that “the classics, from Smith to Marx, all assumed, or argued, that an unlimited supply of labor was available at subsistence wages” (Lewis, 1954). He argues that the surplus of labor is common in the developing countries, and particularly common among the Asian countries. The unlimited supply of labor contributes to the possibility of creating capital without the input of more scarce land or capital. This provides a new approach of accumulating capital beyond the neo-classical model. This also makes Lewis' model particularly beneficial for the developing countries, as surplus of labor is very common among the developing countries and other resources, such as land and (particularly) capital, are usually comparatively scarce in these economies.

Main Argument of the Model

Arthur Lewis argues that as more population surplus occurs in the agricultural sector, the agricultural sector marginal product (MP) of labor become close to zero. This means despite the increasing labor put in agricultural sector, the overall output of the sector tends to increase less and less before remaining almost same in the end. This suggests that the living

As shown in Figure A (b), the total product $TPA(KA)$ becomes a constant as the amount of labor reaches LA and becomes surplus. At this point, the average wage of the labors in agricultural sector is $WA = TPA/LA$. Given surplus labor in the agricultural sector and the amount labor reaches LB , the average wage of the labors in agricultural sector at this point becomes $WB = TPA/LB$. As $LA < LB$, $WA > WB$. This shows that with surplus labor in the agricultural sector, the average wage of the labors in the sector will decrease.

As shown in Figure A(a), the total product of industrial sector $TP_M(K_{M1})$ can always continue to increase as the total amount of labor increases. As the increase of labor in the industrial sector, the average wage of industrial sector will decrease as it is in agricultural sector as well with the same reinvestment compared to last time-period. However, as argued by Lewis, “there is really only one class that is pretty certain to reinvest its profits productively, and that is the class of industrialists” (1954). Ideally, the capitalists will reinvest the profit gained from last time-period in order to pursue profit-maximizing and thus the total input capital in the sector will increase, and the total product of the industrial sector will shift from $TP_M(K_{M1})$ to $TP_M(K_{M2})$ in the next time-period and then from $TP_M(K_{M2})$ to $TP_M(K_{M3})$ in the following time-period. In this way, the average real wage of the labor in the industrial sector will maintain same without decrease. This process is considered as self-sustaining growth and more labor can be absorbed as time goes by in the industrial sector (Todaro, 2000). During this process, the living standard of people in the society can be increase by more labors with better wage in industrial sector as well as the better wage of the labors in the agricultural sector resulted from less surplus labor.

Limitations of the Model

As mentioned by Todaro (2000), there are also limitations of the model. First, the model assumes naturally high reinvestment rate and efficient job creation that “the rate of labor transfer and employment creation in the modern sector is proportional to the rate of

modern-sector accumulation” (Todaro, 2000). To begin with, the capitalists can adopt Western ways of living or be addicted to Ragnar Nurkse’s “international demonstration effect”, which will increase the consumption and thus decrease the reinvestment. Given a high reinvestment rate in total, there is still possibility of limited reinvestment rate in industry resulted from the increasingly reinvestment rate in financial sector or savings for better profit or lower risks. Given the high reinvestment rate in industrial sector, there is still possibility of non-efficient job creation rate as expected by this model. It is highly possible that the capitalists reinvest in technology innovation or in machines and equipment instead of in recruiting more workers. This is even more possible as the increasing of worker wages and the mature of technology in automation.

Second, the model will be problematic if there is full employment in the urban areas (Todaro, 2000). Given full employment in the urban areas, the industrial sector cannot absorb more labor from agricultural sector even if there are surplus labor there. Unemployment is particularly severe among the developing countries. Third, as argued by Todaro, the assumption that a competitive modern-sector labor market guarantees the continued existence of constant real urban wages up to the point where the supply of rural surplus labor is exhausted is unreal (2000). There are institutions and movements always making efforts in improving the income and welfare of the labors and thus limiting the competitive labor market, and this is why the ideal fully competitive labor market is hardly to be achieved anytime.

Apart from the limitations argued by Todaro, urbanization itself resulted from the structural adjustment may also be problematic. For example, because of the large migration from rural to urban sector and the very limited infrastructure preparation, many developing countries are experiencing slum issues accompanied with significant sanitation and security problems. Also, many over crowded cities has severe traffic jam, which significantly decrease

the efficiency of people's live as well as economic activities. Moreover, urbanization always associated with environmental pollution and degradation, which does serious harm to people's lives as well as economic development.

Empirical Section

In this sector, the paper explores the adaptability of the dual sector model in India and Brazil, in terms of its assumption and argument with discussion of limitations of the model in the two countries. First, the paper elaborates the applicability of the assumption of the models in the two countries.

