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Migration, human capital accumulation and economic development ☆

Corrado Di Maria [a,*], Piotr Stryszowski [b]

[a] University College Dublin, Dublin, Ireland
[b] OECD, Paris, France

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ABSTRACT

We study how the possibility of migration changes the composition of human capital in sending countries, and how this affects development. In our model, growth is driven by productivity growth, which occurs via imitation or innovation. Both activities use the same types of skilled labour as input, albeit with different intensities. Heterogenous agents accumulate skills in response to economic incentives. Migration distorts these incentives, and the accumulation of human capital. This slows down, or even hinders, economic development. The effect is stronger, the farther away the country is from the technological frontier.

1. Introduction

Classical theoretical studies on the *Brain Drain* hold that migration of skilled workers is beneficial for destination countries and harmful for source ones.[1] Bhagwati and Hamada (1974), Kwok and Leland (1982), Galor and Tsiddon (1997), and Miyagiwa (1991), for example, all point at the potential negative effect of the outflow of human capital on source countries. These predictions, however, are at odds with the experience of some sending countries that grew faster than relatively more closed ones. Examples include Japan, South Korea, Taiwan and Singapore as opposed to Bangladesh, India and Indonesia.[2]

Recently, the literature has focused on the potential for a *Beneficial Brain Drain*, a *Brain Gain* (BG). The central proposition of studies such as Mountford (1997), Stark et al. (1997, 1998) and Vidal (1998), and Beine et al. (2001) is that the possibility of emigration reinforces the incentives to accumulate skills, and that source countries actually increase their stock of human capital as possibilities to work abroad increase.

Empirical work on the effects of skilled migration on source countries has provided mixed results. Recently Beine et al. (2008) have shown that the net effect of the brain drain can be either positive or negative, and that the BG hypothesis is supported only for a small number of countries. The authors conclude pointing out the necessity of a better understanding of the circumstances and factors favouring the occurrence of a detrimental brain drain.

This paper focuses on the role of the composition of human capital in fostering productivity growth and economic development. Our study is based on the well established literature that points at productivity growth as the key engine driving innovation and thus economic development (see Jones, 2005, for a discussion). The arguments we present are additionally motivated by the recent literature discussing the determinants of innovative societies (e.g. Feinstein, 2006).

The literature on the BG implicitly assumes that all human capital is equally useful to the sending country, irrespectively of its stage of development. A long literature dating back to Becker (1964), instead, recognizes the different roles played by different types of human

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* Corresponding author.
E-mail address: corrado.dimaria@ucd.ie (C. Di Maria).

[1] Borjas (1994, 1995) provides excellent reviews of the economics of immigration. For a recent survey of the literature on Brain Drain, see Commander et al. (2003).

[2] Japan and South Korea experienced high levels of skilled emigration in recent decades: over 9% of Korean skilled workers left the country in 1990. In the same year, Taiwan and Singapore had even higher rates: 15.2% and 24.8%, respectively. India (3.9%), Bangladesh (2.1%), and Indonesia (3.9%) suffered much smaller outflows. However, Japan and the Asian Tigers grew much faster than the countries in the latter group.

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capital. In a development context, both Durlauf and Johnson (1997) and Krueger and Lindahl (2001), for example, provide evidence as to the heterogenous effects of education on growth across countries with different levels of development. Recent investigations have highlighted complementarities between different types of human capital in the innovation process. Mokyr (2005), speaking of the industrial revolution, argues that it had less to do with technological breakthroughs, and more with the intellectual climate linking creative efforts to economic rewards. Sustained growth became possible thanks to the systematic transformation of inventions into commercially lucrative technologies. In a modern context, Yusuf (2007, page 3) recognizes that "many forms of creativity can be valuable, [but] the economic yardstick favours creativity which leads […] to commercial results". Thus the degree of (economic) success of a society depends on its ability to promote the sustained conversion of inventions into innovations; this ability "is a function of organizational capabilities and the coordinated use of multiple skills—managerial, financial, marketing and legal".[3] In other terms, scientific knowledge and technical skills, while necessary, are not sufficient to the emergence of innovative societies. Instead, the more advanced a society, the more fundamental the need for a full range of competencies and skills.

Following up on this discussion, we assume that imitating available techniques is an easier task than bona fide innovation. Thus, in the early stages of development, when the main task is to copy and adapt available technologies, a specialization in technical skills may be helpful. At later stages, however, the development of truly innovative techniques requires a broader range of skills: technical, financial, managerial, legal and political. Thus, we assume that improvements in productivity depend on the composition of human capital in each country, and on the distance from the technological frontier.

