SUSTAINABLE MIGRATION POLICIES

BY PIERRE M. PICARD AND TIM WORRALL*

August 2012

This paper considers whether countries might mutually agree a policy of open borders, allowing free movement of workers across countries. For the countries to agree, the short run costs must outweighed by the long term benefits that result from better labor market flexibility and income smoothing. We show that such policies are less likely to be adopted when workers are less risk averse workers and when countries trade more. More surprisingly, we find that some congestion costs can help. This reverses the conventional wisdom that congestion costs tend to inhibit free migration policies.

JEL CLASSIFICATION: F22 · J61 · R23

1. INTRODUCTION

Since its beginnings, the European Union has aimed at implementing free movement of workers between member states, Subsequent enlargement of the E.U. has raised the issue further up the agenda. Whereas the benefit of a policy of free movement of workers may seem obvious to many economists and economic advisers, some member states have been reluctant implement the policy, either implementing the policy in stages or applying different standards of implementation, or in some cases applying policies as restrictive as for non-EU immigrants.[1] The main reason of this reluctance lies in the fear that inflows of migrant workers may depress local labor market conditions and the welfare of the host country workers.[2]

Département Economie, University of Luxembourg, 162A avenue de la Faï£¡Encerie, L-1511 Luxembourg and CORE, Université Catholique de Louvain, Louvain-la-Neuve, Belgium.

* We thank the participants at the NARSC 2009, 2010 TOM workshop on frontiers of migration research, 2011 NORFACE Conference on migration and Erasmus University for comments. We are grateful to C. Détang-Dessendre, G. Fachini A. Margherita, P. Neary, A. Sapir, M. Schiff and E. Toulemonde for comments and suggestions. The second author gratefully acknowledges the support of the Hallsworth Research Fellowship Fund at the University of Manchester. The usual caveats apply.

[1] Clemens et al. (2010) find that the gain from migration is large. They find that the gain from a migrant of moderate skill from a median country moving to the U.S. is around $10,000 per year. They attribute this large gain as due to policy barriers to labor mobility. Klein and Ventura (2009) find similarly large gains from removing barriers to international labor mobility which are of an order of magnitude greater than the gains from capital mobility.

[2] In April 2011, such a fear has enticed France to threaten to suspend its obligation to the E.U. freedom of movement (Schengen Treaty) because of the threat of abnormal flow of migrants from Italy. See for instance *The Telegraph*, 22 April 2011.

In this paper, we discuss the decision of countries to open their borders to workers and adopt policies of unconditional or uncontrolled movements of workers. Free movement of workers and labor market integration, as well as product market integration, has been a regular topic on the agenda of the socio-economic projects of both the E.U. and N.A.F.T.A. The topic has featured in discussions about the assent of new member states to the E.U. and in the assessment of Mexican migration to the U.S. In this paper, we consider that countries implement a policy of free movement of workers only if it is sustainable or self-enforcing. That is, each country should be better-off with the policy at each point in time taking into account any short run costs and long term future benefits. We present a model where migrants impose a negative externality on locals through increased congestion of local factors (e.g. land, local resources, local capital, etc.) or through adverse changes in the terms of trade. However by agreeing on a policy of free movement of labor a country may increase the future expected utility of its citizens because it allows its labor force to reallocate in response to future productivity shocks and therefore benefit from improved labor market flexibility. In addition, risk averse workers benefit from better income smoothing under the policy of free movement of labor.

