



Elasticity of substitution in public capital formation and economic growth

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Abstract

Incorporating monopolistic competition in an endogenous growth model with a driving force of public capital, we have shown that when the elasticity of substitution among goods in public investment is sufficiently small relative to those in the private sector, an increase in the government purchase of goods decreases the effective price elasticity of total demand and thereby the demand of each firm for capital, and that, because of this negative demand-side effect, an increase in the income-tax-financed public investment ratio to GDP may result in a lower balanced-growth rate even below the government size of the natural efficiency condition.

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1. Introduction

It has already been shown theoretically that public capital as an input increases the level of output or the economic growth rate by raising the marginal productivity

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of private capital (e.g., Arrow and Kurz, 1970; Baxter and King, 1993; Turnovsky, 1997). When public investment is financed by an income tax, this direct output effect of public capital will be overwhelmed by the tax-distortion effect as the size of government becomes greater. The growth-maximizing size of the government is given by the natural efficiency condition (e.g., Barro, 1990; Barro and Sala-i-Martin, 1992; Futagami et al., 1993). These models assume that goods for public investment are purchased in perfectly competitive markets, and, therefore, how many goods a government purchases does not affect the condition of competition in the goods market. However, if goods are not perfectly substitutable, what and how many goods the government purchases will affect private economic activities by changing the market structure of competition, in addition to the direct output and tax-distortion effects. Especially when government purchases are highly rigid in the sense that the elasticity of substitution among goods in public investment is lower, an increase in public investment may make the market structure less competitive.¹ This may exert an important effect on private investment and hence economic growth. Thus the problem considered in this study is whether public capital formation boosts economic growth when the elasticity of substitution among goods in public investment is low.

For our purpose we extend an endogenous growth model with the growth engine of public capital formation in Futagami et al. (1993) by incorporating monopolistic competition in goods markets à la Galí (1994), in which markups are variable due to variations in the composition of aggregate demand.² Public investment is financed by an income tax, and the government has to purchase goods for investment in a monopolistically competitive market. Accumulated public capital enlarges the capability of production in the private sector, while the public investment demand for goods affects the effective price elasticity of total demand by changing the demand structure. When each firm can not discriminate among its customers in pricing, the total demand for goods is the sum of the demand for it as a consumer good and as investment goods by other firms and by the government. Therefore, the (effective) price

¹ For example, in Japan the structure of Public Works has changed only slightly over two decades (1980–1999). Public Amenities such as sewage systems and industrial waste facilities have increased from 15.2% to 17.8%; improvement of Basic Conditions for Agriculture has decreased from 14.1% to 11.7%; and other items such as Housing and Roads have changed no more than 2% points, while, for example, the relative shares of the primary, secondary and tertiary industries have changed from (3.6, 37.8, 58.7) in 1980 to (1.7, 31.7, 66.7) in 1998. Furthermore, the Japanese government's disclosure of purchases in public investment has been questioned, for example, by the US government (e.g., US–Japan Working Group, 1990).

² In showing the possibility of equilibria with persistent fluctuations driven by self-fulfilling revisions of expectations, Galí (1994) has developed a monopolistic competition model with endogenous markups due to changes in the composition of aggregate demand. In comparing equilibrium business cycle models with increasing returns to scale, Schmitt-Grohé (1997) extended Galí's model with firms' internal increasing returns to scale due to fixed costs and the zero profit condition due to free entry. Heijdra (1998) examined the effects of fiscal policy in a monopolistic competition model with increasing returns, and obtained a large long-run output multiplier with a zero-profit condition. However, none of the above discussed a growing economy nor did they consider public capital formation. On the other hand, Aghion and Howitt (1992) and Grossman and Helpman (1991) based their findings on growth due to product variation. See Matsuyama (1995, 1997) for a review of monopolistic competition.

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