Governmentally amplified output volatility☆

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HIGHLIGHTS

- We examine the impact of cyclical behavior in public finance on output fluctuations.
- The theoretical analysis is based on a standard neoclassical growth model.
- Public investment at a certain frequency range can cause output resonance.
- An empirical analysis to test the theoretical implication is also conducted.
- In the U.S. case, resonance phenomena change from low to high frequency.

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ABSTRACT

Predominant government behavior is decomposed by frequency into several periodic components: updating cycles of infrastructure, Kuznets cycles, fiscal policy over business cycles, and election cycles. Little is known, however, about the theoretical impact of such cyclical behavior in public finance on output fluctuations. Based on a standard neoclassical growth model, this study intends to examine the frequency at which public investment cycles are relevant to output fluctuations. We find an inverted U-shaped relationship between output volatility and length of cycle in public investment. This implies that periodic behavior in public investment at a certain frequency range can cause aggravated output resonance. Moreover, we present an empirical analysis to test the theoretical implication, using the U.S. data in the period from 1968 to 2015. The empirical results suggest that such resonance phenomena change from low to high frequency.

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1. Introduction

Previous works have pointed out that public investment consists of multiple components, but they provide no details about the effects of the individual factors on output movement. In the context of spectral analysis, also known as frequency-domain analysis, behavior in public investment can be decomposed by frequency. That is, the spectrum of public investment resembles that depicted in Fig. 1, and the underlying components are considered in order of frequency as follows.

First, many researchers have been interested in the business-cycle components of fiscal policies so far. As in Refs. [1,2], the range of business cycles is supposed to be 1.5–8 years in the United States.[1] As for the short run, previous works empirically found that public sectors are prone to react to business cycles. For example, Sorensen et al. [9], Lane [10],

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[1] A substantial number of papers characterize business cycles in a variety of ways. See, e.g., Refs. [3–8].
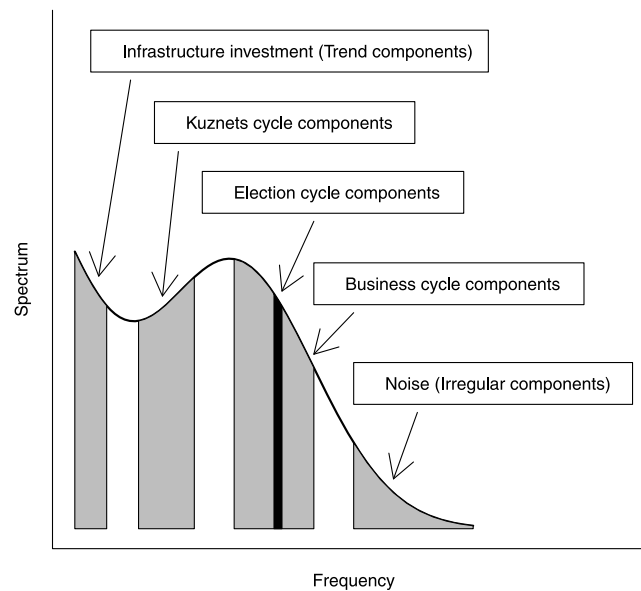
Fig. 1. Spectrum of government spending. *Notes:* In the United States, the typical range of business cycles is supposed to be 1.5–8 years (e.g., Refs. [1,2]). The election cycle of presidential elections is 4 years, which are depicted as a black band to be included in business-cycle frequencies.

Hines [11], and Afonso and Jalles [12] estimated some policy reaction functions for broad categories of government spending and demonstrated how governments have reacted to economic fluctuations (i.e., countercyclical, procyclical, or acyclical).

Second, numerous authors have examined the existence of opportunistic political business cycles (e.g., Refs. [13–16]).[2] They shed light on the particular political aspect of policymakers manipulating macroeconomic policies in order to be re-elected, and consequently, there is a tendency to be expansionary as an election approaches and to be austere after the election.[3] This means that election cycles in public investment are based in reality. In the U.S. case, the cycle of presidential elections is determined de jure, and 4 years strictly are included in business-cycle frequencies.

Third, as relatively low-frequency components on approximately 20-year cycles, the Kuznets cycle regarding the public sector is well known (e.g., Ref. [22]). Lastly, updating cycle of infrastructure can be considered as more low-frequency components (i.e., trend components), such as 50-year cycles.

In this study, we focus on such cyclical behavior of public investment and attempt to clarify the effects on macroeconomic fluctuations. To be more precise, we examine transitional dynamics by incorporating our observational hypotheses that public finance patterns are cyclical into Ramsey's [23] classic growth model. In doing so, as a first attempt, we consider the case in which the government invests cyclically by having access to lump-sum taxes.

There are several predecessors closely related to our model.[4] Turnovsky and Fisher [30], Fisher and Turnovsky [31], and Turnovsky [27] provided models that include public-capital dynamics, and they are closely related to the framework we propose in this study. However, their models are more general than ours in certain aspects while these works naturally differ in accordance with their purposes. For instance, Turnovsky and Fisher [30] considered two types of government expenditure to investigate these effects: consumption expenditure, which improves utility, and which we do not consider; and investment expenditure, which raises private productivity, and which we do consider. On the other hand, although Fisher and Turnovsky [31] did not consider government consumption expenditure, instead, they studied investment expenditure under congestion, that is, when infrastructure is not a pure public good and is attended by a certain degree of rivalry. Furthermore, Turnovsky [27] examined both expenditure types under various tax finances.[5] In order to focus on the public-investment cycle (hereafter PIC), we reasonably consider only lump-sum tax and omit government consumption expenditure from our model for the time being.

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[2] As in Ref. [14], the literature can be classified into two types of theories, that is, opportunistic and partisan. The present study pertains only to opportunistic types of political cycles that are inspired by Nordhaus' [13] pioneering work, rather than partisan types that can be traced to Hibbs [17]. Milani [18] studies these political business-cycle models in a dynamic stochastic general equilibrium framework.

[3] While the present study does not consider monetary policies, their independence from politics is an ongoing subject of controversy. For recent empirical evidence of the relationship between presidential elections and monetary policy in the United States, see Refs. [19–21].

[4] Since a seminal work by Barro [24], inquiries into the relationship between public investment and economic growth have been conducted widely along with various developments (e.g., Refs. [25–27]). From some empirical perspectives, Aschauer [28] and many others investigated the contribution of public capital to economic growth for the United States. More recently, Marrero [29] offered an elaborate, calibrated model in which public investment-to-output ratios as observed in developed countries are accounted for with adequate precision.

[5] See also Barro and Sala-i-Martin [32] for some extensions of the Ramsey model to include government spending with various taxes.