

Environment, fertility, structural change, and growth

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This thesis analyzes three interesting aspects that affect economic growth, that is, the environment aspect, the fertility aspect, and the structural change aspect, and clarifies their relationships with economic growth.

First, as for the environment aspect, we analyze how transboundary pollution caused by the pursuit of economic growth in developing countries affects the environmental conditions and life expectancy in these countries and in neighboring developed countries. We develop an overlapping generations (OLG) model, which considers the environmental interactions between two regions representing the developed and developing countries. We consider two models that differ in their environmental interactions: one in which the two regions share an environment and the other in which they do not. By comparing the environmental qualities of the two models' steady states, we show that the two regions sharing an environment may enter a trap characterized by both lower environmental quality and shorter life expectancy due to a free rider problem.

Second, as for the fertility aspect, traditional theoretical analyses on the interactions between economic development and fertility behavior mainly focus on two aspects of fertility: total fertility rate and childbearing age. In this work, we develop a three-period model with two periods of childbearing to consider the two aspects at the same time. Also, since theoretical and empirical researches show the correlations between educational (human capital) factors and fertility, we incorporate education into the model. We examine how well the model can explain the long-run changes in fertility and education in countries such as the US and the UK qualitatively. We focus on four periods of the long-run changes: the period of the rapid fertility decline roughly from the early 1920s to the early 1930s; the period of baby boom roughly from the early 1940s to the early 1960s; the period of "baby bust" roughly from the early or middle 1960s to the mid-1970s; and the period of rising fertility of elder mothers and falling fertility of younger mothers after the mid-1970s. Changes of fertility and education in the period roughly from the early 1920s to the early 1930s can be explained by the increased productivity of childhood education of the model; the changes in the period of baby boom can be explained by the decreased fixed time spent on household chores, the decreased relative cost of late childbearing and the decreased cost of child-rearing except the increased years of secondary education; the changes in the period of "baby bust" can be explained by the increased cost of child-rearing; the changes in the period after the mid-1970s can be explained by the increased productivity of adulthood education except the largely unchanged total fertility rate.,

Finally, as for the structural change aspect, traditional structural change analysis typically uses the Cobb-Douglas production function in which the elasticity of substitution between capital and labor (ES) is 1. Although such setting makes analysis relatively simple, it is not able to explain a part of empirical facts, such as changes in factor income shares and sectoral capital-labor ratios. Also, evidence shows that the ESs vary between sectors and the ES of the macro economy changes over time. Therefore, we explore a two-sector framework with the sectoral difference in the ES to analyze how sectoral labor, capital and value-added shares, the factor income ratio, and the ES of the macro economy change over time. Analysis shows that the income ratio of capital to labor exhibits an inverted U-shaped trend, the capital share of the non-agricultural sector exhibits a U-shaped trend, and the macro-ES decreases over time in the early stage of development and increases over time in the late stage of development. The first result is consistent with empirical observations except recent periods in developed countries in which the income ratio is rising. By contrast, the remaining results agree with some studies but are only partially consistent with other studies. A likely reason for the discrepancy is that in our model, capital stands for equipment such as machines and power products, while in these works, capital includes structure as well as equipment.