Journal of Macroeconomics 33 (2011) 819–827

Contents lists available at SciVerse ScienceDirect

Journal of Macroeconomics

journal homepage: www.elsevier.com/locate/jmacro

# Multiple equilibria arising from donor's aid policy in economic development

Koji Kitaura [a], Hikaru Ogawa [b], Sayaka Yakita [b,*]

[a] Faculty of Economics, Tezukayama University, 7-1-1 Tezukayama, Nara 631-8501, Japan
[b] School of Economics, Nagoya University, Furocho Chikusaku, Nagoya 464-8601, Japan

ARTICLE INFO

*Article history:*
Received 3 June 2010
Accepted 7 September 2011
Available online 21 September 2011

*JEL classification:*
F35
O11
O38

*Keywords:*
Aid allocation
Fungibility
Multiple equilibria
Cyclical growth
Economic development

ABSTRACT

This paper presents a neoclassical growth model comprising education and child labor with a focus on developing and aid-receiving countries to demonstrate cyclical growth and bifurcation in economic development. The appearance of multiple equilibria has often been attributed to the internal affairs of recipient countries, such as technology in production, subsistence minimum in consumption, and liquidity constraints in investment. The main argument of this paper is that the aid allocation policy employed by donor countries, thereby the motive of aid-providers, leads to divaricated and cyclical development in the recipient countries.



## 1. Introduction

Developed countries have repeatedly made large fiscal transfers to developing countries in order to aid their economic takeoff. The impact of foreign aid from donors to recipient countries varies across countries. These variations can primarily be explained by a set of particular circumstances in the recipient countries. The empirical study of Burnside and Dollar (2000) has piqued our interest in *good policies* in the recipient countries. The study found that the contribution of development aid to economic growth is more in countries that have a good policy environment than in those that are not well governed. This result has been reexamined by many researchers in order to develop a better understanding of aid effectiveness.[1]

The persistent differences in growth rates of less-developed countries have also been explained by theoretical researchers. One of the contributory explanations is the existence of a threshold effect arising from discontinuity in the use of technology, as shown by Azariadis and Drazen (1990). When production technology in an aid-receiving country is a step function with a jump at some critical level of physical/human capital, the economy exhibits bifurcation; this leads to an environment where stagnant countries and countries succeeding in economic takeoff coexist.[2] This argument calls for a bifurcation mechanism on the technological features of aid-receiving countries. The other factors causing bifurcation in economic growth, as

* Corresponding author. Tel.: +81 52 789 2379; fax: +81 52 789 4924.
*E-mail addresses:* kkitaura@tezukayama-u.ac.jp (K. Kitaura), ogawa@soec.nagoya-u.ac.jp (H. Ogawa), yakita.sayaka@b.mbox.nagoya-u.ac.jp (S. Yakita).

[1] See, for example, Collier and Dollar (2002), Hansen and Tarp (2001), Easterly et al. (2004), Clemens et al. (2004) and Dollar and Levine (2006).

[2] It is, of course, true that the discontinuity in technology is not strictly required, as stated by Azariadis and Drazen (1990, p.509). In fact, what is required is a shift from decreasing to increasing returns-to-scale technology at any level of state variables.

0164-0704/$ - see front matter © 2011 Elsevier Inc. All rights reserved.
doi:10.1016/j.jmacro.2011.09.003

shown in most of the preceding theoretical studies, are the existence of a subsistence minimum in consumption, liquidity constraints in investment, and the nature of increasing returns in production; moreover, all of these factors are based on the internal affairs of the target countries, i.e., their preferences, technology, and market conditions.[3]

This paper aims to spark an interest in the possibility that bifurcation in economic development is generated not only by the internal conditions of the recipient countries but also by aid policy of donor countries. Specifically, the feature that differentiates our model from those of other related studies is the reasoning behind our model that multiplicity and cyclical growth are caused by the form of foreign aid allocation employed by the donor countries.[4] This bifurcation can be observed even among countries that have the same technology, preferences, and market structure. The form of foreign aid considered in this paper is not unusual; we simply assume that the donor provides developing countries with assistance under a co-finance regime to stimulate human capital accumulation until the recipient country's economic standard reaches the benchmark level, after which the donor ceases to support the recipient and the developing country is no longer on the list of aid recipients.

