On the Choice Between Capital and Labor Mobility: The Small Country Case

by

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Abstract

In this paper alternative policies of a small high-wage country towards factor mobility are studied. If technologies are identical throughout the world, then the optimal capital export policy leads to the same national income as the optimal immigration policy. In contrast, the optimal capital export policy is inferior to the optimal immigration policy if the country exhibits a technological superiority. In the latter case national income can be increased without limits by taxation of factor inflows if both factors are imported.

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1 Introduction

International factor mobility has become a very important phenomenon during the last decades. Barriers to capital mobility have been decreased, so that capital now tends to go where the highest return is to be expected. Labor mobility is generally still restricted by the potential immigration countries. However, a tendency towards a global liberalization of labor mobility cannot be disputed. Many emigration restrictions have fallen with the iron curtain in 1989, and the EU reform of 1992 has allowed the EU workers to move freely throughout Western Europe.

Despite these tendencies, international factor mobility is not seen without worries. People have objections against any kind of factor mobility. Capital outflow is viewed as a flight which may destroy domestic jobs or at least bring wages down. Capital inflow is seen as a buy-out of the domestic economy, which becomes dependent on a foreign country's goodwill. Labor immigration drives wages down, and native workers may be dismissed because of the arising competition. Labor emigration is regarded as a sign of weakness of the domestic economy.

It seems that any kind of international factor mobility will generate winners and losers. The question arises if it may be sensible for a government to control international factor mobility in order to take into account the interests of both the domestic winners and the domestic losers. Policy-makers may aim at maximizing total income which accrues to the country's citizens. This income is called national income henceforward.

Suppose the initial situation is characterized by autarky, i.e. the domestic economy produces with domestic factors only and no factors are placed abroad. One non-traded output good is produced by means of capital and labor. Initially, the wage rate in the country under consideration is higher and the interest rate is lower than in the rest of the world. Domestic capital owners can earn a higher return abroad since capital is more scarce in the rest of the world while foreign laborers want to immigrate. Two policies are at hand: First, capital exports may be allowed while keeping the borders shut for labor mobility in order to exploit the interest differential. Second, immigration can be admitted while keeping the borders closed for capital mobility since domestic capital owners' gains will exceed domestic workers' losses (Berry and Soligo, 1969). Which policy is superior?

This question has already been addressed by Ramaswami (1968). His
answer was that the optimal immigration policy leads to a higher national income than the optimal capital export policy. This theorem has formally been proved by Calvo and Wellisz (1983). The optimal capital export policy is characterized by an effective restriction while the optimal labor immigration policy implies a taxation of foreign workers' wages.

Ramaswami's theorem has been demonstrated for a large country, i.e. for the case that factor mobility significantly affects the capital-labor ratio in the rest of the world. For most countries, however, the opposite assumption seems to be a closer approximation to reality. Therefore, this paper explores the question on the choice between capital and labor mobility for the case of a small country. Foreign factors are available in unlimited supply at given factor prices. It is shown that both policies are equivalent in this framework if all countries in the world share a common technology. If, however, the high wage country exhibits a technological superiority, the optimal labor immigration policy dominates the optimal capital export policy. Moreover, a policy which encourages immigration of both factors while at least taxing the inflow of one factor can increase national income without bounds.

2 The Model

In the model there is one home country, called "Mancunia", and the rest of the world. $K$ and $L$ denote the initial endowments of Mancunia with capital and labor respectively. Mancunia produces one non-traded good with a constant returns to scale technology under full employment. Its autarkic income is given by

$$ Y_a = F(K, L). \quad (1) $$

The production function $F$ exhibits positive but diminishing marginal returns, i.e. $F_K, F_L > 0$ and $F_{KK}, F_{LL} < 0$. Each factor is paid its marginal product. Thus, the autarkic wage rate in Mancunia is

$$ w_a = F_L(K, L), \quad (2) $$

and the autarkic interest rate is

$$ r_a = F_K(K, L). \quad (3) $$
Due to the constant returns to scale technology factor prices in Mancunia only depend on the actual capital-labor ratio $k$. Foreign and domestic factors are assumed to be perfect substitutes.

The rest of the world employs labor and capital at exogenously given prices $\bar{w}$ and $\bar{r}$. It is assumed that $w_a > \bar{w}$ and $r_a < \bar{r}$. Thus, there is an incentive for labor to immigrate into Mancunia while capital earns a higher return abroad.

