Producers, parasites and poverty traps☆

Marcelo de Carvalho Griebeler [a],*, Ronald Otto Hillbrecht [b]

[a] *Universidade Federal do Rio Grande do Sul, Faculdade de Ciências Econômicas, Av. João Pessoa, 52 sala 23 – 3° andar, Centro, Porto Alegre, RS 90040-000, Brazil*
[b] *Universidade Federal do Rio Grande do Sul, Faculdade de Ciências Econômicas, Av. João Pessoa, 52 sala 33 – 3° andar, Centro, Porto Alegre, RS 90040-000, Brazil*

Abstract

We studied the population dynamics of producers and parasites in a developing economy through the Lotka–Volterra model. Our baseline model found a cyclical equilibrium between these two groups of agents. When the equilibrium output is low, we propose that economy is in a poverty trap, such that the only way to achieve superior equilibrium is through improvements in the institutional parameters (e.g. property rights). By adding expectations and time delays, the cyclical result may no longer hold. Nevertheless, institutional improvements promote development through an increase in the level of producers and a decrease of parasites. Still, such improvements positively affect the stability of the modified model.
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Resumo

Estudamos a dinâmica populacional de produtores e parasitas em uma economia em desenvolvimento através do modelo de Lotka-Volterra. Nosso modelo base encontra um equilíbrio cíclico entre esses dois grupos de agentes. Quando o produto de equilíbrio é baixo, estabelecemos que a economia está em uma armadilha de pobreza, tal que o único meio de alcançar um equilíbrio superior é através de melhora nos parâmetros institucionais (p.e. direitos de propriedade). Ao adicionar expectativas e defasagem temporal, o resultado cíclico pode deixar de existir. De todo modo, melhoras institucionais promovem desenvolvimento através de um aumento no nível de produtores e um decréscimo no de parasitas. Além disso, tais melhoras afetam positivamente a estabilidade do equilíbrio do modelo modificado.
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1. Introduction

Developing economies have in common the presence of a large number of unproductive businesses, which are financed by and survive at the expense of productive activities. These type of parasitic activities assume several forms, such as violent criminal organizations and gangs affiliated with corrupt politicians. Although parasites do not produce, they have the same objective as a regular firm, namely profit. Economic consequences of parasitic activities may be very serious, such that it is possible that it could result in an economy falling into a poverty trap (Mehlum et al., 2003a).

The following parasitic behavior is quite typical: on the one hand, they provide protection and enforce contracts of small businesses, but on the other hand the "price" of these services is charged through extortion. This is the well known *modus operandi* of mafia: problem solving, which should be a state responsibility, is handled by violent groups that extort the agents.[1] Although it is possible to find examples of such groups in developed countries (e.g. Sicilian mafia), the presence of parasites is more common in developing nations (see Campos, 2000 for eastern European economies in transition in general, Volkov, 2002 for Russia and Naím, 2006 for Latin American countries, for example).[2]

The aim of this paper is to model the population dynamics of producers and parasites in a developing economy. In order to do so, we use the Lotka–Volterra model, which describes the evolution over time of populations of predator and prey. The idea is to treat producers as prey and parasites as predators. Our baseline model finds cyclical equilibrium between these two groups of agents. When the equilibrium output is low, we claim that the economy is in a poverty trap, such that the only way to achieve a superior equilibrium is through improvements in the institutional parameters (e.g. property rights). By adding expectations and time delays, the cyclical result no longer holds. Nevertheless, institutional improvements promote development through an increase in the level of producers and a decrease of parasites. Still, such improvements positively affects the stability of the modified model.

Our paper contributes to the literature on economic development that considers the institutional environment and its influence on the economic growth (e.g. Besley and Ghatak, 2010; Mehlum et al., 2003a,b; Grossman, 1998) by stressing the importance of parameters like property rights and law enforcement, for example. Concerning to the use of Lotka–Volterra model in Economics, we follow the tradition of seminal paper by Goodwin (1967). Among its many extensions (e.g. Desai, 1973; van der Ploeg, 1988; Sportelli, 1995), one of the most innovative is Vadasz (2007), which incorporates time lag (and expectations) in the economy's dynamics in order to consider informational failure in the model. Because of this desirable feature, we adopt in our modified model the same framework as proposed by the latter author.

This paper is divided into two sections, besides this introduction. Section 2 presents the baseline model of producer and parasite dynamics as well as the modified one, which includes a time lag, and studies the stability of the found equilibria. Section 3 concludes by presenting the possibility of identifying a poverty trap and how it is possible to overcome it. Our findings also provide some policy implications, discussed in this section. Appendix A shows the proofs omitted from the text.

2. The dynamics of producers and parasites

2.1. The baseline model

Let us consider a developing economy where two types of agents, producers, and parasites exist. Producers include individuals and firms that engage in legal productive activities, which make the economy's output grow. These agents are the only ones that are productive. We make the simplifying assumption that all producers are identical and each one produces only one unit of output, such that the economy's aggregate output is equal to producers' number. We also assume that there is no barrier to entry and exit, and the market for factors is able to meet producers' demand without affecting their cost.

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[1] It is important to stress that, based on the above definitions, the appropriation of income made by this group is different from regular rent-seeking. Such agents capture income in a direct manner from an active – and usually large – state through regulation of private business, for example. On the other hand, parasitic action takes advantage of gaps due to an absence or weakness of the state.

[2] In order to have an idea of economic consequences of parasitic action, let us analyse the case of piracy, one of the most widespread activities of this sector. According Naím (2006), U.S. companies, for instance, estimate a loss of revenues due to falsification between 200 and 250 billion dollars. Furthermore, the European Union has reported that the cost due to illegal copies, in terms of lost jobs, may achieve 100 thousand.