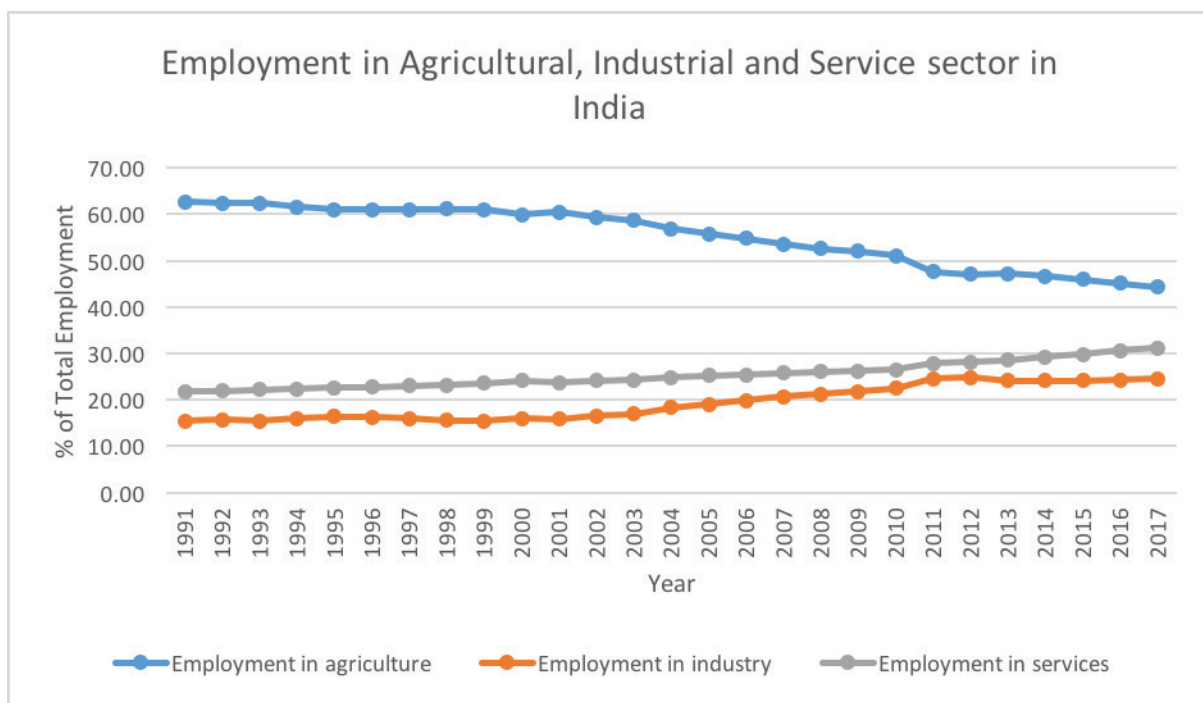
Applicability of the Assumptions

The assumption of two sectors: As shown in Figure 1 and Figure 2, service sector has become an increasingly important sector in India and Brazil in terms of its added value in total GDP apart from the agricultural and industrial sector defined by Arthur Lewis. Particularly for Brazil, we can realize that its service sector has surpassed 50% since 1991 according to Figure 2, and the proportion of this sector measured by added value in total GDP has been continuously increasing since then in general. The proportion of this sector in India measured by added value in total GDP has also increased beyond 50% since 2012. What's more, it has been well-known that Indian people has achieved phenomenal success in software industry, as a symbolic representative of service sector, and the revenue of this industry has been increasingly essential for the country (Athreya, 2005). Therefore, it has been increasingly hard to explain the economic development by focusing merely on the two sectors as assumed in the dual sector model. Nevertheless, it is arguable whether service sector and industrialized agriculture should be included as a part of the capitalist sector instead of the tertiary industry or the primary industry respectively, as Lewis defined the capitalist sector as "that part of the economy which uses reproducible capital and pays capitalists thereof" (1954). This is particularly true for Brazil as industrialized agriculture with large capital, land and technology input while very limited labor

input contributes significantly for its export and total economy.