We develop a two-country trade model where individuals consume both a local non-traded good and two traded goods: one produced locally and one produced abroad. We assume Cobb-Douglas preferences, so goods are imperfect substitutes with a unit elasticity of substitution. Workers inelastically supply one unit of labor in the production sectors of their country of residence. Production is subject to decreasing returns to scale (congestion) and country specific productivity shocks. With a policy of free movement of workers, individuals are free to move and reside in the country where they find an employment contract. We first analyze the short run equilibrium under this policy and discuss the resulting efficiency in the labor market. We show that a policy of free movement of workers yields an excess agglomeration of the labor force in the high productivity country except in specific cases. This excess agglomeration occurs because migrating workers do not internalize the effect of their move on the productivity and consumption basket of local workers. In our model, there is no excess agglomeration only in three specific cases: when all goods are traded, when no goods are traded and when the production function displays infinitely decreasing to scale (full congestion). In all other cases, the local workers in the higher productivity country incurs a short

run cost from uncontrolled inflows of workers. Interestingly this cost is highest when the production process displays no congestion effect (constant returns to scale) and each country trades a significant share of its total production. The cost therefore, mainly stems from the adverse change in the terms of trade. Note that the presence of trade effects qualifies the common idea that international workers movements have no effect on natives in closed economies that produce under constant returns to scale (or where capital perfectly adapts to the labor inflow). The inflows of workers may have no impact on wages, but have adverse effect on the relative import prices and the consumption basket of domestic workers. As presented above, the policies of free movement of workers are a concern for economies such as Europe and North America that have significant trade and labor mobility. So, one should not neglect the impact of trade on migration incentives and on the adoption of migration policies.

We then discuss the dynamic trade-off between the short cost of the policy of free movement of workers and its long run benefit in terms of labor market flexibility and insurance. Because free movement of workers has the effect of unifying the two countries' labor markets, workers benefit from better job opportunities. In addition, a policy of free movement of workers frees the individuals (and their descendants) from economically depressed areas and allows them to smooth their consumption by relocating to more productive regions. We set up a dynamic model where, under free movement of workers, individuals freely choose their work location in each time period. Free movement of workers becomes a sustainable common policy if and only if no country finds it optimal to breach the policy by blocking inflows of workers or not renewing the foreign workers' work permits. Unsurprisingly, we show that the common policy is more sustainable if individuals and governments become more patient. More interestingly, we show that the common policy becomes less sustainable when the countries trade more goods. This is because the terms of trade partly absorbs productivity differences and diminish the benefit of labor market flexibility. We also show that reductions of congestion effects have a non-monotone impact on the sustainability of the policy of free movement of workers. When congestion effects are important (i.e. strong decreasing returns to scale), a reduction in congestion diminishes the negative impact of the inflows of international workers on local wages and makes the policy more likely to be sustained. By contrast, when congestion effects are weak (i.e. weak decreasing returns to scale), local wages respond too weakly to inflows of international workers and

become bad signals for immigrants. The resulting excessive agglomeration of the labor force in high productivity countries may be too high a short run cost for natives to pay making the policy of free movement unsustainable. Finally, we show that free movement of workers is more likely to be implemented when individuals are more risk averse. In this case, free movement of workers smoothes individual income and plays the role of an insurance scheme. Therefore more risk averse workers are more likely to support international labor mobility.

In this paper we also make a distinction between uncontrolled movement of workers that unconditionally grant work permits and uncontrolled migration policies that grant citizenship rights to incoming workers. Article 45 of the Lisbon Treaty sets out E.U. labor movement policy. It specifies that individuals who qualify for "worker" status shall unconditionally get permission to work throughout the E.U. while retaining their native citizenship rights. Similarly, in the N.A.F.T.A., TN status offers work permits to workers (typically Canadians) but not U.S. nationality and all its associated rights. Under such a policy, immigrants are not formally part of the electoral constituencies of the host country and may regularly need to renew their work permits. A more challenging policy would therefore be a *full right migration policy* that unconditionally grants full citizenship rights and duties to all migrants. We analyze this policy and compare it to that of free movement of workers. We show that the full right migration policies are less likely to be adopted and sustained. For some parameter values, such policies are never adopted if countries unconditionally offer citizenship rights to migrants. This helps explain why uncontrolled movement of workers can be implemented in economies such as the E.U., whereas policies that grant full citizenship rights generally remain controlled by strict migration conditions and quotas.

