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Can total factor productivity explain value added growth in services?☆

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ABSTRACT

This paper examines the factors responsible for generating the services led growth witnessed in the Indian economy during 1980–2005. A sectoral growth accounting exercise shows that total factor productivity (TFP) growth was the fastest for services; moreover this TFP increase was significant in accounting for service sector value added growth. A growth model with agriculture, industry and services as three principal sectors is calibrated to Indian data using sectoral TFP growth rates. The baseline model performs well in accounting for the evolution of value added shares and their growth rates, but is unable to capture sectoral employment share trends. The performance of the model with respect to value added shares improves when the post 1991 increase in service sector TFP growth following the inception of market-based liberalization reforms is accounted for. A modified version of the model with public capital can better track trends in sectoral employment shares.

1. Introduction

An empirical comparison of the historical growth experiences of contemporary developed countries with the current growth experiences of some fast growing contemporary developing nations reveals some significant differences in their growth patterns. For most industrialized nations, such as United Kingdom, France and the United States, historical data show that at low levels of per capita income, the agricultural sector dominated the composition of output and employment. As these nations embarked on a path of rapid and sustained economic growth, resources were transferred from the agricultural sector to the manufacturing and service sectors. Only when the economy matured and reached the status of a high-income nation did the role of the service sector become more dominant. Today, for some low income, rapid growing industrializing nations, this process of sectoral reallocation of economic activity, also known as structural transformation or structural change, looks different. In these countries, even at low levels of per capita income, the service sector accounts for a significant amount of the economy's output as measured by its share in Gross Domestic Product (GDP). Moreover, in these economies the share of services in GDP has been increasing at a rapid rate, much greater than the corresponding growth rate witnessed by the service sector in the GDP of contemporary developed economies when they were at equivalent stages of development. In some of the low-income economies in the present day, the role of the service sector has become more prominent at relatively early stages of economic development. This paper accounts for the rapid growth of the service sector in one of today's low-income, fast growing, developing economies—India, and investigates the factors driving this services-led growth in the economy.

Fig. 1 presents an empirical comparison of the current growth experience of India with the historical growth experience of the United States (U.S.). During the 1980–2005 period, the average annual growth rate of real output of the aggregate Indian economy was 5.8% while the growth rate of real output produced in the service sector exceeded the aggregate growth rate, measuring 7.2%. In other words, the service sector's share in GDP grew at an average annual rate of 1.3% for the 1980–2005 period. This growth rate is much higher than the corresponding growth rate witnessed by the U.S. economy, when the U.S. was at an equivalent stage of development, where the stage of development is measured by the relative level of real GDP per capita. The upper panel of Fig. 1 shows the growth in the share of service's output in Indian GDP during the 1980–2005 period. One can also see how the relative Indian/U.S. GDP per capita evolved during the same period. From this figure, it is evident that in 1980, when India's GDP per capita was 5.2% of the U.S. GDP per capita, the share of services in Indian GDP was about 38%. By 2002,

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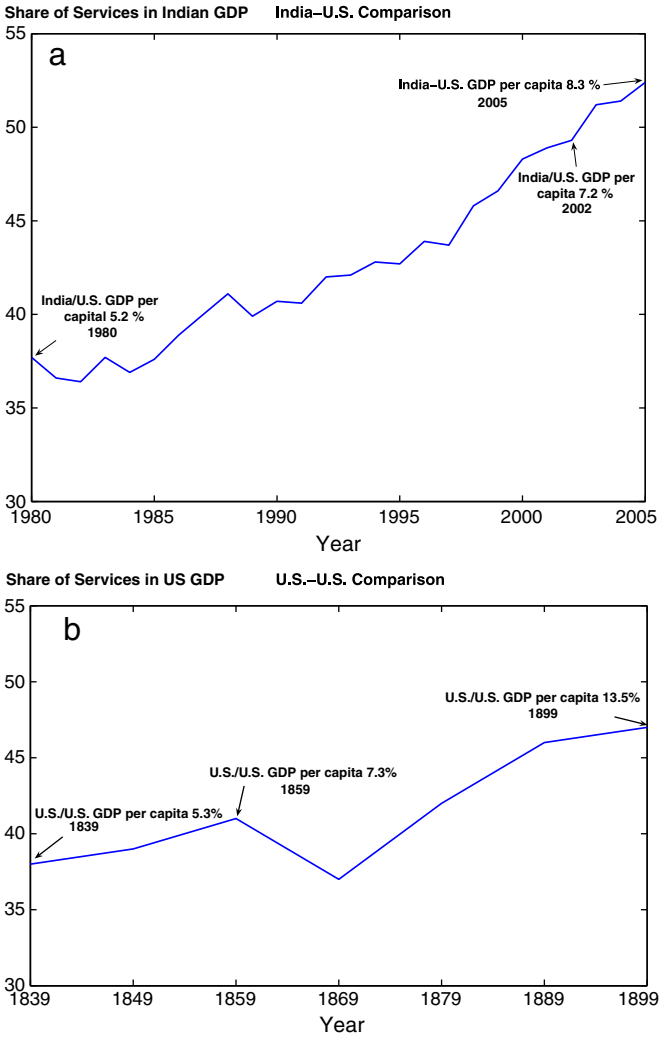

Fig. 1. A comparison of the Indian economy relative to the U.S. economy.