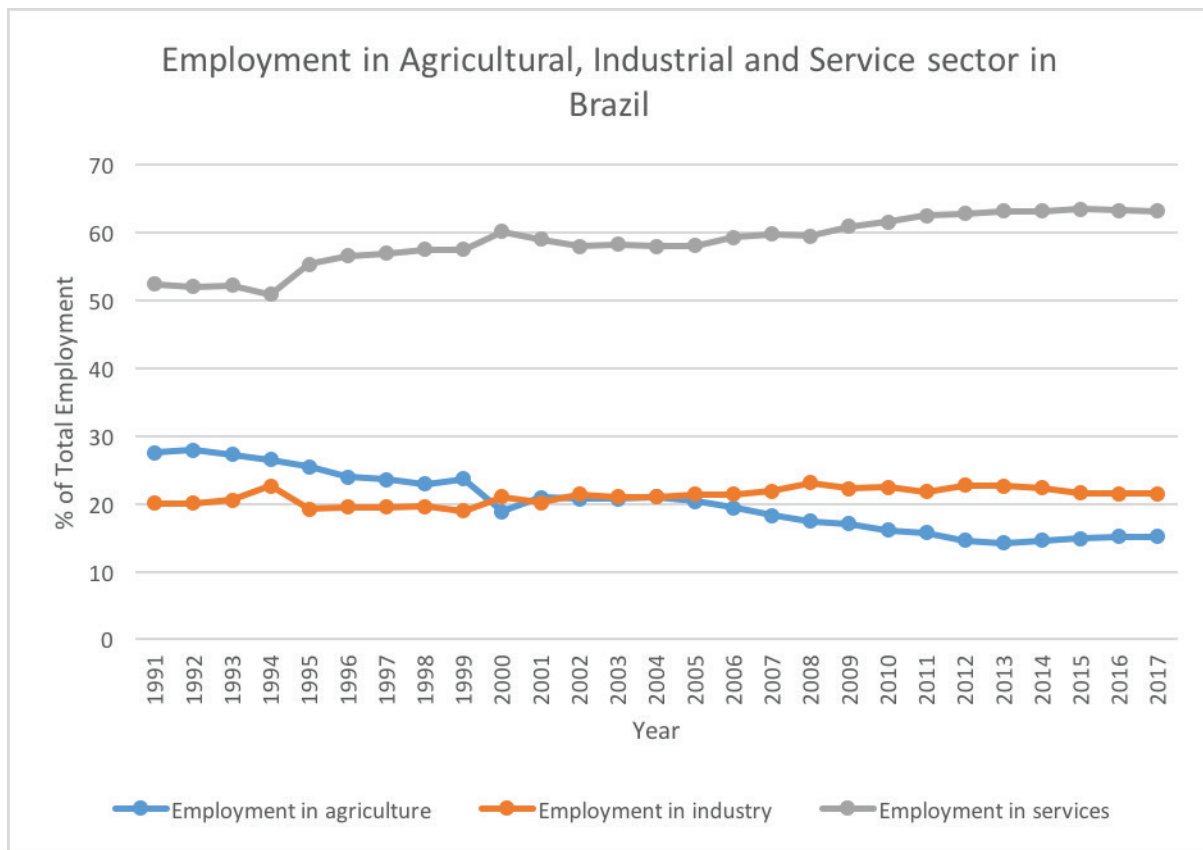
The assumption of unlimited supply of labor: As assumed by the dual sector model, Lewis assumes that there is a large amount of surplus labors in agricultural sectors in developing countries, which can be migrant from agricultural sector to industrial sector. As shown in Figure 1 and Figure 2, the proportion of employment in agricultural sector has indeed experience significantly decrease in India and Brazil since 1960 to 2017, while the proportion of employment in industrial sector has generally increased in India and has somehow increased in Brazil since 1960. This support the assumption of the existence of surplus labor in the agricultural sector in both countries.

Figure 1. Employment in Agricultural, Industrial and Service sector in India (1991-2016)



Source: World Bank Data

Figure 2. Employment in Agricultural, Industrial and Service sector in Brazil (1991-2016)