Related literature

This paper is related to several strands of literature. First it relates to the literature emphasizes that governments cannot commit to policies in advance and will re-evaluate policy at each point in time weighing any current losses from the policy against possible future expected gains (See e.g. Acemoglu et al. 2010, Chari and Kehoe 1990). Our analysis also relates to Thomas and Worrall (1988) who

discuss self-enforcing insurance mechanisms.[3] The present paper differs however in two regards from this literature. First the motivation for exchange comes from labor flexibility and the potential beneficial effects of the mobility of workers. Such gains from flexibility help countries offset the short term cost of inflows of international workers by the longer term expected future benefits. Secondly, the present paper focuses on the adoption of market based policies rather than first-best policies. That is we shall suppose that governments do not have the ability to finely control the international labor movement decisions but can either opt for free movement or no movement of labor. Thus with free movement of labor the allocation is determined by individual migration decisions and market forces and is not in the direct control of government. This not only makes our discussion more realistic in the case of the E.U. integration but it also significantly simplifies the analysis and adds the potential externality of migrants on local workers. Indeed, each migrant does not internalize the effect of his/her migration decision to on domestic and foreign wages and the terms of trade.

It also relates to the literature which analyzes the effect of migrants on the welfare of local workers. The empirical relevance of the wage impact of migration is a much debated issue (see e.g. Borjas 2003, Borjas et al. 1996, Card 1990, Ottaviano and Peri 2005). Broadly speaking, the literature suggests that competition from foreigners is likely to harm workers, especially those at the bottom end of the income scale.[4] By presenting a general equilibrium model where labor movements can have a negative or a zero short run impact on local welfare, we claim to capture the empirical facts. However, for the sake of analytical tractability, our neoclassical analysis of the labor market focuses on the benchmark case of homogenous workers. As a result, the interpretation of our results must

[3] Empirical applications of informal insurance theory have primarily focused on individual relationships within villages in less developed country (Ligon et al. 2002).

[4] In fact, the empirical literature on the effect of migration on local labor markets does not reach a clear consensus. As a case in point, early studies could not confirm strong and significant long-run effects of immigration on local wages (Borjas et al. 1996, Card 1990). While it was admitted that most of the economic gain from migration accrues to the migrants (Boeri and Brücker 2005), the impact of worker's conditions in the receiving countries has been more debated (Faini et al. 1999). Because the above studies were not concerned with the crowding out of natives by immigrant workers, which potentially eliminated any wage effects (Filer 1992), researchers have been tempted to avoid spatial studies of localized labor inflows and have preferred to consider the impact on the entire labor market. For example, the 1980 Cuban immigration may have been important in Miami but small for the whole U.S. labor market. Under such a strategy, Borjas (2003) measured significant and negative effects of immigration on U.S. wages, harming more importantly the low skilled. Ottaviano and Peri (2005) recently analyzed the effect of migration by modeling labor as a differentiated input in general equilibrium. Those authors found negative partial effect of immigrants on natives within the same group of workers but with significantly mitigated effects on the overall economy. See Okkerse (2008) for an extensive summary.

probably be restricted to the situations where governments weigh most heavily the welfare of low skilled workers, either because of distributional concerns or because of the weight of low skilled workers in the political decision making process (perhaps along median voter lines).

Our discussion is nevertheless driven by a general concern about public opinion in many democratic countries, which appear relatively hostile to immigration.[5] As reported by Scheve and Slaughter (2001), Chiswick and Hatton (2003) and Mayda (2006), public opinion in democratic countries has been far more anti-immigrant than has public policy in recent decades.[6] Our discussion anchors to this negative attitude towards immigration and focuses on the willingness to implement free movement of labor with other states and countries. In our discussion the motivation of this attitude is rooted in individuals' anticipations of labor markets rather than in possible (mis-)perceptions of multiculturalism or criminality. Our analysis of the acceptability of free movement of workers becomes even more relevant in the E.U. because of recent suspicions of a "race to the top" in the migration policies of the E.U. member states particularly in respect of the new member countries (Kvist 2004). Whereas E.U. member states recently opened their borders to labor, many seemed to strengthen their migration requirements. The current paper offers a possible explanation for this issue.

