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Public infrastructure, production organization, and economic development

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ABSTRACT

We develop a political economy model of growth to examine economic development led by the interactions between an economic decision concerning a firm's production technology (CRS vs. IRS technology) and a political decision concerning public infrastructure. We show that multiple equilibrium growth paths occur due to differences in expectations regarding the quality of public infrastructure. These multiple paths illustrate why economies with poor initial conditions can catch up to and, furthermore, overtake economies with better initial conditions. Our result could explain the experiences of some East Asian countries where the co-evolution of public infrastructure and industrial transformation spurred economic development.

1. Introduction

Over the past five decades, several East Asian countries, including Japan, South Korea, and Taiwan, have experienced rapid growth because of the drastic industrial transformation of production organizations that shifted from engaging in obsolete, inefficient small-scale production to developing modern, efficient large-scale production. However, many other countries have struggled with poverty because they have continued to engage in inefficient small-scale production.[1] The adoption of large-scale production is one of the significant driving forces behind economic development (Rosenstein-Rodan, 1943;Nurkse, 1953). Murphy et al. (1989 on p1003) state that "[V]irtually every country that experienced rapid growth of productivity and living standards over the last 200 years has done so by industrializing. Countries that have successfully industrialized – turned to production of manufactures taking advantage of scale economies – are the ones that grew rich, be they eighteenth-century Britain or twentieth-century Korea and Japan."

Increasing the efficiency of large-scale production requires sufficient aggregate demand and high-quality infrastructure. In particular, the roles of public infrastructure (e.g., power plants, transportation, telecommunications, and the property rights of institutions) are essential. For example, Tybout (2000) survey of empirical studies of manufacturing sectors argues that the high proportion of very small firms in developing countries partly stems from their weak transportation systems, uncertainty about policies, poor rule of law, and corruption. Kummar et al. (2005) and Leaven and Woodruff (2007) also provide empirical evidence of a positive relationship between firm size and the quality of legal institutions. Moreover, the World Bank (1994) provides convincing evidence that public infrastructure has played a crucial role in the drastic industrial transformations in East Asian countries. Table 1 shows GDP and infrastructure stock at their 1995 levels as multiples of their 1975 levels, which is calculated by Straub et al, (2008). East Asia's economic growth and accumulation of infrastructure stocks has outpaced those of other regions. The coevolution of infrastructure and industrial transformation induced economic development in these countries.

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[1] For example, see Evans (1995) for an illustration of the industrial transformation of Japan, South Korea, and Taiwan.

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Table 1
Growth of GDP and infrastructure.

	GDP	Electricity	Roads	Telecoms
Stocks 1995 levels as multiples of 1975 levels East Asia	4.8	5.9	2.9	15.5
South Asia	2.6	4.4	2.5	8.2
Middle East and NorthAfrica	1.8	6.1	2.1	7.2
Latin America and Caribian	1.8	3.0	1.9	5.1
OECD	1.8	1.6	1.4	2.2
Pacific	1.7	2.0		4.3
Sub-Saharan Africa	1.4	2.6	1.7	3.9
Eastern Europe	1.0	1.6	1.2	6.9

Note that large-scale production firms come to rely more heavily on public infrastructure. For example, they require more reliable power grids for their advanced equipment and more developed transportation systems for their commodity distributions. Thus, as the number of firms that adopt large-scale production increases, large expenditures for public infrastructure become more likely to gain political support. This hypothesis is consistent with Wagner (1893) law that the transformation from a traditional society to an industrialized society is accompanied by a surge in demand for public services such as education, health care, and infrastructure. In fact, Randolph et al. (1996) and Sturm (2001) show that the per capita expenditures for public infrastructure strongly respond to changes in the per capita income and that the estimated income elasticity of the per capita expenditures exceeds unity.

The purpose of this paper is to examine how interactions between political decisions regarding public infrastructure and economic decisions regarding production organizations affect the long-run process of economic development. We show that multiple growth paths occur due to interactions between political and economic decisions. In our model, self-fulfilling properties of voting can occur and lead to multiple equilibria. The intuition is as follows. If people rationally anticipate large expenditures for public infrastructure as a political outcome, they will begin to employ large-scale production even when the potential aggregate demand is still small. Once this is accomplished, it is indeed optimal for people to then agree to large expenditures for public infrastructure in the relatively early stages of economic development. In contrast, if people rationally anticipate low expenditures for public infrastructure, they will continue to employ small-scale production until the economy's aggregate demand becomes sufficiently large. Once this is accomplished, it is indeed optimal for them to agree to small expenditures for public infrastructure in the relatively early stages of economic development. Hence, even for economies with equivalent initial conditions, the difference between their expectations for the political outcomes regarding public infrastructure leads to different processes of evolution for this public infrastructure, the firms' production organization, and per capita income.

This "multiple growth paths" result could explain why relatively backward economies with relatively poor initial conditions can catch up to and, furthermore, overtake more advanced economies with better initial conditions. Suppose the former adopts efficient large-scale production earlier than the latter due to its ability to coordinate decisions for production organizations and attracts a corresponding high level of political support for public infrastructure. Then, an equilibrium outcome can be the result for an economy with relatively poor initial conditions that rapidly catches up to and overtakes an economy with better initial conditions. This result helps us to understand how such rapid transformations are related to differences in the evolution of public infrastructure and production organizations across countries (Gerschenkron, 1962; Rodrik, 2005). In particular, our result is partly consistent with the experiences of some East Asian countries where the co-evolution of public infrastructure and industrial transformation spurred economic development.

In addition, this paper notes the critical role of efficiency in public service production. Efficiency is determined by the quality of bureaucratic and legal procedures. If efficiency is high, production organization changes monotonically from small-scale to large-scale production. Along with this change, people are more willing to support increases in public infrastructure expenditures. Due to the co-evolution of production organizations and public infrastructure, the economy eventually converges to a steady state equilibrium characterized by "high quality infrastructure, large-scale production, and high per-capita income." However, if efficiency is low, the economy is trapped in a steady state equilibrium characterized by "low quality infrastructure, small-scale production, and low per-capita income." Moreover, if efficiency is at an intermediate value, multiple steady state equilibria exist. Under some parameter regions, even economies with equivalent initial conditions may converge to different steady state equilibria due to differential expectations about the quality of public infrastructure. This "multiple steady state equilibria" result suggests that small differences in the efficiency of public service production can account for large differences in the per capita income across countries (La Porta et al., 2008;Chakraborty and Dabla-Norris, 2011).

This paper is related to the literature on public infrastructure and economic growth (e.g., Barro, 1990;Agénor, 2010; Chakraborty and Dabla-Norris, 2011). These studies show that public infrastructure has growth-promoting effects through various channels (e.g., the productivity of private inputs, complementarity effects on private investment, and the production of health and education services).[2] However, as noted by Agénor (2010), the effect of public infrastructure on economic growth

[2] See, for example, Agénor and Moreno-Dodson (2006) for a survey.