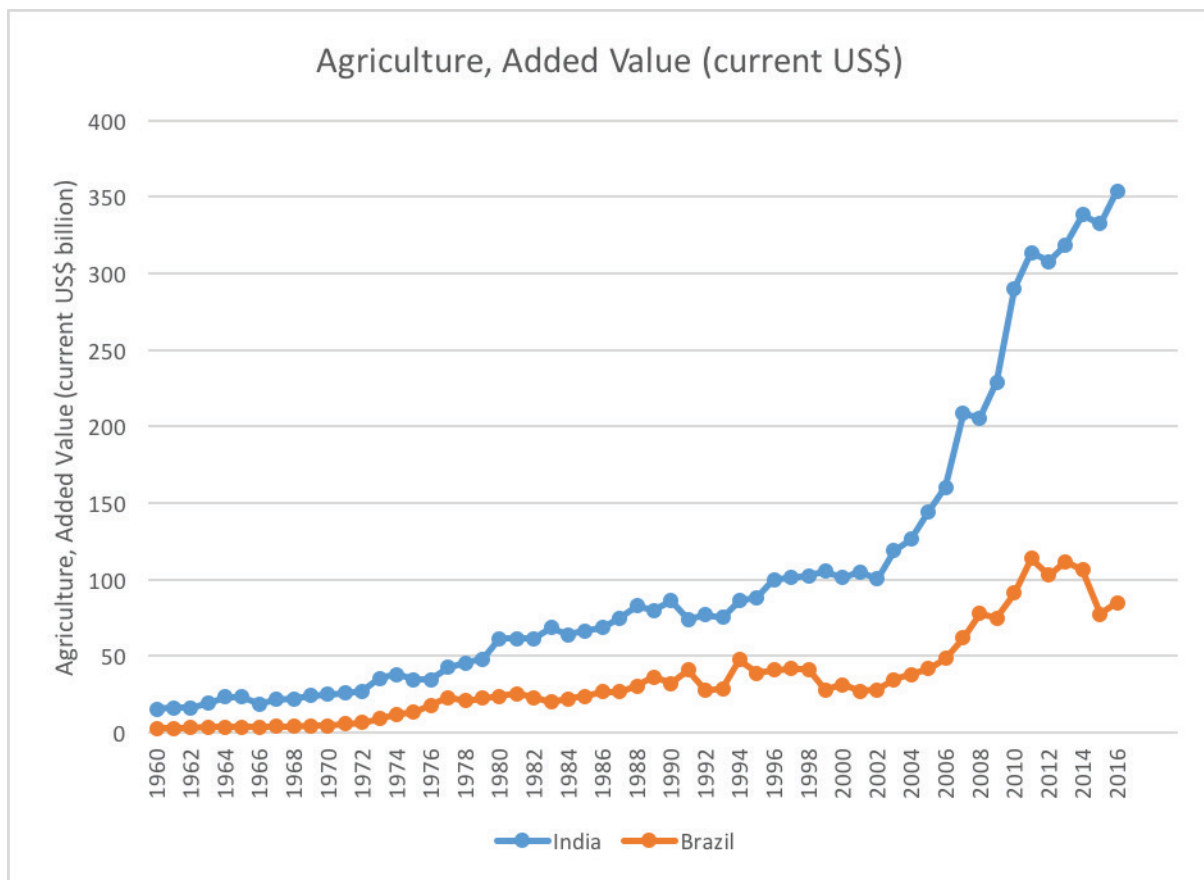


Source: World Bank Data

The dual sector model also assumes a constant output of agricultural sector despite a decreasing of surplus labors in the sector. However, as shown in Figure 3 the added value of agriculture measured by current US\$ has increased continuously since 1960 and significantly since 2002, particularly in India. On one hand, as there isn't any decreasing in the agricultural sector suggested by the data provided by the Figure 3 despite the decreasing proportion of employment in the sector, we can make the argument that the evidence supports the existence of surplus labor in both countries. Then, how can we explain the increasing of the added value of agriculture measured by current US\$ in both countries? First, it is possible that the advancement of technology and the industrialization of agriculture has increased the productivity of agricultural sector in both countries. In both countries, large transnational agricultural company

has played increasingly significant role in agricultural sector. The seeds of genetically modified food, the modernized and efficient machines and equipment have been largely used in agriculture in the two countries. In Brazil, there have been lots of fields and farms focusing on the plantation of a particular crop, such as soybean, merely for export (USDA, 2018). Second, it is possible that there has been inflation of US dollar and the appreciation of the domestic currency of India and Brazil. Brazil currency experienced appreciation resulted from the domestic economic policy before and after economic crisis in 2008 (Barbosa, 2010). Although these two possible phenomenon is not discussed in the Lewis' model, they resulted to even more surplus labor in agricultural sector than Lewis expected at least logically. Thus, the assumption of the model that there are surplus labors in the agricultural sector in both countries is supported.