In this paper, the donor country's aid policy is characterized not only by a benchmark level but also by the type of aid allocation among various areas of public spending. This approach is based on data that indicates the importance of effective aid allocation among various types of public spending for economic growth in the recipient country.[5] In our model, we have considered two types of policy options: one is education aid to improve the quality of public education, and the other is cash transfers to poor families. It is natural to have a stake in aid for education because the sectoral composition of aid has changed quite dramatically since the early 1990s. The most notable change is in the share of aid devoted to education, which rose from approximately 5.9% during 1990–1992 to approximately 8.2% during 2002–2004, whereas the share of non-educational aid and general budget support decreased from approximately 12.5% to approximately 7.5% (Thiele et al., 2007). The decomposition of aid enables us to examine how the allocation of aid between productive and non-productive spending affects the economic development of the recipient country.

The rest of this paper is organized as follows. Section 2 introduces the basic model, and Section 3 presents the optimization problem. The growth paths and steady states are examined in Section 4. Section 5 concludes the paper.

## 2. Model

### 2.1. Individuals

We employ a three-periods-overlapping-generations model in a small open economy. In our analysis, there exist individuals who live for three-periods and a recipient government that receives support from developed countries until it reaches a certain level of development. All individuals in the recipient country live for three periods and are endowed with one unit of time in both the first and second periods of their lives. In the first period (childhood), they spend their time in schooling in order to acquire human capital and working as child laborers. In the second period (parenthood), they work, plan their families, and rear children. Finally, they retire in the third period.

Individuals are considered to inherit human capital from their parents. Further, they attend school to acquire human capital. The function of human capital accumulation is given as

$$h_t = e_{t-1}^{\alpha} E_{t-1}^{\eta} h_{t-1}^{\gamma}, \tag{1}$$

where the subscript $t(=1,2,\ldots)$ denotes the period. In (1), $\alpha$, $\eta$, and $\gamma$ are the parameters which fit the confines of $[0,1]$.[6] It is assumed that human capital of the individuals born at time $t-1$ depends on the schooling time, $e_{t-1}$, the level of public education, $E_{t-1}$, and the human capital of their parents, $h_{t-1}$. Note that human capital is accumulated both through schooling time and public expenditure for education.

The lifetime utility of an individual of generation $t$, born in period $t-1$, is assumed to be log-linear, and is given by the form

$$U_t = (1-\beta)\ln c_{t+1} + \beta \ln n_t h_{t+1}, \tag{2}$$

where $\beta(>0)$ is the preference parameter for children. The utility of the individuals of generation $t$ depends on the consumption in the third period, $c_{t+1}$, the number of children they rear, $n_t$, and the level of human capital of their children, $h_{t+1}$.

In the second period of life, as parents, individuals decide on how to allocate the endowed time of unit one to their children between schooling and working as child laborers. Assuming that the working ability of children is inferior to that of parents, the provision of efficient labor by a child is expressed as $(1-e_t)\theta h_t$, where $1-e_t$ and $\theta(0<\theta<1)$ represents the

[3] See, for example, Galor and Zeria (1993), Galor and Weil (2000), Hazan and Berdugo (2002), Tabata (2003), and Moav (2005). See also the excellent survey presented by Azariadis and Stachurski (2004).

[4] Although few studies have depicted the relationship between the donor's aid policy and growth path in economic development, a study by Dalgaard (2008) is noteworthy. Using the model of Arrow and Kurz (1970), Dalgaard succeeds in showing that foreign aid policy may cause cyclical growth. While Dalgaard does not consider the allocation of foreign aid in alleviating poverty, our results argue that the aid allocation rule employed by donor countries, thereby the motive of the aid provider, causes not only cyclical growth but also multiple equilibrium in the recipient countries, which has not been mentioned previously.

[5] For example, Hansen and Tarp (2001) point out that the aid-growth relationship depends not only on the level of aid but also on aid allocation. World Bank (1998) argues that the decision on aid allocation would have a greater impact on poverty reduction if it were targeted at the poorest countries.

[6] Although Glomm and Kaganovich (2003, 2008) assume that $\eta=\gamma$, we relax this condition in this model. The restriction that is required in our model is $\eta+\gamma<1$, as will be found later.