If borders are opened, each factor tends to go where it reaches its highest return. The quantity of labor migrating to Mancunia is denoted by $E$ while the amount of capital outflow from Mancunia is denoted by $Q$.

Policy-makers in Mancunia have two instruments at hand. First, they can set pure quantity restrictions on factor mobility. In this case the migration quotas are not auctioned. Second, they are able to tax factor flows. It is assumed that tax revenues are redistributed among Mancunia's citizens. Negative taxes (i.e. subsidies) on factor flows are also admitted.

Two regimes are investigated. The first is characterized by identical technologies throughout the world. In this case an equalization of the prices of one factor causes the price differential of the other factor to vanish. The second regime is characterized by a technological superiority of Mancunia. If one factor price is equalized world-wide, the other will be higher in Mancunia than in the rest of the world.

3. Identical Technologies

In this section it is shown that Ramaswami's theorem does not hold if Mancunia is a small country, i.e. if it cannot influence the factor prices in the world market.

Let us begin with considering the optimal capital export policy. If labor is immobile, Mancunia's national income is given by

$$ Y_c = F(L, K - Q) + \bar{r}Q. \quad (4) $$

Note that (4) would also hold if Mancunia taxes or subsidizes capital exports. Lemma 1 shows that it does not make sense to restrict capital mobility:

**Lemma 1** Free mobility of capital is the optimal capital export policy.
Proof: Differentiating (4) with respect to $Q$ yields
\[ \frac{\partial Y_c}{\partial Q} = -F_K(K - Q, L) + \bar{r}, \] (5)
which is positive as long as the capital-labor ratio in Mancunia is higher than in the rest of the world. Since free mobility of capital will lead to an allocation where the domestic marginal productivity of capital is equal to the interest rate abroad, it turns out that the optimal capital export policy is characterized by laissez-faire. □

Migration incentives for labor will also vanish if the laissez-faire policy is implemented.

Lemma 1 confirms the old result of Kemp (1962) that a country which is capital-abundant should not restrict capital mobility if capital exports do not influence the marginal productivity of capital abroad. It is in contrast to the large country case in which it is optimal to restrict capital outflow (Kemp, 1962; Ramaswami, 1968; Bhagwati and Srinivasan, 1983). The divergence arises since the negative externality of capital exports on previous capital exports does not appear in the small country scenario under consideration.

Now turning to the case of labor mobility, analyzing a pure quantity restriction yields a similar result. If labor in amount of $E$ is immigrating and capital does not move, Mancunia’s national income is
\[ Y_l = F(L + E, K) - F_L(L + E, K)E. \] (6)

**Lemma 2** If Mancunia has to decide on a pure restriction on labor mobility, it is optimal to permit a free factor flow.

**Proof:** Differentiating $Y_l$ with respect to $E$ results in
\[ \frac{\partial Y_l}{\partial E} = -EF_{LL} > 0. \] (7)
In other words, any immigration of labor leads to an increase in Mancunia’s national income. □

Immigration of labor always raises the income of the domestic capital owners more than it reduces the native workers’ wages. However, immigration will stop if the marginal product of labor in Mancunia has been driven down to $\bar{w}$. Again, no restrictions should be placed on factor mobility.
Note that free labor migration leads to the same income of the Mancunians as free capital mobility. However, labor mobility is different from capital mobility since Mancunia can get a tax revenue being paid by foreigners. If a tax of $t$ is levied on every unit of immigrating labor, Mancunia’s national income turns out to be

$$Y_t = F(K, L + E(t)) - E(t)[F_L(K, L + E(t)) - t],$$

where $E(t)$ is determined by the migration equilibrium equation

$$\bar{w} = F_L(K, L + E(t)) - t.$$  \hspace{3.5cm} (9)

Lemma 3 shows that it is optimal to refrain from employing the tax instrument.

**Lemma 3** The optimal tax on labor inflow is zero.

**Proof:** Totally differentiating the equilibrium condition (9) shows that

$$\frac{dE}{dt} = \frac{1}{F_{LL}}$$

i.e. a higher tax leads to a lower number of immigrants. Differentiating (8) with respect to $t$ yields

$$\frac{\partial Y_t}{\partial t} = (t - EF_{L}L) \frac{dE}{dt} + E = \frac{t}{F_{LL}}.$$  \hspace{3.5cm} (11)

Thus, $\frac{\partial Y_t}{\partial t} > 0$ if $t < 0$ and $\frac{\partial Y_t}{\partial t} < 0$ if $t > 0$ hold. It follows that setting $t = 0$ maximizes national income, i.e. any tax or subsidy on labor import is detrimental to the Mancunians. \hspace{3.5cm} \Box

Again, the optimal labor import policy leads to the same income as the optimal capital export policy. There is no incentive for an international movement of capital in the migration equilibrium.