Figure 3. Agriculture, Added Value (current US\$) in India and Brazil



Source: World Bank Data

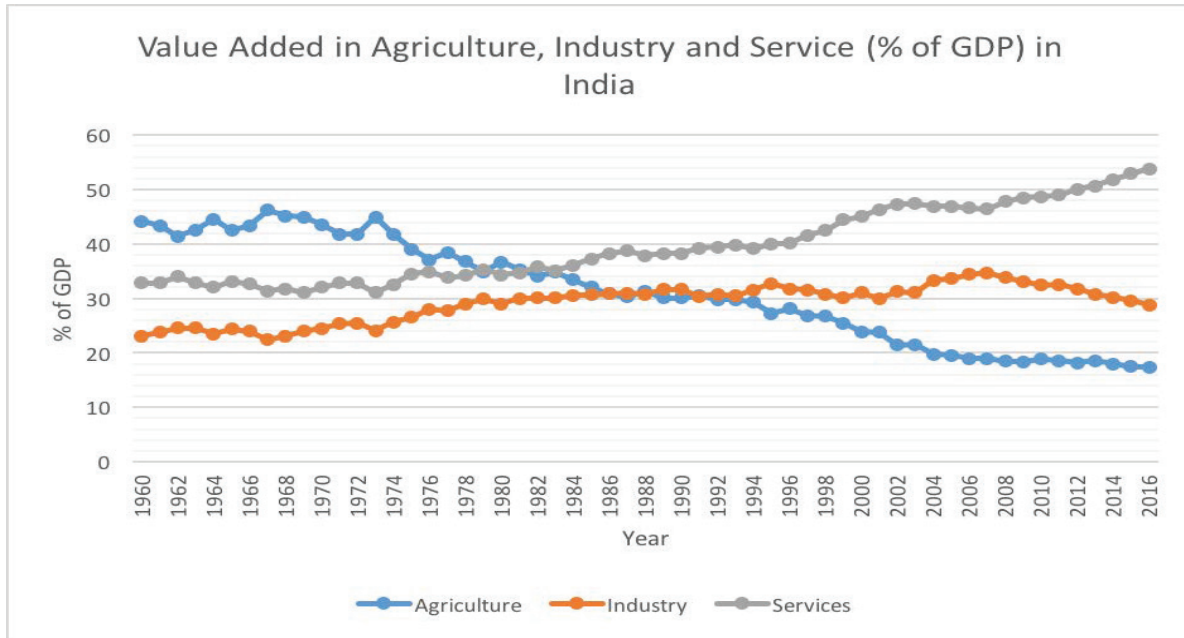
Applicability of the Arguments

Labor force moving from agricultural sector to industrial sector: As is shown in Figure 1 and Figure 2, there have been significantly decreasing of the proportion of employment in the agricultural sectors in India and Brazil, which is exactly expected by the dual sector model. However, there isn't any increasing on the proportion of employment in the industrial sector in any of the two countries as significant as the decreasing in agricultural sector. For India, there has been generally decreasing in the proportion of employment in the agricultural sector as shown in Figure 1, while the decrease is comparatively subtle in Brazil as shown in Figure 2. We may make the argument that Brazil has achieved the structural adjustment before 1991 and there had been large amount of labor force transit from agricultural sector to industrial sector by then, as this is supported by the large proportion of employment in service sector always beyond 50% since 1991. For India, we can realize from Figure 1 that the proportion of employment in agriculture sector has always been the largest among the three sectors despite its continuous decreasing. We may make the argument that the more time is needed for more labor force moving from agricultural sector for India on one hand as the decreasing in the proportion of employment in the agricultural sectors in India tends to be more rapidly in the most recent years. It is also possible that the lacking of technology for most peasants and the caste system constraint the development of surplus labor and the movement of them into other sectors.

On the other hand, there is also sign that more proportion of employment in the service sector instead of industrial sector increases as shown in Figure 1. If we consider service sector as an apart of capitalist sector, then the evidence perfectly supports the dual sector model. If we do not think so, we may argue that this is beyond the explanatory of the dual sector model. It is particularly notable that since 2013 the proportion of employment in the agricultural sectors increased in Brazil and the proportion of employment in the industrial sector decreased, which is on the opposite to the expectation of the dual sector model. As we mentioned above, it is

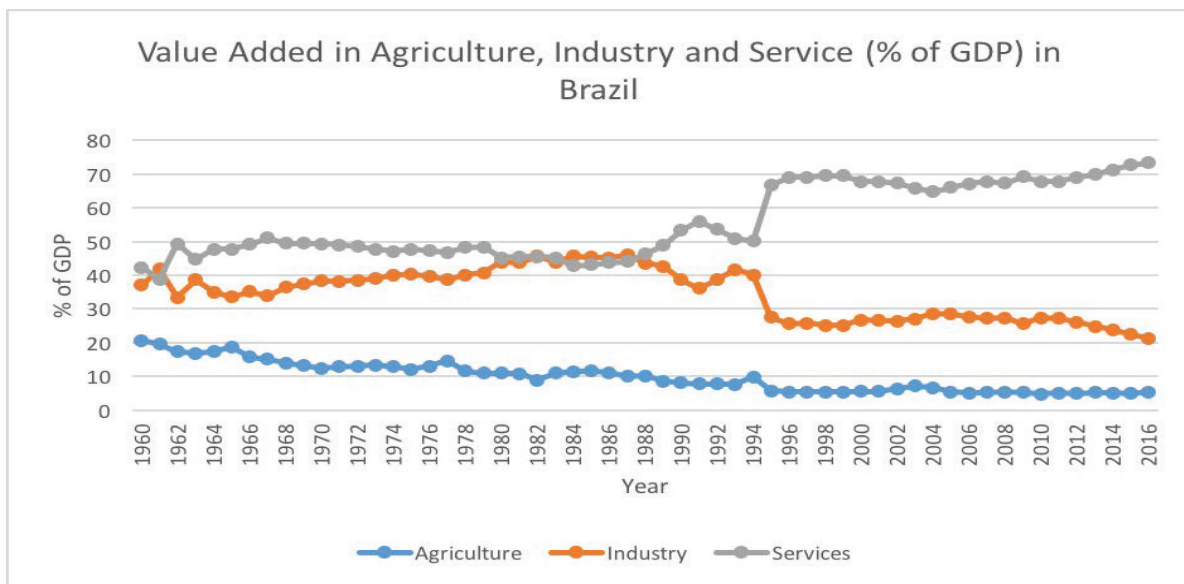
possible that this is resulted from the industrialization of agriculture and the profitability and thus more reinvestment in this sector by the capitalists, or it can be resulted from the large unemployment in the industrial sector and the retreatment of labors from the sector.

