



## Growth and inequality in a small open economy

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### ABSTRACT

This paper employs an endogenous growth model to analyze the growth and inequality relation for a small open economy where agents differ in their initial endowments of capital stock and international bond-holdings. We analyze the impacts of different structural shocks through their effects on agents' relative wealth and their labor supply decisions. Both theoretical analysis and numerical simulations demonstrate that openness – access to an international capital market – enriches the growth-inequality relations from those of the corresponding closed economy. Specifically, we show that the growth and distributional consequences of structural shocks depend crucially on whether the underlying heterogeneity originates with the initial endowment of domestic capital or foreign bonds.

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### 1. Introduction

The relation between growth and inequality is one of the fundamental questions in economics, dating back to the seminal work of Kuznets (1955). Despite the intensive research activity that this issue has generated, the nature of the relationship remains unresolved, with the empirical evidence being inconclusive. Early growth regressions by Alesina and Rodrik (1994), Persson and Tabellini (1994), Perotti (1996), and others, yield a negative growth-inequality relationship.<sup>1</sup> But more recent studies obtain a positive, or at least more ambiguous, relationship; see for example, Li and Zou (1998), Forbes (2000), and Barro (2000).<sup>2</sup> From a theoretical perspective, this empirical controversy should not be surprising. Because an economy's growth rate and its income distribution are both endogenous equilibrium outcomes of the economic system, the income inequality-growth relationship – whether positive or negative – will reflect the underlying set of forces to which both are reacting. To understand these linkages, it is necessary to adopt a structural, consistently-specified general equilibrium approach.

Following this approach, recent literature explores various economic factors and modeling strategies in analyzing the growth-inequality relationship.<sup>3</sup> However, virtually the entire growth-inequality literature is restricted to a closed economy, which is a severe shortcoming given the increasing openness characterizing most economies. Accordingly, the goal of this paper is to examine the linkage between growth and inequality in the context of a small open economy and to explore the additional

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<sup>1</sup> The various explanations for this include: the political economy consequences of inequality (Alesina and Rodrik, 1994), the potential harm inequality may cause for investment in physical or human capital (Galor and Zeira, 1993; Aghion and Bolton, 1997), and the unequal distribution of natural resources (Gylfason and Zoega, 2003).

<sup>2</sup> In particular, Forbes finds a positive relationship when the short-term impact is considered. Barro finds a negative relationship between inequality and growth for poorer countries, but a positive relationship for richer countries. Explanations for the positive relationship include: a positive relationship between inequality and higher tax rates to finance public education (Saint-Paul and Verdier, 1993), socio-economic stratification (Bénabou, 1996a), and the nature of technological progress (Galor and Tsiddon, 1997).

<sup>3</sup> Aghion et al. (1999) provide an overview of much of the literature.

dimensions that international transactions bring to the relation. Specifically, we focus on openness in the form of access to an international bond market and employ an open economy adaptation of Romer's (1986) canonical endogenous growth model.

In a completely general setup, in which the equilibrium growth rate and income distribution are mutually dependent, their joint determination and the analysis of their relationship become intractable (see e.g. Sorger, 2000). Following García-Peñalosa and Turnovsky (2006), we exploit the fact that if the utility function is homogeneous in its relevant arguments, the aggregate economy can be summarized by a representative agent.<sup>4</sup> As a result, aggregate behavior becomes independent of the economy's distributional characteristics, and the implied recursive structure enables one to address distributional issues in a tractable way. The class of constant elasticity utility function that dominates contemporary growth theory possesses this property, and we adopt it in our analysis.

While in general inequality may reflect diverse sources of underlying heterogeneity, several recent studies focus on agents' initial endowments of assets as being a key element. For example, Alesina and Rodrik (1994), Bertola (1993), García-Peñalosa and Turnovsky (2006), among others, develop closed-economy growth models where agents differ in their initial stocks of capital. By extending the analysis to an open economy with a competitive international bond market, we introduce an additional source of inequality, namely agents' initial endowment of the internationally-traded bonds. This extension enriches the growth-inequality relation in several dimensions. For example, to the extent that agents' relative endowment of domestic capital differs from that of international bonds, structural shocks, through their effects on the relative price of the two assets, may not only impact income inequality and its correlation with aggregate growth, but also wealth and welfare distribution as well.

The key mechanism generating the endogenous distribution of income is the positive equilibrium relationship we derive between agents' relative wealth and their relative allocation of time to leisure. This relationship has a simple intuition. Wealthier agents have a lower marginal utility of wealth. They therefore choose to increase consumption of all goods including leisure, and reduce their labor supply. Given their relative capital endowments, this translates to an endogenously determined distribution of income. The negative relationship between wealth and labor supply also has substantial empirical support from a variety of data sets; see e.g. Holtz-Eakin et al. (1993), Cheng and French (2000), Coronado and Perozek (2003), Algan et al. (2003).

Using this framework, we analyze the joint determination of the growth rate and inequality and consider how they respond to various structural changes, including an increase in productivity, an increase in savings (decrease in rate of time preference), and an increase in the foreign interest rate. The structural approach allows us to consider not just wealth and income inequality, but also welfare inequality. In doing so, we show how the impacts of these structural changes on the growth-inequality tradeoff depend upon the underlying origin of the heterogeneity, i.e. whether it originates with the endowment of capital or bonds. We also demonstrate that the presence of adjustment costs to capital accumulation may drive a wedge between an agent's relative wealth standing and her relative income, depending again on the relative endowments of domestic capital and foreign bonds. These findings highlight the relevance of international asset markets in understanding the growth-inequality relationship, and how this tradeoff facing a small open economy may be dramatically different from that confronting a closed economy. While access to an international riskless bond market captures only a limited aspect of openness, our analyses already illustrates the importance of considering such additional channels.

By adapting the basic Romer model, we are ignoring other important elements relevant to the growth-inequality relationship, most notably human capital and education. This aspect is emphasized by Galor and Zeira (1993), Bénabou (1996b), and Viane and Zitcha (2003), among others. By identifying agents' heterogeneity with their initial physical asset endowments, we are embedding distributional issues within a more traditional growth-theoretic framework. Indeed, the role of the return to capital, which is essential in that literature, has largely been ignored in the recent discussions of income inequality. The argument that the return to capital is essential to understanding distributional differences has, however, been addressed by Atkinson (2003), and is supported by recent empirical evidence for the OECD (see Checchi and García-Peñalosa (2005)). Like the Romer model, our model has the feature that the economy always lies on its balanced growth path. While this rules out the dynamics of income distribution, which are clearly important, it has the pedagogic advantage of highlighting the growth-inequality relation in a lucid way.<sup>5</sup>

## 2. Small open economy with heterogeneous agents and endogenous labor supply

We begin by setting out the structure of a small open economy. It is based on an endogenous growth model with endogenous labor supply, where agents have heterogeneous income, stemming from initial distributions of endowments of capital and of international bonds.

### 2.1. Technology and factor payments

The economy consists of a fixed number of firms indexed by  $j$ . The representative firm produces output using the production function<sup>6</sup>

<sup>4</sup> This strategy is also adopted by Caselli and Ventura (2000) and García-Peñalosa and Turnovsky (2007), among others. While knowledge of this feature dates back to Gorman (1953), it assumes particular importance in the present context.

<sup>5</sup> For the analysis of distributional dynamics in a closed economy see Caselli and Ventura (2000), Turnovsky and García-Peñalosa (2008).

<sup>6</sup> To simplify notation, we normalize to unity here the productivity parameter  $A$ , which enters the production function multiplicatively with function  $F$ . In Section 5 we will examine the effects of a change in  $A$ .

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