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Returns to specialization, competition, population, and growth

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ABSTRACT

Using an expanding-variety endogenous growth model with purposive human capital accumulation, this paper provides an alternative explanation of why we may observe an ambiguous correlation between product market competition (PMC) and economic growth, and between population and economic growth rates. Our explanation is based on the notion of 'returns to specialization'. Under the model's assumptions, PMC and economic growth are ambiguously correlated when returns to specialization are decreasing, whereas population growth and productivity growth are ambiguously correlated when returns to specialization are increasing. From a theoretical point of view, these results are explained by the presence or absence of an 'increasing production-complexity' effect associated to the use of a larger number of intermediate-input varieties in the same production process.

1. Introduction

Does *product market competition* (*PMC*, hereafter) promote or deter economic growth in the long run? What is the sign of the impact of population growth on productivity growth? Although economists have been studying for a long time the effects of an increase in the intensity of PMC and in the population growth rate on R&D incentives, the pace of innovation and productivity growth, these questions still remain to a large extent unsettled.

Given its intrinsically *nonrival* nature, the presence of technological progress (in the form of creation of new ideas) leads to non-convexities in an otherwise standard neoclassical production function with constant returns to scale to rival inputs and, therefore, a decentralized equilibrium with price-taking competition cannot be sustained. Schumpeter (1942) was among the first to recognize that more market power,[1] by increasing the rents that can be appropriated by the successful innovator, definitely spurs R&D incentives and, hence, stimulates economic growth in the long run. Contrary to this view, more recent theoretical research (both IO and macro-based)[2] finds mixed results in the correlation between PMC and

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[1] In what follows, terms like monopoly (or market) power and competition will refer to the way in which an industry is organized from the point of view of its own product market structure (*i.e.*, whether it is more or less concentrated).

[2] An excellent review of these two branches of the literature on PMC, innovation and economic growth is in Aghion and Griffith (2005).

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innovation/growth, and the existing empirical evidence confirms the ambiguity of this correlation.[3] In order to account for this varied evidence, the basic *Schumpeterian-growth paradigm* (Aghion and Howitt, 1992) has been recently re-formulated and extended[4] to include consideration of *agency problems*, a more gradualist ("*step-by-step*") view of technological progress, and the decomposition of R&D activities into *research* and *development*. As a whole, it is a fair conclusion that there now exist many different and persuasive (theoretical and/or empirical) arguments showing that the sign of the relationship between PMC, innovation and economic growth may be either always positive, or always negative, or ambiguous.

Though, it is well known that R&D activity and growth in real per-capita incomes are influenced not only by the degree of PMC but also by demographic change. Kuznets (1960), Simon (1981) and Boserup (1981) have been among the main and early advocates of the so called "*population-push hypothesis*", according to which: "…*Population growth…produces an absolutely larger number of geniuses, talented men, and generally gifted contributors to new knowledge whose native ability would be permitted to mature to effective levels when they join the labor force…*" (Kuznets, 1960, p. 328). Similarly to the relationship between PMC, innovation and productivity growth, so far a complete agreement about the sign of the long run correlation between population and economic growth rates has not emerged yet, both empirically and theoretically (Ehrlich and Lui, 1997; Kelley and Schmidt, 1995 and 2001; Tournemaine, 2007).[5] Proponents of the view that population growth is detrimental to economic growth (for example, Solow, 1956; Barro, 1991; Mankiw et al., 1992) found their argument on the belief that an increase in population leads to a dilution of reproducible resources. Conversely, proponents of the optimistic view (population growth is beneficial to economic growth) emphasize the positive effect that a larger population can exert on innovation and the rate of technological progress (R&D-based growth theories).

Using an expanding-variety endogenous growth model with purposeful human capital accumulation, the first aim of the present paper is to provide an alternative explanation of why we may observe an ambiguous correlation between PMC and economic growth, and between population growth and economic growth. Our explanation is based on the notion of "*returns to specialization*", that is the extent "…*To which society benefits from* '*specializing*' *production between a larger number of intermediates*" (Benassy, 1998, p. 63). In our model the markup ratio is related (although in a contradictory manner) to the returns to specialization. The sign of such correlation depends, in fact, on the magnitude of a key parameter that indicates (when compared to one) which of the two opposing forces (*specialization* vs. *increasing production-complexity*) associated to the simultaneous use of a larger number of intermediate-input varieties prevails over the other. This trait of our model represents a departure not only from the first generation growth models with endogenous technological change—such as Grossman and Helpman (1991, Chapter 3), in which there exists a one-to-one relationship between the monopolistic markup and the degree of returns to specialization—but also from Benassy (1996a, 1996b, 1998), where the degree of returns to specialization is set to a level completely independent of the markup rate. Along the *balanced growth path* (*BGP*, henceforth), human capital and ideas grow at constant rates and the growth rate of real per-capita income depends on population growth, the degree of returns to specialization and the rates at which individuals and firms accumulate, respectively, human capital and ideas. Moreover, the returns to specialization are also ambiguously correlated to the growth rate of ideas and human capital, with the sign of these correlations ultimately depending on whether agents' intertemporal elasticity of substitution in consumption is higher, lower, or equal to one. In the light of all this, an exogenous increase in the markup ratio affects the economy's growth rate in two fundamental ways: *directly*, through the effect it has on the degree of returns to specialization ('*returns to specialization*' effect) and *indirectly*, via the impact that the changed degree of returns to specialization has, in turn, on factor accumulation (*i.e.*, the accumulation of ideas and human capital, this is the '*accumulation*' effect). Although it exhibits an ambiguous sign, we see that along the BGP the indirect '*accumulation*' effect does not alter the sign of the whole impact of a change in the markup on economic growth, which is therefore uniquely determined by that of the direct '*returns to specialization*' effect. Likewise, an increase in population influences real per-capita income growth both directly ('*dilution*' effect) and indirectly ('*ideas*' effect). The direct *dilution effect* measures the impact of a more sizable population on the per-capita endowment of the reproducible resources, and is always negative. On the other hand, the indirect '*ideas*' effect describes the influence that an exogenous change of population size may have on the economy's growth rate of ideas and is positive if, for given intertemporal elasticity of substitution in consumption, the degree of agents' altruism towards future generations is sufficiently high (the more altruistic agents are, the more patient they become, and the more willing they are to invest for the future). When the '*ideas*' effect is positive, the total impact of a rise of population size on real per-capita income growth is then a priori ambiguous, and we find that it is again crucially associated to the degree of the returns to specialization.

Another objective of the model is to explain not only why in some (typically OECD) countries the correlation between PMC and economic growth may be ambiguous, but also why in other (notably, less-developed but fast growing, non-OECD)

[3] Nickell (1996) and Blundell et al. (1995, 1999), for example, find that competitive pressures encourage innovation and, therefore, may have a positive effect on productivity growth in a long run perspective. On the other hand, Aghion et al. (2005) show convincingly that the relationship between PMC and innovation/growth is *inverted U*-shaped.

[4] A complete description of these extensions can be found in Aghion and Howitt (1998, Chapter 7) and Aghion and Griffith (2005).

[5] "…*Though countries with rapidly growing populations tend to have more slowly growing economies…, this negative correlation typically disappears (or even reverses direction) once other factors …are taken into account. …In other words, when controlling for other factors, there is little cross-country evidence that population growth impedes or promotes economic growth. This result seems to justify a third view: population neutralism*" (Bloom et al., 2003, p. 17). Fifteen years earlier, however, Kelley (1988, p. 1686) already reached the conclusion that, depending on the country under scrutiny, population change might have affected positively, deterred or even had no impact on economic development.