The paper also relates to a strand of the international trade literature concerned with the relationship between trade and migration. This literature has indeed investigated the substitution between trade and migration policies and the complementarity between movements of goods and workers. In the Heckscher-Ohlin framework, trade and migration are substitute in the sense that they have the same impact on prices (Mundell 1957). In its simplest version with symmetric country productivities, this framework leads to factor price equalization and therefore eliminates any incentives for migration. So, movements of workers must stem from exogenous asymmetries. When the framework is enriched with productivity differences, movements of workers and commodities can be shown to be complements as they vary in the same direction after positive productivity shocks (Markusen 1983). Such a shock

[5] The number of citizens stating that there are "too many" immigrants is 77% in the U.S., 67% in France, 78% in the U.K. (Pew Global Attitudes Survey 2007). In Australia, his number rose for 16% to 68% during the period 1961-1988. In many democratic countries the support for anti-immigration political parties is not negligible (e.g. the extreme right in the second tours of French Presidential Election in 1974 and 2002).

[6] This puzzle can be explained by the presence of industry interest groups and by the existence of an election bias due to voters' participation incentives (Facchini and Mayda 2008, Mayda 2006, Müller and Tai 2009).

leads one country to increase its exports, which raises domestic wages and attracts more immigrants.[7] Our model follows this track and presents a simple and analytically tractable Ricardo-Viner model that includes two countries, two tradeable goods, three factors (labor and two country specific factors) in addition to productivity shocks. It reproduces the complementarity between the movements of workers and goods mentioned above: in the sense that productivity shocks stimulate both exports and immigration. It is important to note that our model also reproduces the fact that the policies of free movement of workers and goods are substitutes. Both trade and free migration policies reduce the effect of productivity shocks on labor market inefficiencies and income fluctuations. Indeed, the impact of productivity differences on individual consumption is reduced not only by the relocation of workers but also by the change in the terms of trade. As a main consequence, countries are more likely to reject a policy of free movement of workers if they trade more. This gives an possible explanation for why E.U. member states become more reluctant to free the movement of their workers as soon as their trade barriers have been removed. Those countries may simply expect that the terms of trade will attenuate income discrepancies and they do not expect that future gains from migration outweigh the current loss of an increased congestion of local factors.[8]

The paper is also related to the political economy literature that considers the dynamic trade-offs in migration policy acceptability. For instance, Dolmas and Huffman (2004) show that the number of voters supporting immigration rises when immigrants are denied voting rights. Ortega (2010) shows that, in the presence of upward social mobility, unskilled workers may favor the immigration of low skilled foreigners to sustain their future majority and thereby advantages from income redistribution. This literature focuses on the domestic benefits from a controlled immigration from an outside world (typically, an infinite supply of immigrants) whereas our paper concentrates on the mutual benefits that a group of countries find in sharing their labor markets through an uncontrolled immigration policy. In addition, this literature generally does not consider the impact of trade on the adoption of

[7] Several authors have qualified and extended these results. See e.g. Neary (1995) and Schiff (2006).

[8] The idea of substitution between trade and migration is also conveyed by policy makers. For instance, the German foreign affairs minister, Mr Kenkel, set a priority to open trade to Eastern European countries as a means to alleviate the migration threat caused by the collapse of Eastern European regimes (*Financial Times*, 24 March 1994). Similarly, promoting the N.A.F.T.A. agreement, the Mexican President Salinas stated in 1991 free trade means "more jobs ... [and] higher wages in Mexico, and this in turn will mean fewer migrants to the United States and Canada. We want to export goods, not people." (Martin 2010; p.7).

migration policies. In our opinion, our setup seems more appropriate to discuss the flexibility and insurance motivations of policies favoring free movement of workers within the E.U. or N.A.F.T.A.