Indian GDP per capita had grown to 7.2% of U.S. GDP per capita, at which date the share of services in Indian GDP was 49%. By the end of the sample period in 2005, Indian GDP per capita had increased to about 8.3% of U.S. GDP per capita, and the corresponding share of services accounted for about 52% of Indian GDP.

The lower panel depicts how the share of services in U.S. GDP[1] evolved during the period 1839–1899. In 1839, the U.S. GDP per capita relative to its average 1980–2005 value was similar in magnitude to the 1980 Indian/U.S. GDP per capita ratio. In other words, in 1839 the U.S. GDP per capita was 5.3% of the average U.S. GDP per capita of 1980–2005, and services accounted for 38% of aggregate GDP. In 1859, the U.S. had grown to 7.3% of its average 1980–2005 GDP per capita value with the output share of services being 41%. By 1899, U.S. GDP per capita had grown to 13.5% of its average 1980–2005 GDP per capita value, and the output share of services in GDP had risen only to about 47%. One can infer from these numbers that the share of service's output in U.S. GDP grew at an average annual rate of 0.36% during the 1839–1899 period. In comparison, the average annual growth rate of the output share of services in Indian GDP during the 1980–2005 period was one full percentage point higher than its U.S. counterpart when the U.S. was at an equivalent stage of development.

The objective of this paper is to explain the rapid growth of value added in the service sector in India and to examine the factors driving this services-led growth in the economy for the period 1980–2005. With this objective in mind, I develop a three-sector general equilibrium model consisting of agriculture, industry and services. Output in each sector is produced using capital, labor and land (in agriculture). The production function in each sector is assumed to be Cobb–Douglas and I allow for different values of capital and labor shares, as well as different growth rates of total factor productivity (TFP) across the sectors. There is a representative agent who has homothetic preferences defined over goods of the three sectors which are gross substitutes. Using sectoral data, I calculate sector specific TFP growth rates which are fed exogenously into the model with the objective of examining the model's performance with respect to the evolution of sectoral value added shares over the 25-year period. The results indicate that the model can closely track the time paths and also match the growth of sectoral value added shares for the sample period. With respect to sectoral employment shares, the model has difficulty in matching the data. Also, the rates of growth of sectoral employment shares predicted by the model are very close to those of sectoral output shares, a feature not observed in the data. This is a result of using the Cobb Douglas functional form. Introduction of sector specific tax policy and public capital as an additional factor of production in each sector helps to break the relationship between the growth rates of sectoral output and employment shares. It also improves the model's predictions for shares of employment in each sector which come closer to matching the data.

The three sector model described above is used in two specific applications in this paper. The first case involves a quantitative experiment conducted which highlights the importance of increase in service sector TFP during the 1991–2005 period. The results of this exercise reveal that the performance of the model improves significantly when the post-1991 increase in service sector TFP growth is accounted for. I argue that following economic liberalization in 1991, it was the inception of market-based liberalization policies, in particular deregulation and privatization of banking, business and communications services, which resulted in significant productivity improvement in this sector.

The second application involves using a modified version of the model with the objective of improving the baseline model's performance with respect to sectoral employment shares. A per unit tax is imposed on the industrial and service sectors while agriculture faces no tax.[2] The tax revenue is used to finance an aggregate stock of public capital which is distributed between the three sectors. As in Barro (1990), public capital serves as an input to private production and the conducted exercise highlights the productive role of this form of capital as well as the effect of the tax policy on labor and output reallocations across sectors. The absence of tax in agriculture reduces the relative price of the good produced by this sector while having no effect on the price of the other goods. If the goods are assumed to be substitutes, then this attracts a larger proportion of labor into agriculture. Also, government capital has an impact on sectoral labor reallocation. The sector which is more intensive in the use of government capital experiences a relatively higher growth in its output. This leads to relatively faster price decline and a larger share of labor being absorbed by this sector, since goods are substitutes.

The process of structural change has been studied by previous authors using two classes of models. The first class of models focuses on the demand side reasons for structural change. These models use non-homotheticities in preferences and neutral technological change across sectors. The intuition is that if income elasticities of demand are not unitary, then as economies grow richer, reallocation of resources across sectors occurs due to differences in the marginal rate

[1] These data are obtained from Weiss and Gallman (1969); they report data for every 10 years starting from 1839 to 1899.

[2] The income from agricultural operations in India is exempted from income tax.