We recognize that skill accumulation is influenced by the prospects of migration. The International Organization for Migration (IOM, 2003) recently claimed that "prospects of working abroad have increased the expected return to additional years of education, and led many people to invest in more schooling, especially in occupations in high demand overseas." To capture this effect, we extend the model of Vandenbussche et al. (2006), making skills accumulation endogenous, and study the interactions between human capital accumulation, labour market outcomes, and migration possibilities, and their implications for the process of development.

Our results show that migration distorts the agents' incentives to accumulate the most appropriate skills for their country of origin; this reduces the growth rate of the source economy. We identify (plausible) circumstances under which this process leads to development traps, i.e. situations where convergence stops short of the technological frontier. The model's policy implications provide a rationalization of policies implemented by successful East-Asian economies, where Governments invested in specific types of tertiary education with an eye to the interests of local employers. Our conclusions are also consistent with the recent shift from interventionism to laissez-faire in these countries: when convergence has been achieved, direct interventions become redundant, and market mechanisms regain center stage.

2. The model

Our economy consists of two countries, a large destination country and a small source one. The destination country (which we can think of as the group of the OECD countries for concreteness) is the technological leader, whereas the source country is technologically less developed.

The economy is populated by (skilled) workers and firms. Workers accumulate skills, and supply skilled labour to firms. Skill accumulation is costly as time is needed to acquire knowledge. Workers differ in their 'talent', so that certain skills are more difficult to accumulate for some agents than for others. All workers accumulate skills and they can only acquire two types of skills, which we broadly label 'technical' and 'general'. Thus there are two types of workers: technically- (T) and generally-skilled (G).[4]

Since the reward to the accumulation of different skills depend on the wage commanded by the specific skill and the opportunity cost it entails, each worker chooses the type of skills to acquire, based on her type.

Firms engage in production of an intermediate good needed to produce the final good, and invest in technology improvements. Workers are only used in the latter activity, hence firms decide how many workers of each type to employ in the 'research' sector.

In the next subsections we describe the workers' skill accumulation decision and the parallel innovation choices facing firms. We first discuss these decisions in a situation where no migration possibility exists—this fully characterizes the destination country, given our assumption that it is large enough that smaller foreign markets are not relevant to its agents' decisions.[5] We then allow for migration. As regards international links, our analysis focuses on the flow of ideas (via imitation), and of skilled workers across countries and, for the sake of simplicity, we ignore the possibility that goods are traded internationally.

2.1. Investment in education

Workers only live for one period: each period a new cohort of agents is born; they decide about their education, work for a wage, consume all their income, and eventually die. There is no population growth, the population size in the leading country is $\bar{L}$, larger than L, the population in the lagging country. Without loss of generality, as long as we only look at one country at the time, we can simplify notation by letting the population size equal 1.

Workers are risk neutral and differ only in their ability to accumulate human capital. They are ranked in terms of increasing talent, by $j \in [0,1]$ and – in the interest of simplicity – uniformly distributed over that interval. The agent's talent determines her relative cost to acquire general skills. Agent j needs to spend a fraction $(1-j)$ of her time to acquire these skills, while the time needed to learn technical skills is independent of talent and equal to $(1-\xi)$ for all workers, with $\xi \in (0,1)$.[6] Agent j thus provides j units of general skills, or ξ of technical skills.

The composition of skills is determined by their relative costs, and rewards. Letting the salary for a G-skilled (T-skilled) worker at time t be $w_{Gt}=\omega_{Gt}A_{t-1}$ ($w_{Tt}=\omega_{Tt}A_{t-1}$), with ω_{Gt} the wage per effective unit of human capital provided at time t, and A_{t-1} the level of total factor productivity at time $t-1$, it is possible to identify the worker, j', who is indifferent between acquiring technical or general skill. For her it must hold that:

$$\omega_{Tt}\xi = \omega_{Gt}j'. \tag{1}$$

All agents indexed by $j \in [0,j']$ accumulate technical skills, while agents with $j \in (j',1]$ become 'generalists'. The total supply of G-skilled labour equals

$$G_t = \int_{j'}^{1} j\mathrm{d}j = \frac{1}{2}(1-j'^2);$$

[3] Yusuf (2007), page 3.

[4] Notice that all skills in our framework represent "general skills" in the sense of Becker (1962), as they can be usefully employed by any firm.

[5] In this paper we focus on the migration of skilled workers, in this context the assumption that the destination country's labour market does not respond to the inflow of foreign workers is plausible as the share of foreign-born individuals with tertiary education in the total skilled workforce of OECD countries is less than 2% according to the OECD's "Database on immigrants and expatriates."

[6] This only means that, using the difficulty of developing technical skills as a benchmark, general skills are relatively easier to acquire for some individuals. G-skills are not overly costly for any worker, but for some, technical ones are easier to acquire.