Finally, the paper is related to the literature about regional risk sharing (Asdrubali et al. 1996). The present paper indeed suggests that the benefit of sharing local productivity risks is an important factor in the decision to adopt the common policy of free movement of workers. The policy allows individuals to diversify their human capital risk by letting them choose the most productive location. In theory, individuals could also diversify their risk by buying short diversified portfolios of international assets. However, this strategy is not followed by workers (in particular those with low and average incomes) who are often credit constrained and who mainly invest in their domestic housing market and stock markets (French and Poterba 1991). For this reason the present paper abstracts from the possibility of asset diversification.

The paper is organized as follows. We present the model in Section 2 while Section 3 derives and discusses the short run equilibrium. Section 4 discusses sustainable policies of free movement of workers that grant work permits to moving workers. Section 5 extends those policies to immigration policies that grant citizenship rights to moving workers. Section 6 studies some important extensions to permanent productivity differences and to countries with unemployment. The last section concludes.

2. THE MODEL

We consider a two-country model in which a domestic country produces a tradeable good X and a local non-tradeable good Z. The foreign country produces another tradeable good X^* and local non-tradeable good Z^*. Consumer's preferences for goods are given by the utility function $U(C)$ where U is an increasing and concave function and where C is a Cobb-Douglas composite good $C \equiv KX^{\gamma/2}(X^*)^{\gamma/2}Z^{1-\gamma}$ and K is a constant. The parameter $\gamma \in [0,1]$ expresses the preferences for tradeable goods as well as their share in the whole economy.[9] In this paper, we use the parameter γ to discuss the importance of trade between countries. For instance, when $\gamma = 0$, consumers demand only the local non-traded good Z; there is no trade. When $\gamma = 1$, consumers demand only the traded goods; all goods are traded. The former case is generally assumed in the migration literature while the latter

[9] For the sake of simplicity, we assume symmetric trade preferences $(\gamma/2, \gamma/2)$. Results are qualitatively the same for asymmetric trade preferences $(\gamma/2, \gamma^*/2)$.

is analyzed in the international trade literature about movements of factors and goods. Our model attempts to make a link between the two literatures.

The domestic country has L worker-consumers and the foreign country L^* where $L+L^* = \bar{L} > 0$ and $\bar{L}$ finite. For the sake of analytical tractability we assume that labor is homogeneous. Each individual inelastically supplies one unit of labor. In the domestic (foreign) country, L_X (L_X^*) individuals work in the tradeable good sector while L_Z (L_Z^*) are employed in the local non-tradeable good sector. Workers freely move between sectors and are thus paid the same wage w (w^*) in each sector.

Each tradeable and non-tradeable sector includes a unit mass of firms that produce according to a production function $F_i(L_i) = \alpha L_i^{\beta}$, $i \in \{X,Z\}$, where L_i is the firm's labor and where $\alpha > 0$ and finite, and $\beta \in (0,1]$ denote two parameters for productivity and congestion, which we assume to be identical across firms and sectors for the sake of simplicity. The same production function applies to the foreign country with a productivity parameter $\alpha^* > 0$ (though with β common across countries). For $\beta < 1$ the firm's marginal product $F_i'(L_i) = \alpha\beta L_i^{\beta-1}$ decreases with the size of the labor force L_i. Production displays constant returns to scale or no congestion if $\beta = 1$. In this case, each worker's marginal productivity (and wage) remains constant whatever the size of the domestic production and labor force. By contrast, production displays decreasing returns to scale or congestion if $\beta < 1$. In the limit, $\beta \to 0$, there is full congestion and output is equal to α, which is independent of the size of the labor force. In this case, production can be interpreted as a crop of fixed size α.