Figure 4. Value Added in Agriculture, Industry and Service (% of GDP) in India (1960-2016)



Source: World Bank Data

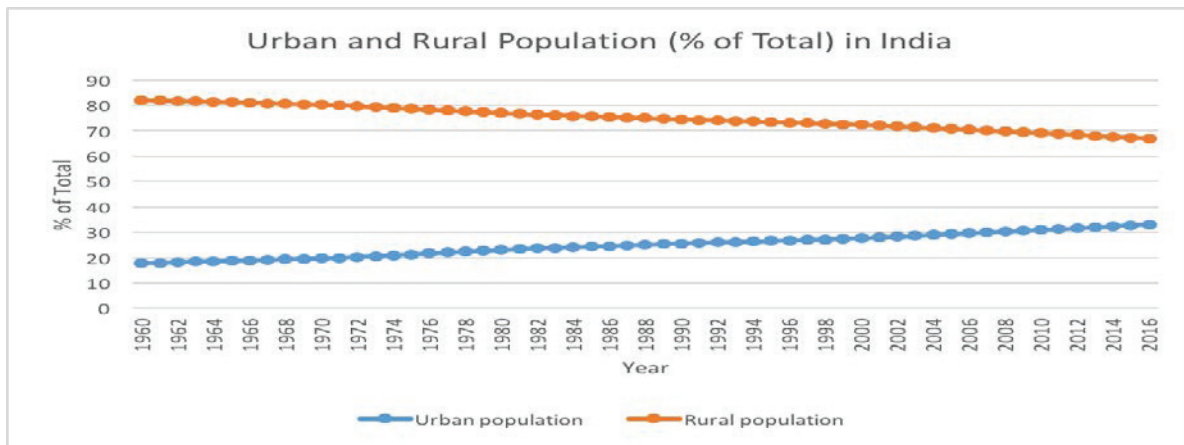
Figure 5. Value Added in Agriculture, Industry and Service (% of GDP) in Brazil (1960-2016)



Source: World Bank Data

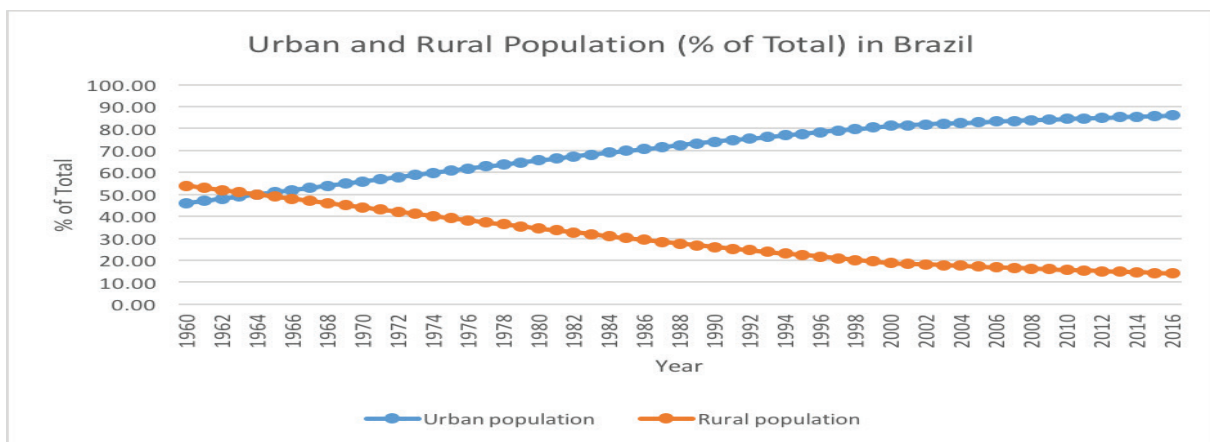
Structural Adjustment in terms of economic sectors: As shown in Figure 4, we can realize that India has experienced an economic sectors adjustment with the transition to higher proportion of value added in industry compared to agriculture around 1990. This supports the expectation of the dual sector model. As shown in Figure 5, we can see that since 1960, the value added in industrial sector has always been higher compared to the agricultural sector in Brazil. We may assume that the structural adjustment has already occurred before 1960 in Brazil. As temporary conclusion, we can argue that the evidences support the assumption of structural adjustment in terms of economic sectors in the dual sector model.