In contrast to the large country case (Ramaswami, 1968) it is not optimal to set a positive tax on labor inflow. This is a consequence of the circumstance that the foreign workers’ demand for migration is more elastic here. Any higher tax revenue due to an increase in $t$ is more than compensated by the loss of natives’ factors due to a lower immigration. Additional gains from
a higher tax in case of a given inflow of labor are just offset by the direct loss of domestic factors due to the reduced immigration. However, since the number of foreign workers in the country decreases, the tax revenue will not rise that far. Therefore, the total effect of raising the tax rate on Mancunia's national income is negative. Conversely, any subsidy on labor imports turns out to be too expensive in view of the additional gain which accrues to the native factors.

It does not matter if Mancunia has the ability to discriminate directly against foreign workers in such a way that the immigrants only receive a wage of $\tilde{w}$. If the Mancunian government then maximizes national income

$$Y_{id} = F(K, L + E) - \tilde{w}E$$

with respect to the number of immigrants $E$, the corresponding first-order condition is $F_L - \tilde{w} = 0$. Thus, in any case immigrants are admitted until the discrimination vanishes since marginal productivity of labor reaches the foreign wage.

The results of this section can be summarized as follows:

**Proposition 1** If all countries share a common technology, both the optimal capital export policy and the optimal labor import policy lead to the same national income.

Proof: Both policies lead to $w = \tilde{w}$ and $r = \tilde{r}$ in Mancunia so that national income is identical under both policies. $\Box$

The strategy of importing the whole factor endowment of the rest of the world and paying the foreign factors their autarkic factor prices, which maximizes national income of a large country (Jones, Coelho and Easton, 1986), here also leads to an allocation with $w = \tilde{w}$ and $r = \tilde{r}$ in Mancunia. It has to be admitted, however, that this policy cannot be treated adequately while keeping the small country assumption.

## 4 Technological Superiority

If Mancunia has a technological superiority, matters look quite different. Again, the initial autarkic situation is supposed to be characterized by $r_a < \tilde{r}$ and $w_a > \tilde{w}$. Now technological superiority can be described as follows: If the
wage rate in Mancunia was the same than in the rest of the world \((w = \bar{w})\), then Mancunia's interest rate would exceed the interest rate in the world market \((r = \bar{r} > \bar{r})\), and if the interest rates were equalized \((r = \bar{r})\), then the wage rate in Mancunia, \(w = \bar{w}\), would be higher than \(\bar{w}\), the wage rate in the rest of the world.

As a consequence of the technological superiority, a migration incentive to Mancunia for at least one factor always remains if factor movements are not taxed.

Note that the Lemmata 1-3 are still valid here. Thus, the optimal policies if only one factor is mobile are characterized by laissez-faire, and the factor price differential of the moving factor vanishes. However, the policy neutrality result of Proposition 1 no longer holds:

**Proposition 2** If Mancunia exhibits a technological superiority, the optimal policy with a pure quantity restriction on labor immigration and no capital mobility leads to a higher national income than the optimal policy with a pure quantity restriction on capital exports and no labor mobility.

**Proof:** The autarkic situation and the two policies under consideration share the common feature that all Mancunian factors receive the same respective factor price. Thus, national income of the Mancunians is given by

\[
Y_f = w(k)L + r(k)K,
\]

where \(w(k)\) and \(r(k)\) denote the factor prices in Mancunia, dependent on \(k\), the capital-labor ratio in Mancunia.