We here make two remarks about the congestion assumption. First, the congestion force can be interpreted either at a firm or sector level. At a firm level, each firm, which hires L_i workers, can be thought of holding a unit of local indivisible capital, which embeds either natural resources like land or water or local human resources like local human capital, entrepreneurial skills, etc. At the sector level decreasing returns to scale can be interpreted as the sharing of common infrastructures, resources and land. In this case, the production function $F_i(L_i)$ applies to each sector $i \in \{X,Z\}$ with L_i being the sector employment and then each firm can be interpreted as experiencing a sector specific productivity $g_i = F_i'(L_i) = \alpha\beta L_i^{\beta-1}$. Second, the reader may interpret the no-congestion case ($\beta = 1$) as a case where production involves capital and labor and where capital is instantaneously

and elastically supplied.[10] As commonly argued, migration may have no effect on wages when firms' capital demand is not fixed. However, Section 3 shows that the absence of congestion does not eliminate the possibility of short-run an excess agglomeration of the work force in the high productivity country. Moreover, in a dynamic setting like the one we will develop in Section 4, capital is likely to be allocated in the time period before the realization of productivity shocks. The production function therefore displays decreasing returns to scale in the short-run and labor demand is downward sloping. Hamermesh (1993) provides ample empirical evidence about such downward sloping labor demand functions at the firm and sector levels while Borjas (2003) presents evidence at the country level. The fact that international labor movements impact on local wages is crucial for a possible public reluctance to uncontrolled movements of workers. Finally, we assume initially that there is no trade friction and no price rigidity in either the labor or product markets.[11] For simplicity we assume that profits are redistributed to local individuals.

3. SHORT RUN EQUILIBRIUM

We now determine the short run equilibrium where individuals consider just current payoffs in their decisions to move to another country. For the sake of conciseness, we characterize the variables for the domestic country, those for the foreign country being symmetric. We first establish the equilibrium for immobile labor, then we characterize and discuss the equilibrium under free movement of worker and finally we discuss the issue of excess migration.

Market equilibrium Let us first suppose that labor is not allowed to move between countries. The equilibrium consists of a set of prices, wages, income and sectorial labor distribution that satisfy both profit maximization and market clearing conditions for labor and goods. The solution of the model is standard and detailed in Appendix A. Firms hire workers so that their marginal product of labor equates wages: $P_i F_i'(L_i) \equiv P_i \alpha\beta L_i^{\beta-1} = w$. Under iso-elastic labor demand, their sales and profits are proportional to the wage bill so that $P_i F_i(L_i) = wL_i/\beta$. Because production functions are similar across sectors, labor allocates across the tradeable and non-tradeable sectors according to their

[10] For instance, under Cobb-Douglas production function of labor and capital, capital is proportional to labor and the marginal product of labor is constant under the optimal demand of capital.

[11] The assumption is relaxed in Section 6.2.

respective product demands: $L_X = \gamma L$ and $L_Z = (1-\gamma)L$. When the markets of the tradeable goods clear, the terms of trade adjust to balance the values of exports and imports. As consequence, one can show that wages adjust so that

$$w/w^* = L^*/L. \tag{1}$$

This shows that the relative wage rate adjusts to changes in the allocation of labor between countries.

The individual consumption in each country is given by the equilibrium consumption of the composite good $C = (P_X)^{-\gamma/2}(P_X^*)^{-\gamma/2}(P_Z)^{\gamma-1}Y/L$, where the constant K defined above is normalized so that the constant terms multiplying this expression are canceled out. Given $Y/L = \beta^{-1}w$, and using the prices in wage units computed above, we have

$$C(L) = A\left(\frac{L^*}{L}\right)^{\beta\gamma/2} L^{\beta-1}, \tag{2}$$

where $A = \alpha(\alpha^*/\alpha)^{\gamma/2}$. A symmetric expression holds for individual consumption in the foreign country:

