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Productive government spending and its consequences for the growth–inequality tradeoff ☆

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ABSTRACT

This paper investigates the effects of productive government spending on the relationship between growth and inequality in an economy subject to idiosyncratic production shocks and heterogeneous endowments. Assuming lognormal distributions, we derive tractable closed form solutions describing the equilibrium dynamics. We show how the effect of government investment on the equilibrium dynamics of both inequality and growth depends crucially upon the elasticity of substitution between public and private capital in production. This has important consequences for the growth- and welfare-maximizing rates of government investment. Finally, we supplement our theoretical analysis with numerical simulations, calibrated to approximate the productive characteristics of a real world economy. With the empirical evidence strongly supporting the complementarity between public and private capital, our simulations suggest that conclusions based on the commonly employed Cobb–Douglas production function may be seriously misleading.

1. Introduction

The role of public investment in infrastructure as a source of economic growth continues to be widely debated in both developing and advanced economies, with different economies adopting different policy options. Several emerging-market countries including India, China, and Brazil have undertaken extensive public investment, to which their high growth rates of recent years may at least in part be attributed. In contrast, several European countries have reduced public spending, as they have pursued austerity measures intended to deal with concerns related to their rising debt levels. Contemporaneously with these diverse policies toward public investment, we have witnessed increasing income inequality, both in emerging markets and in most OECD countries. This raises the important question that we address in this paper, namely the relationship between public investment directed toward growth enhancement and its consequences for income inequality.

Interest in the relationship between public investment, output, and growth has a long history, dating back to Arrow and Kurz (1970), who examined it in the context of a neoclassical economy. Beginning with Barro (1990), an extensive literature has evolved addressing the issue in an endogenous growth framework, with a general consensus that government spending on infrastructure can yield significant productivity gains and thus enhance growth. See e.g. Futagami et al. (1993), Glomm

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and Ravikumar (1994), Turnovsky (1997), and more recently Agénor (2011), who provides a detailed survey of the theoretical literature on this topic. The empirical literature is even more extensive. Most of it focuses on estimating the productive elasticity of government expenditure in producing output. The overwhelming consensus is that infrastructure contributes positively and significantly to output, though the productive elasticity is considerably smaller than Aschauer's (1989) original estimate of 0.39. Bom and Ligthart (2014) provide an exhaustive review of the literature and place the elasticity somewhere between 0.10 and 0.20, a range also shared by most other studies.[1]

By impacting factor productivity, and hence relative factor returns, public investment also plays a critical role in the evolution of wealth and income distributions as the economy grows over time. Indeed, infrastructure by virtue of its diverse nature is likely to have significant redistributive consequences, since depending on its type it will inevitably confer differential benefits across agents in the economy. Public investment in public transportation, directed toward the needs of the less affluent agents, is likely to reduce inequality, while public expenditure on enhanced communication, by favoring the wealthier owners of capital, will tend to exacerbate inequality. As our analysis highlights, the distributional consequences depend critically upon the substitutability–complementarity relationship between private and public capital in production.

In contrast to the public investment–growth relationship, empirical evidence on the relationship between infrastructure investment and inequality is less conclusive and more anecdotal. For example, Calderón and Chong (2004), Calderón and Servén (2004), Fan and Zhang (2004), Ferranti et al. (2004), and Lopez (2004) find that public investment has both promoted growth and helped mitigate inequality.[2] On the other hand, Brakman et al. (2002) find that government spending on infrastructure has increased regional disparities within Europe, while Artadi and Sala-i-Martin (2003) suggest excessive public investment has contributed to rising income inequality in Africa. In the case of India, Banerjee and Somanathan (2007) report that access to critical infrastructure services and public goods is in general positively correlated with social status, while a World Bank (2006) study also finds that the quality and performance of state-provided infrastructure services tend to be the worst in India's poorest states. The diversity of these empirical findings emphasizes the need for a well-specified analytical framework, within which the interaction between infrastructure spending, economic growth, and inequality can be systematically addressed.

This paper examines the distributional and growth effects of public investment within such a unified framework, where both growth and inequality are endogenously determined. In doing so, we address a key limitation of the existing literature. Most of the literature, both theoretical and empirical, assessing the productivity of public capital, employs a Cobb–Douglas production function. This is a serious shortcoming in light of the empirical evidence suggesting that the elasticity of substitution between public and private capital in aggregate output is most likely significantly less than unity, contrary to the Cobb–Douglas specification. Thus, since the elasticity of substitution turns out to be a key mechanism whereby public investment influences the distribution of income and growth, it becomes even more important that the production function be generalized beyond the restrictive Cobb–Douglas form.

We develop an overlapping generations model in which individuals are subject to two sources of heterogeneity: (i) their initial endowments of private capital, and (ii) idiosyncratic productivity shocks. To examine the potential impact of the substitutability–complementarity relationship between public and private capital on the growth–inequality relationship, we assume that these two factors contribute to final output via a constant elasticity of substitution (CES) production function. By assuming that the technology has constant returns to scale in public and private capital, the macroeconomic equilibrium we generate is one of endogenous growth.

We assume that the two sources of heterogeneity can be represented by lognormal distributions. This assumption facilitates aggregation, enabling us to derive the joint distributional and aggregate dynamics of the CES economy in a very tractable closed form, thereby providing substantial insight into its evolution.[3] The equilibrium dynamics has a simple recursive structure. The dynamics of inequality drives the growth of the aggregate variables – private capital, public capital, and output – but not vice versa.

There are no credit or insurance markets, the absence of which is a key element generating inequality, as in Loury (1981), and Bénabou (2000, 2002). When individuals cannot fully insure themselves from future income uncertainty and are unable to borrow or lend unlimited amounts, inequality associated with the idiosyncratic productivity shocks persists.[4] This is because diminishing returns to investment imply that the poorly endowed can obtain a higher marginal return to their capital than do the wealthy. But, since they cannot borrow and invest efficiently due to credit constraints, Pareto efficiency cannot be achieved, as often is implicitly assumed in representative-agent models with complete markets. Consequently, inequality persists, leading to less efficient resource allocation and slower growth.

However, if redistributive public investment policies can mitigate the equity-efficiency trade-off they could potentially yield additional efficiency gains. To the extent that this is so depends upon the degree of substitutability between public and private capital. This is yet another reason why it is so important to generalize the production technology to the CES function, rather than restrict it to the Cobb–Douglas function as so much of the relevant growth literature does.

[1] There is a much briefer literature analyzing the effect of infrastructure on the growth rate. While much of this is inconclusive, Sanchez-Robles (1998) and Calderón and Servén (2004, 2010) obtain a substantial positive growth effect.

[2] For example, using data for low and high income countries, between the period 1960 and 1997, Calderón and Chong (2004) find a negative and significant relationship between infrastructure measures (such as roads, railways, telecommunications, and energy) and income inequality.

[3] Some empirical support for the lognormal is that for several economies it describes quite well the distribution of income below the top 3%; see Clementi and Gallegati (2005).

[4] In contrast, the inequality originating with the initial endowments gradually disappears.