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Fertility, economic growth, and human development causal determinants of the developed lifestyle

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ABSTRACT

The paper focuses on the long-term determinants of economic development and demographic transition and identifies the causal structure governing the triad of high income, high human development and low fertility rates defined as the “developed lifestyle”. We construct a balanced panel for 72 countries between 1980 and 2007 and use panel unit-root and cointegration tests. In estimating the long-run relationship between cointegrated variables, we use the dynamic OLS (DOLS) estimation techniques. Empirical results show a causal long-run relationship between high income, high human development and low fertility. The evolution of the developed lifestyle differs significantly, however. In advanced economies, the demographic transition is essentially complete and therefore only changes in human development and income matter. In developing countries, fertility is negatively related with human development, but positively with income and – consistently with Galor and Mountford (2006, 2008) – trade. Moreover, we find no significant impact from human development on income – either for advanced economies or for developing countries.

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1. Introduction

In the last two and a half decades, economic growth theory has expanded the list of fundamental development processes to include not only income but also human capital, demographic transition, technology/urbanization, institutions, and economic integration. Some of these processes are closer to being the main causal backbone of economic development than others. In particular, one major characterization of economic development is the “developed lifestyle” defined as high income, high human capital, and low fertility. This article questions the long-term determinants of the developed lifestyle and seeks to identify the causal structure governing the triad of income, human development (i.e. human capital) and fertility. Clarifying the interaction of these components of the human development process is crucial for identifying the causal structure of long-run economic development.

To address this question, we apply cointegration techniques to an annual panel on economic development combining the UNDP dataset on human development indicators of Gidwitz et al. (2010) with the World Development Indicators dataset (World Bank, 2010). In particular, we construct a balanced panel for 72 countries between 1980 and 2007 and use panel unit-root and cointegration tests to determine the causal structure for the developed lifestyle, while controlling for

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institutions, technology/urbanization, and economic integration. To estimate the long-run relationship between the cointegrated variables, we use the dynamic OLS (DOLS) estimation techniques proposed by [Kao and Chiang \(2000\)](#) in order to avoid spurious regression results introducing leads and lags of first differences. This means that we account for the presence of the very short-term causal relations that are consistently present in the long run. As a robustness test, we also lag our explanatory variables to 5 years to test if long-run causal relations are more medium-term related. For example, there is no doubt that fertility has its major impact on human capital and income in the future, but higher levels of education lead to lower fertility rates and higher income in the very short-run. Empirical results show a causal long-run relationship between high income, high human development and low fertility. The evolution of the developed lifestyle differs significantly, however. In advanced economies, the demographic transition is essentially complete and therefore only changes in human development and income matter. In developing countries, fertility is negatively related with human development but positively with income and – consistently with [Galor and Mountford \(2006, 2008\)](#) – trade. Moreover, we find no significant impact from human development on income as in [Mayer-Foulkes \(in press\)](#), which slows the transition to the developed lifestyle and therefore to economic development.

The paper is organized as follows: Section 2 reviews the literature on long-term economic development and outlines the existing empirical evidence. Section 3 describes the data. Non-stationary issues and estimation techniques are covered in Section 4, while Section 5 contains our empirical results. Section 6 presents the conclusions.

2. Economic growth and human development

Income has long been considered the evident main feature of economic development. Until the mid-twentieth century, economic growth was viewed fundamentally as a process of capital accumulation, or industrialization ([Harrod, 1939](#); [Domar, 1946](#)). In confronting cross-country data, this point of view shifted, affording a more prominent role to human capital and technological change. Human capital was used as an input complementary to physical capital, representing knowledge or skills. Knowledge could lead to endogenous growth, and was first thought of as an externality of capital accumulation, and then as accumulated asset ([Arrow, 1962](#); [Uzawa, 1965](#); [Frankel, 1962](#); [Romer 1986, 1990](#); [Lucas, 1988](#)). Using an augmented Solow model, [Mankiw et al. \(1992\)](#) argue that simply including human capital could account for an important proportion of cross-country income variation. However, productivity differences across countries are found to be very significant ([Knight et al., 1993](#); [Islam, 1995](#); [Caselli et al., 1996](#); [Klenow and Rodríguez-Clare, 1997](#); [Hall and Jones, 1999](#); [Easterly and Levine, 2002](#)). [Aghion and Howitt \(1992, 1998\)](#) distinguish knowledge from skill to model endogenous technological change, conceptualized as a driving force complementary to capital accumulation. [Howitt's \(2000\)](#) multi-country model shows that convergence and growth are driven by the diffusion and spillover of ideas. [Dollar and Wolff \(1988\)](#) find that technological convergence rather than factor accumulation was behind the tendency of OECD countries to catch up with the USA. These ideas can also be used to explain underdevelopment. [Howitt and Mayer-Foulkes \(2005\)](#) model underdevelopment and development as distinct steady states in technological change, while [Aghion et al. \(2005\)](#) identify the effect of credit on steady-state levels in technological change. What emerged was a long-term conceptualization of the production process as dependent on the accumulation of capital, human capital (i.e. education) and technology. In summary, the main thrust of the theoretical and econometric literature of the last three decades has been that income growth is driven by rising human capital and technology. In turn, some of the literature considers that these determinants may be subject to mechanisms of persistent inequality between countries.

Health also gained center stage, or at least a claim to a central, fundamental role, in a second, complementary, approach to economic development. Health came to be conceptualized as part of human capital based on evidence of its long-term impact on economic growth. Nobel Prize-winning historical studies by [Fogel and Wimmer \(1992\)](#) and [Fogel \(1994\)](#) find that a third or even one-half of the economic growth in England over the last 200 years was due to improvements in nutrition and health. [Arora \(2001\)](#) find comparable results for seven industrialized countries using 100–125-year time series of diverse health indicators. Econometric studies then incorporated health into the study of human capital ([Schultz, 1997](#)). The role of health in generating income and education has also been ascertained in a series of macroeconomic studies (e.g. [Knowles and Owen, 1995, 1997](#); [Bhargava et al., 2000](#); [Gallup and Sachs, 2000](#); [Mayer, 2001a, 2001b](#); [Sachs et al., 1995](#); [Sachs and Warner, 1997](#)). [Heckman and Carneiro \(2003\)](#) identify early childhood development as a crucial stage of investment in human capital formation, with especially high returns. To sum up, this second, mainly econometric strand of the literature finds that improved health is not merely a consequence of economic development, but that in fact it has an independent and measurable impact on education, income and technology. Hence, there are mutual positive impacts between income and human development, and that these are positively affected by technological change, institutions, and economic integration.¹

In an effort to provide a single theoretical framework to address the traditional concern with the link between population growth and income, the third approach to economic development leads to the unified growth theory and the importance of demographic transition. This approach posits that a combination of reduced population growth and creation of human capital is essential for technological change and per capita income growth ([Galor and Weil, 1999](#)). Demographic transition in turn depends on the incentives that human capital returns create for fertility choice ([Galor, 2011, 2012](#)). Increased human capital investment in turn generates technological change. This theory also provides a theory of underdevelopment, which

¹ See for example [Frankel and Romer \(1999\)](#) and [Sachs et al. \(1995\)](#).

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