$$C^*(L) = \left(\frac{\alpha^*}{\alpha}\right)^{(1-\gamma)} C(\bar{L}-L).$$

Individual consumption and migration respond to congestion and trade in the following ways. First, when there is no congestion ($\beta = 1$), individual consumption is $C(L) = A(L^*/L)^{\gamma/2}$, which declines as more labor is allocated to the home country. This fall in consumption occurs because the relative wage rate declines and foreign traded goods become relatively less expensive (see equation (1)). When there exists some congestion ($\beta < 1$), a greater labor supply also leads to lower real wages making home products also relatively more expensive. Second, when congestion is very important ($\beta \to 0$), individual consumption is $C(L) = AL^{-1}$, which inversely depends on the local labor supply. This case corresponds to a situation where local workers evenly share a fixed crop that depends only on the productivity parameters. Workers are nevertheless able to exchange a part of their crop so that their final consumption is diversified and is proportional to the compound shock A rather than their own shock α. Third, when no goods are traded ($\gamma = 0$), individual consumption is $C(L) = \alpha L^{\beta-1}$, which

depends only on local labor and local productivity. This configuration corresponds to a situation where local workers equally share a production factor that is subject to congestion. Finally, when all goods are traded ($\gamma = 1$), individual consumption is the same in both countries, $C^*(L) = C(\bar{L} - L)$. Exogenous productivity differentials (α^*/α) are fully absorbed by changes in the terms of trade so that labor mobility between counties will confer no benefits.

Free movement of workers Now suppose that both countries adopt the policy of free movement of workers. We assume that workers incur no moving costs in changing location. This assumption of zero moving costs is largely for simplicity and in Appendix B we show that a simple model where moving costs are heterogeneous across workers can replicate the same equilibrium outcome provided some workers have zero moving costs and provided average moving costs are not too high.[12] Under a policy of free movement and with zero moving costs, workers will move until individual utilities and therefore individual consumptions are equalized between countries: $C(L) = C^*(L)$. If productivity is higher in the home country ($\alpha > \alpha^*$) and $\gamma < 1$, then the free movement of workers implies that $C(L) < C(\bar{L} - L)$ since $(\alpha^*/\alpha)^{(1-\gamma)} < 1$. As $C(L)$ is decreasing, we have therefore that $L > \bar{L} - L$ or $L > \bar{L}/2 > L^*$ so that workers relocate to the more productive country. In the present Cobb-Douglas setting, free movement of workers yields a unique equilibrium for the allocation of workers between countries. The labor allocation satisfies

$$\frac{\hat{L}^*}{\hat{L}} = \left(\frac{\alpha^*}{\alpha}\right)^{\frac{1-\gamma}{1-\beta(1-\gamma)}}, \tag{3}$$

where the hat $\hat{}$ denotes the short run equilibrium outcome under free movement of workers. One can check that $d(\hat{L}^*/\hat{L})/d(\alpha^*/\alpha) > 0$, while $d(\hat{L}^*/\hat{L})/d\beta < 0$ and $d(\hat{L}^*/\hat{L})/d\gamma > 0$ if $\alpha > \alpha^*$. As expected, workers move into the most productive country because the latter offers higher wages. However, the equilibrium number of immigrants in the most productive country decreases with the intensity of local congestion and the share of tradeable goods.

[12] Although we later introduce a dynamic element for public policy on labor mobility our model of individual decision making is entirely static. For a model where the migration decision is dynamic and based on the migrant learning the wage distribution in the foreign country, see Kennan and Walker (2011).

