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Endogenous growth and the gains from immigration

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Abstract

This note is concerned with the welfare implications of immigration when growth is endogenous. In contrast to standard neoclassical results, immigration will benefit an arbitrary native if and only if the average immigrant possesses more capital than the average native.

Keywords: Immigration policy; Democracy; Endogenous growth; Capital accumulation

JEL classification: F22; O41

1. Introduction

One of the central insights of neoclassical migration theory is that the host country as a whole gains from immigration, provided that the physical capital endowment of the average native differs from that of the average immigrant (Berry and Soligo, 1969). This result is due to the factor price movements immigration induce by changing the capital–labor ratio: when the average immigrant is equipped with less capital than the average native, immigration increases the supply of labor relative to that of capital and vice versa. On average, the increase in the remuneration of the more scarce factor will more than offset the lower return of the other. Nevertheless, immigration may be problematic from a distributional point of view, as some members of the domestic population may hold too little of the more scarce factor to overcome the losses incurred by the more abundant one. This point is elaborated formally by Benhabib (1996), who also discusses the political economy of immigration. He shows that society divides into two groups, one (the capital-rich) wanting to admit only capital-poor and the other (the capital-poor) only capital-rich migrants.

The purpose of this note is to examine these results in a setting that allows the economy to grow at an endogenously determined rate. This feature, which has hardly been investigated in the migration literature so far, leads to a quite different finding: Building on the ingredients of the Romer (1986)

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model, we show that immigration benefits an arbitrary native (including the average one) if and only if the average immigrant owns more physical capital than the average native. The mechanism responsible for this bias towards capital-rich immigration is a simple one: The central feature of the Romer (1986) growth model is a positive externality created by the economy-wide capital stock rendering the return to physical capital constant as capital is accumulated over time. But then, the interest rate is constant, ruling out the possibility of higher interest earnings to overcome lower wages caused by capital-poor immigration. Capital-rich immigration, on the contrary, increases the wage income of every native without diminishing his capital income.

The paper is organized as follows. The next section sets up the model and discusses the impact of immigration on the natives' economic position. Concluding remarks can be found in Section 3.

2. The model

Consider an economy where output Y is produced with physical capital K and labor L. While every member of the native population $i = 1, \ldots, N$ inelastically supplies one unit of labor, people differ with respect to their endowment of physical capital K^i. Total and average native physical capital endowments are denoted by K^N and $k^N = K^N/N$, respectively. The economy-wide capital–labor ratio of the economy corresponds to $k = K/L$, which, without immigration, trivially equals k^N. If, however, $M \geq 0$ immigrants are allowed in, the capital–labor ratio becomes:

$$k = k^N + m(k^M - k^N), \tag{1}$$

where $m = M/(N + M)$ is the immigrants' share of the new working population $L = N + M$ and $k^M = K^M/M$ is the average immigrant's capital endowment.

Production is carried out by competitive firms according to a constant returns to scale production function:

$$Y = F(K, A \cdot L) = f\left(\frac{K}{A \cdot L}\right) A \cdot L,$$

where A is an economy-wide labor-augmenting technology parameter, exogenous to the single firm. This parameter reflects the positive spillover that investments in physical capital have on the economy as a whole by creating knowledge as a side product (Arrow, 1962; Romer, 1986). In accordance with the literature, this *learning-by-investing* effect is assumed to have the following functional form:

$$A = \frac{1}{a}\frac{K}{L} = \frac{1}{a}k, \tag{2}$$

with $a > 0$. Labor productivity is determined by total investment per worker, that is, the capital–labor ratio.[1]

[1] It should be noted that some endogenous growth models, including the original work of Romer (1986), use a slightly different formulation: they assume the externality to depend on total rather than per-capita investment. Yet, such a specification has the counter factual implication that a continuous expansion of the labor force, be it caused by immigration or domestic fertility, produces an ever increasing per capita growth rate (Barro and Sala-i-Martin, 1992). Consequently, approaches with endogenous growth and non-stationary populations typically employ a formulation like (2), also because it is the only one consistent with a balanced growth path (King and Ferguson, 1993).

Factor markets are competitive, thus firms employ labor and capital such that the respective marginal products, taking A as given, correspond to their factor prices. This implies:

$$\frac{\partial Y}{\partial K} = f'\left(\frac{K}{A \cdot L}\right) = r,$$

and:

$$\frac{\partial Y}{\partial L} = f\left(\frac{K}{A \cdot L}\right)A - f'\left(\frac{K}{A \cdot L}\right)\frac{K}{L} = w,$$

which, after substitution of (2) gives:

$$r = f'(a) \tag{3}$$

$$w = [f(a)/a - f'(a)]k. \tag{4}$$

For an individual with capital endowment K^i, current income corresponds to $r \cdot k^i + w$, with factor prices given by (3) and (4).[2] This yields the following:

Proposition. *Each native benefits from immigration if and only if the average immigrant possesses more capital than the average native. He is worse off precisely if the average immigrant is endowed with less capital than the average native.*

This proposition is easily established by comparing the native's income with and without immigration:

$$f'(a)K^i + [f(a)/a - f'(a)]k \gtreqless f'(a)K^i + [f(a)/a - f'(a)]k^N.$$

Rearranging immediately yields $k \gtreqless k^N$ and, by (1), $k^M \gtreqless k^N$.

The intuition behind this result is straightforward. In order to sustain endogenous long-run growth, the production technology must display constant returns to capital at the social level. But then the remuneration of capital is unaffected by changes in the capital–labor ratio. Consequently, all effects are bundled in the wage income, which is influenced positively by a higher and negatively by a lower capital–labor ratio. As a result, immigration that increases the capital–labor ratio is favorable, while immigration that decreases it is unfavorable.

This result has two implications: First, the general conclusion of Berry and Soligo (1969) that any immigration altering the domestic capital–labor ratio benefits the average native does not hold in this endogenous growth setting. And second, the conflict of interest within the native society may be less severe than supposed. In contrast to Benhabib's (1996) direct-democracy model, the current setting gives rise to a unanimous consent for an immigration policy that maximizes the capital–labor ratio.

[2] As usual in the literature, we concentrate on current native income. Alternatively, one might consider lifetime incomes. This would not alter the results, but require a formulation of individual savings behaviour. We omit this for it would distract attention from the fact that it is the formulation of the production technology that drives our result.

3. Conclusion

This paper has shown that the supposition of endogenous growth exerts a significant effect on the judgment of immigration policies. In contrast to the results in the literature, any native will gain from immigration if and only if immigration increases the capital–labor ratio. The key mechanism behind this result is the constancy of the returns of physical capital required to sustain growth in the long run, thus pegging the interest rate at a fixed level. In order to focus on this point, the model has been constructed as simple as possible. Especially, it is static for the determination of savings and the dynamical evolution of the model was not addressed. This was done to keep the approach as general as possible. It is, however, important to note that the above results go through irrespectively of whether individual optimization over an infinite horizon, an overlapping generations (OLG) setup or even a constant savings rate approach is assumed. It is straightforward to combine the model with one of these approaches in order to obtain a fully-fledged growth model. However, this would not yield much additional insight: In all these cases, the long run and short run effects coincide for an AK-growth model that does not display any transitional dynamics (see Barro and Sala-i-Martin, 1992). The main difference between the above options would be that in a two-generation OLG model the distribution of capital holdings would be degenerate, for only the old would hold capital.

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