Differentiating (13) with respect to \(k\) yields

\[
\frac{\partial Y_f}{\partial k} = LF_{kk}[k_a - k].
\]

It follows that \(\frac{dY_f}{dk} > 0\) if \(k > k_a\) and \(\frac{\partial Y_f}{\partial k} < 0\) if \(k < k_a\). Decreasing the capital-labor ratio beyond \(k_a\) by exporting capital or importing labor increases national income. \(w_l = \bar{w}\) and \(w_c = \bar{\bar{w}}\) with \(\bar{w} < \bar{\bar{w}} < w_a\) imply that \(k_l < k_c < k_a\), where the indices \(l\) and \(c\) refer to the optimal labor import policy and the optimal capital export policy respectively. Thus, the corresponding national incomes must fulfill \(Y_l > Y_c > Y_a\). \(\square\)
If all Mancunian capital earns the same interest rate and if all Mancunian laborers receive the same wage rate, the optimum factor price combination in Mancunia will be \((\bar{w}, \bar{r})\). This result follows from the general rule that the income of the average Mancunian factor combination rises if it becomes relatively more scarce. Since the optimal capital export policy depresses the capital-labor ratio in Mancunia less than the optimal labor immigration policy, the latter is superior to the former. Factor price combinations outside the range determined by the capital-labor ratio interval \([k_l, k_u]\) can be reached, but, as a corollary of Lemma 3, inducing a capital-labor ratio \(k < k_l\) requires too much subsidies to foreigners to lead to a higher national income than \(Y\).

Proposition 2 is a counterpart of the result that Ramaswami's theorem also holds if a large high-wage country exhibits a technological superiority (Calvo and Wellisz, 1983; Ruffin, 1984). The difference lies in the feature that the optimal policies of a large country are always restrictive with respect to the moving factor.

The technological gap suggests a third kind of policy towards factor mobility, namely encouraging the immigration of both factors. Since unrestricted immigration of both factors will not lead to a capital-labor ratio outside the range \([k_l, k_u]\), such a policy is not superior to the optimal pure labor immigration policy. If, however, the factor inflow can be taxed, a double immigration policy may well lead to a higher national income than the optimal labor immigration policy.

**Proposition 3** If taxes on capital imports or labor immigration are permitted, then Mancunia's national income can be increased without bounds (if the rest of the world has the two factors in unlimited supply) by using a policy of letting both factors into the country and tazing at least one type of factor inflow.

**Proof:** Technological superiority implies that the capital-labor ratio in Mancunia can be kept in a range where both factor prices exceed their world market counterparts. Tax revenues can be increased without bounds if the rest of the world has the two factors in unlimited supply since taxes can be chosen in such a way that the immigration incentives for both factors never vanish. ⊓⊔

Proposition 3 rests on the assumption that the factor supply in the rest of the world is unlimited, which is, of course, unrealistic. It is clear, however,
that if the rest of the world is sufficiently large and the technological gap is not negligible, a policy with immigration of both factors will dominate the optimal policy where only one factor moves. In a model with a two-country world, the optimal policy consists of importing all foreign factors while paying them their autarkic factor prices (Jones and Easton, 1989, 1990).

5 Conclusion

It has been shown that the optimal capital export policy is equivalent to the optimal labor import policy if technologies are identical world-wide. In each case free factor flow is permitted and the same wage-interest combination is reached. This neutrality result contradicts Ramaswami's theorem. The divergence is due to the assumption of fixed factor prices abroad. Restricting capital export is not sensible here since capital exports do not harm previous capital exports, and labor immigration should not be taxed since the foreign workers' demand for immigration is more elastic here than in the large country case.

If, however, the high-wage country exhibits a technological superiority, which may be a more realistic description in many cases, then the optimal labor immigration policy leads to a higher national income than the optimal capital export policy. This result turns out since the former policy depresses the capital-labor ratio more than the latter policy so that the factor combination of the average native in the country becomes relatively more scarce.

If taxation of factor flows is possible, then the natives may even gain more by letting both factors into the country and taxing at least one of them. Tax(es) can be chosen in such a way that migration incentives for both factors do not disappear until the country becomes large.

The analysis suggests that policy-makers in a high-wage country can be advised to levy a tax on factor inflows. If such a discriminatory policy is impossible for constitutional or other reasons, it will be a second-best policy to permit a free immigration of labor while restricting capital flows.

Two caveats against this conclusion should be mentioned: First, it is to be noted that the assumption of full employment is crucial for the results. As Brecher and Choudhri (1987) have shown, international factor mobility may be detrimental to the native population in the high-wage country if minimum wage unemployment prevails. Second, the recommended policies
lead to lower wages and higher interest rates in the country, which may be an undesired consequence with regard to the policy-makers' distributional objectives.

Thus, despite the strong and clear results of the analysis above, paying attention to the specific circumstances remains necessary before choosing a policy towards factor mobility.

References