Figure 6. Urban and Rural Population (% of Total) in India (1960-2016)



Source: World Bank Data

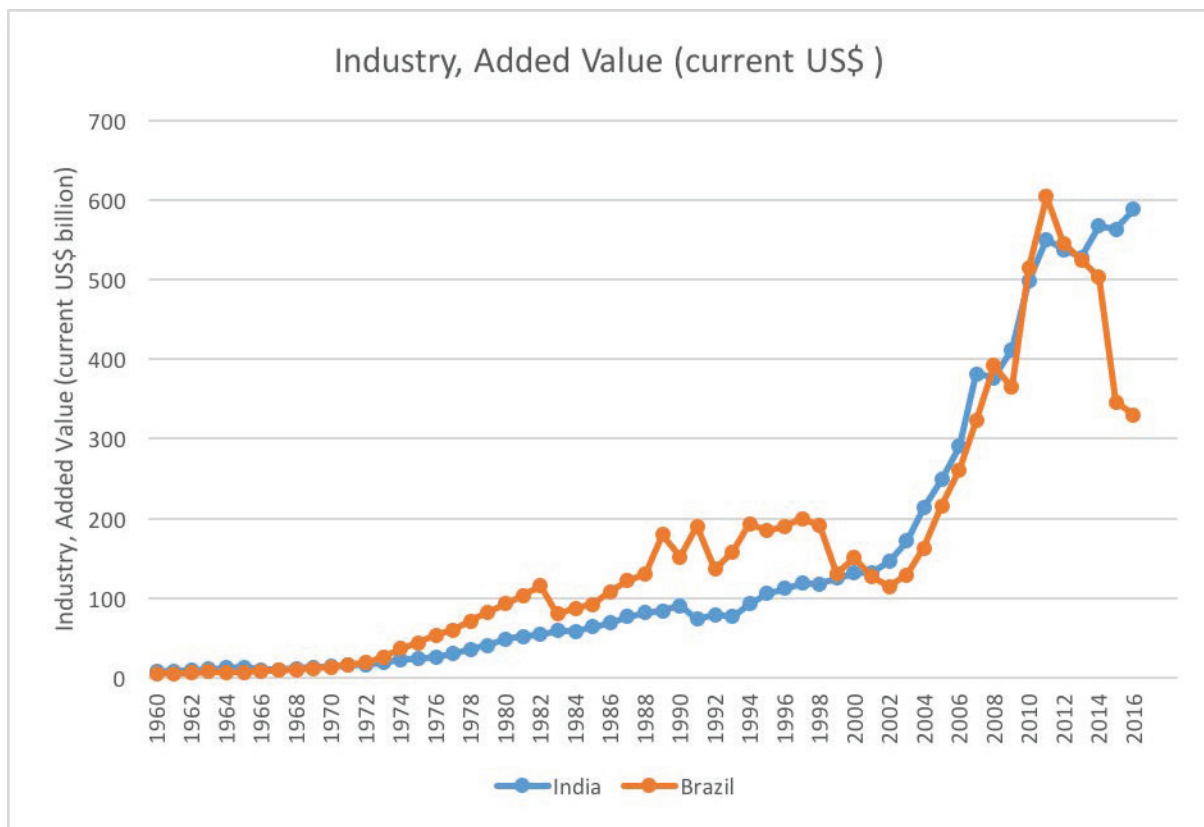
Figure 7. Urban and Rural Population (% of Total) in Brazil (1960-2016)



Source: World Bank Data

Migrations from rural area to urban area: As shown in Figure 6 and Figure 7, we can clearly recognize the occurrence of continuous urbanization in India and Brazil measured by the steady decreasing of rural population and the steady increasing of urban population. We can see that in India, there are still far larger rural population compared to urban population, while urban population has surpassed rural population in Brazil since 1965. This suggests that India may have more potential with further way to go in terms of urbanization compared to Brazil. Generally speaking, this evidence supports the expectation of dual sector model in the large migrations from rural area to urban area.

Figure 8. Value Added in Industry Sector (% of GDP) in India and Brazil (1960-2016)



Source: World Bank Data

Economic development: As shown in figure 8, there has been significantly increasing in the development of industry in India and Brazil and the industrial sectors of both countries has contributed significantly to the development of the two countries generally. This evidence

supports the expectation of dual sector model that industrial sector will maintain sustainable development. However, Brazil experienced significant decreasing in the added value of industrial sector since 2010, with several minor decreases in the former years. Barbosa (2000) argues that there has been cyclical dynamic of economy in Brazil resulted from the subsidy policy particularly in industrial sectors, which may explain the minor fluctuation before 2010. However, with the reference of Figure 1, which shows a declination of value added in agricultural sector at the similar time as the industrial sector shown in this figure in Brazil, the most plausible explanation for the significant continuous declination of value added in Brazil's industrial sector shown in Figure 8 since 2010 may be the occurrence of a general decay in Brazilian economy. This is controversial to the expectation of the dual sector model and more research is needed to be done in order to further understand the sudden, significant and continuous decay of Brazilian economy since 2010.

