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# International trade and industrialization in a non-scale model of economic growth

Thomas Christiaans *

*Department of Economics, University of Siegen, Hölderlinstr. 3, 57068 Siegen, Germany*

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**Abstract**

The relationship between international trade, growth, and industrialization is analyzed in a two-sector non-scale growth model. The counterfactual prediction of new growth theories regarding a positive effect of population growth on per capita income growth is shown to be alleviated by allowing for international trade. While the growth-trade linkage is positive in most cases, it is negative if the rate of population growth is relatively large and the initial capital stock is relatively small. As the timing of the switch from autarky to free trade affects the process of industrialization, trade policy can influence structural change and long-run growth rates even in non-scale growth models.


*JEL Classification:* F43; O14

*Keywords:* Endogenous comparative advantages; Growth-trade linkage; Learning by investment

## 1. Introduction

Among the important questions relating to international trade and economic growth is whether more openness of a country always increases its growth rate of per capita income or not. One of the most convincing arguments in favor of free trade respectively an outward-looking development policy is that international trade can act as an impetus for the flow of knowledge across international borders (aside from the static gains from trade). The most important argument in favor of an import substitution policy is the infant industry argument for protection. The new growth theory, which gives an endogenous explanation of growing labor productivity in the long run, provides the background for a more thorough theoretical analysis of these issues.

Jones (1995) pointed out, however, that *endogenous growth models* such as Romer's (1990) seminal contribution exaggerate by implying that an increase in the size or scale of an economy permanently increases its long-run growth rate of income per capita. This criticism of such *scale models* led to the formulation of *non-scale models* in which long-run per capita growth rates do not depend on population (or another measure of scale) directly but just on the rate of population growth. As the long-run growth rates in non-scale models are usually independent of policy instruments, they are also known as models of *semi-endogenous growth*.

* Corresponding author. Tel.: +49 271 7403186.
*E-mail address:* christiaans@vwl.wiwi.uni-siegen.de.

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Although non-scale growth models need not be models of semi-endogenous growth, nor the other way around, it has been shown in Christiaans (2004) that in the absence of particular knife-edge conditions both properties appear together. Moreover, any model of steady state growth implies that a knife-edge condition must be satisfied (cf. Christiaans, 2004; Growiec, 2007). One such condition that appears to be justifiable is that population grows at a constant rate (Jones, 2001). Any model requiring no further knife-edge conditions must be of the semi-endogenous non-scale type considered in this paper.

The general steady state properties of such non-scale growth models have been analyzed by Eicher and Turnovsky (1999b) for the case of closed economies. It is straightforward that these models are reasonably consistent with the well known stylized facts about growth with two exceptions. First, a closed economy model obviously cannot address the empirically observed positive correlation between the growth in the volume of international trade and the growth of output (the *growth-trade linkage*). Second, the models are inconsistent with the observed negative correlation between population growth rates and the levels of per capita income (the *population puzzle*). Even though there is no unanimity regarding both of these facts in the literature, a number of cross-country studies have shown that population growth and growth of per capita output are either uncorrelated or even negatively correlated (e.g., Mankiw et al., 1992). While most of the empirical literature finds evidence for a positive growth-trade linkage, Rodriguez and Rodrik (2001) expressed serious scepticism about these results.

As has been shown in Christiaans (2003), the population puzzle need not arise in open economy models. That approach cannot at the same time address the growth-trade linkage, however. It is the purpose of the present paper to present a simple two-sector (manufacturing and agriculture) small open economy non-scale growth model dealing with the growth-trade linkage and at the same time alleviating the strong prediction that an increase in the rate of population growth *always* increases per capita income growth.

As Grossman and Helpman (1991) and Feenstra (1996) have stressed, the literature on trade and growth entails two opposite sets of results, which are related to the discussion about outward-looking versus import substitution policies. While models based on learning by doing or human capital accumulation (e.g., Lucas, 1988, section 5) usually predict unequal per capita income growth rates of economies (possible exceptions are outlined in Young, 1991; Goh and Olivier, 2002), models of endogenous technological change following Romer (1990) usually establish that trade will lead to a convergence of growth rates across countries. The latter result often depends on the crucial assumption that the international diffusion of knowledge appears simultaneously with trade. As Feenstra (1996) illustrates using a model in the tradition of Grossman and Helpman (1991), unequal growth is possible if there is no international diffusion of knowledge.

The empirical question of whether knowledge spillovers are primarily intranational or international in scope is therefore important for an assessment of international trade and growth. By way of example, the studies of Jaffe et al. (1993) and Branstetter (2001) provide evidence for geographically localized or intranational spillovers, respectively. Of course, these results do not imply that there is no international knowledge diffusion, but just that intranational diffusion is more important. According to Griffith et al. (2004), R&D does also enhance the absorptive capacity for inventions made abroad and therefore helps countries to "catch-up". Although Keller (2004) in his survey of international technology diffusion provides examples of countries for which foreign R&D matters even more than domestic R&D, he finds that the evidence generally supports the hypothesis that "technology diffusion within countries is stronger than across countries" (p. 772).

Given the ambivalence of empirical evidence, it is worthwhile to consider models with international as well as models with intranational knowledge spillovers as benchmark cases. The present model uses learning by investment as the engine of growth and sticks to the assumption that learning is external on the firm level but internal on the country level. Related to this assumption, the model also abstracts from international capital movements. In contrast to former scale models, it is possible to consider a positive rate of population growth in this non-scale model. The growth rates under free trade of the home country as compared to those of the rest of the world will be shown to depend on the relative magnitude of the domestic population growth rate (as compared to the average rate in the rest of the world) and the pattern of specialization.

In accordance with the empirical results of Rodriguez and Rodrik (2001), however, there is no unambiguous relationship between trade and growth. The reason is that switchovers in comparative advantages are possible.[1] Depending

[1] Cf. Landesmann and Stehrer (2001) for empirical evidence on switchovers in comparative advantages at the industrial level.