Limitations

First, this model ignores the competitiveness of the sector in global markets. India is particularly competitive in calling sector and software sector, as the symbolic parts of service sector, resulted from their large educated labor. After the popularity of protectionism and the beginning of prevalence of the liberalization theories in economy domestically in India since 1990s, the industrial sector has been faced with severe challenges in the global market, while service sector, with the representative of calling service and then software industry, has enjoyed welcome by the Western developed countries and experienced rapid development. This may explain the significant increasing in Indian service sector and fluctuation as well as decreasing in its industry sector in their value added measured by the percentage of GDP. Resulted from the competition outside and the limitation of the capacity, the attraction of industrial sector and its ability in absorbing labors is far limited compared to the expectation of Lewis. For Brazil, its agricultural sector is very competitive particularly in exports, and this may explain why value

added of the agricultural sector in the percentage of GDP maintains generally steady since 1994 and the labor in the sector even increased in the recent years. This may also contribute to the low reinvestment rate in industrial sector in Brazil. Brazilian capitalists are buying off the agricultural industries all over the world instead of investing in domestic industrial sector. The development of JBS, the largest meat processing company in the world by sales may provide a good example.

Second, the dual sector model ignores the reinvestment in as well as the growth resulted from technology. As shown in Figure 4, the value added in service sector measured by the percentage of GDP in India has surplus over the other two sectors, while the proportion of employment in the service sector maintains the second till most recently. This suggests that large output is resulted from the investment in technology or other resources instead of simply labor as assumed by the dual sector model. The value added in industrial sector also experienced a continuously decreasing since 2007. This may also suggest that the wage in industry sector is not as attractive as service sector, or the development of the sector is not sustainable as Lewis expected, or both.

Third, the model is with an assumption that labors can always adapt themselves into the jobs and touches very little on the unemployment issues after the migration occurs. Lewis mentioned that “Several writers have drawn attention to the existence of such ‘disguised’ unemployment in the agricultural sector, demonstrating in each case that the family holding is so small that if some members of the family obtained other employment the remaining members could cultivate the holding just as well (of course they would have to work harder: the argument includes the proposition that they would be willing to work harder in these circumstances) (1954)”. This leads to his argument that the living standard will increase if these surplus people can work in industrial sector gaining more wages and the average income of remaining employments in agricultural sector will increase at the same time. However, he ignores the

possibility that people cannot adapt themselves to new sectors. Unemployment is a serious issue in the developing countries including Brazil and India. Among the unemployment, many of them resulted from the transition of the economic sectors and the failure of the labors in adapting themselves in new jobs. What's more, in extreme cases, it is possible that as argued by James Scott that the advancement of technology and industrialization becomes exploitation of lowest class of people (2008). It is not impossible that there are people who lose land at the same time of not being able to find job in the market. Land becomes more expensive and less affordable for the small farmers and industrial products become more expensive. Those people who cannot be adaptable to new skills or knowledge experience continuous frustration. For example, there are frequent news of suicide of peasants because of losing land and not being capable in paying debt in India (Umar, 2015) as well as unemployment in Brazil (Gillespie, 2017).

Last but not least, the dual sector does not mention any negative effects of urbanization, such as environmental damage and slums. Environmental damage is a severe challenge for quite a few developing countries, including Brazil and India. A report from Financial Times makes the point that environmental damage costs India \$80bn a year (Mallet, 2016). Because of a series of economic activities as well as urbanization, deforestation in Brazil and particularly in Amazon area has been severe. Amazon is the biggest deforestation front in the world and interventions are urgently needed to prevent a large-scale, irreversible ecological disaster (WWF Global). What's more, the slum issue is very problematic in both countries accompanied by urbanization. Although the slum population as percentage of urban has decreased significantly in both countries due to the increasing in living standard and relative targeting policies according to World Bank, their existence is continuously leading to lots of problems in the two countries, including crime, public health problems, education problems and etc.

Conclusion

In this paper, we can conclude that the dual sector model still has quite some explanatory for the economic development of the developing countries. There is indeed a large proportion of labor force moving from agricultural sector to industrial sector in India and Brazil accompanied with migrations from rural to rural area, and generally the industrial sector has been contributing to the economic development of the two countries despite their differences. As a result, the dual sector model still has legacy for nowadays policy making of the developing countries in India and Brazil. First, developing countries should make efforts on infrastructure and urban planning of the cities in order to be more prepared for the large migration from rural area to urban area. Second, in the developing countries with large surplus labors, government should consider the possibility in promoting the development of industrial sector in order to create more employment opportunities. This policy is widely conducted particularly among the overpopulated countries in Asia and increasingly in Africa.

The limitations of the dual sector model also provide lessons for the policy makings of the developing countries as well. First, the developing countries should never ignore the negative effects of urbanization, and policies should be conducted to promote the alleviation on the negative effects. Most importantly, the pollution issues and environmental damage should be particularly attached importance to. Second, the developing countries should not be trapped in the myth of enlarging industrial sector under any circumstances. It is possible that the other sectors are more competitive in the global market instead of industrial sector. Third, the education especially informal skill education for labors to be adaptable in new economic sector and new lives should be arranged for the labors with less skills and the welfare targeting on the extreme poor should be improved in order to protect them in the structural change of society and its pressure on their live.

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