Congestion and trade have the following impact on the distribution of labor. When local factor congestion rises (smaller β) the reallocation of labor in response to productivity differences becomes smaller because changes in labor have a greater impact on reducing local wages and consumption: local congestion diminishes productivity gains and wage differentials and therefore the incentives to move to another country. A larger share of the tradeable sector in the economy augments the impact that the terms of trade have on earnings and consumption. Immigrants arriving in the higher productivity country earn higher wages and this increases their demand for the goods produced in their country of origin. As a result, wages rise in the country of origin and the incentives to move in the foreign labor market are mitigated. The effect of the terms of trade is particularly noticeable when all goods are tradeable ($\gamma \to 1$). In this case, condition (3) implies that individuals spread equally across countries so that the terms of trade fully absorb any exogenous productivity difference. Perfect labor mobility needs then to adjust only for the differences stemming from local factor congestion. Since countries are assumed to have the same congestion parameter β, it follows naturally that the equilibrium labor allocation is symmetric. When some goods are not traded ($\gamma < 1$), the terms of trade do not fully absorb productivity differences and more individuals locate in the country with the higher productivity. As pointed out by Mundell (1957), the labor reallocation in response to productivity differences is smaller the more open is the economy (larger γ) because trade and labor mobility are substitutes.

Welfare It is instructive to consider the welfare consequences of policies promoting free movement of workers. For simplicity, we focus on the case of a world utilitarian planner who assigns individuals' residence and is able to redistribute income through lump sum transfers. To highlight the effect of labor market flexibility we sterilize the possible risk sharing effects by supposing workers are risk neutral, $U(C) = C$. The planner maximizes world per-capita welfare

$$W(L) = \omega(L)C(L) + (1 - \omega(L))C^*(L),$$

where $\omega(L) = L/\bar{L}$ is the proportion of the population allocated to the home country. It is interesting to ask whether the social planner allocates more labor to the high productivity country and if so whether the planner allocates more or less labor than at the free labor mobility outcome.

Under free movement of workers, we have $C(\hat{L}) = C^*(\hat{L})$ so that the marginal per-capita welfare is (see computation in Appendix C)

$$W'(\hat{L}) = \frac{\beta\gamma}{2}\frac{C(\hat{L})}{\bar{L}}\left(\frac{\hat{L}^*}{\hat{L}} - \frac{\hat{L}}{\hat{L}^*}\right).$$

From the above discussion we know that the home country has a larger share of labor in equilibrium when it has higher productivity ($\alpha > \alpha^* \iff \hat{L} > \hat{L}^*$). This implies that $W'(\hat{L}) < 0$ if $\beta \neq 0$ and $\gamma \neq 0$ and if $\hat{L} \neq \hat{L}^*$, which happens only for $\gamma \neq 1$. Likewise $W'(\hat{L}) > 0$ if $\alpha < \alpha^*$. Therefore, the planner prefers less labor dispersion and prefers to restrict the movement of workers, except in three polar cases: full congestion ($\beta \to 0$), no trade ($\gamma = 0$) and full trade ($\gamma = 1$).

Likewise we can check whether the social planner prefers to allocate more labor to the more productive country. Since at $L = \bar{L}/2$, $C^*(\bar{L}/2)/C(\bar{L}/2) = (\alpha^*/\alpha)^{(1-\gamma)}$, we have

$$W'(\bar{L}/2) = \beta(1-\gamma)\frac{C(\bar{L}/2)}{\bar{L}}\left[1 - \left(\frac{\alpha^*}{\alpha}\right)^{(1-\gamma)}\right].$$

For $\alpha > \alpha^*$ we have $W'(\bar{L}/2) > 0$ and likewise $W'(\bar{L}/2) < 0$ for $\alpha < \alpha^*$. Therefore, unless $\gamma = 1$, the planner will always prefer to allocate more labor to the more productive country but not as much as allocated at the free labor mobility equilibrium.

We summarize this result in the following proposition.

PROPOSITION 1: *The policy of free movement of workers yields excessive agglomeration of workers in the high productivity country compared to the utilitarian optimal spatial distribution of risk neutral workers provided there is weak congestion and both tradeable and non-tradeable goods.*

This proposition highlights a well-know externality in location decisions. When a worker decides to relocate to another country, he/she considers only the average or per capita consumption in each

country and does not take into account his/her impact on reducing consumption in the destination country or raising it in the origin country. The planner weighs not only the change in the per capita consumption of the marginal migrant but also the effect on the consumption of all workers in the origin and destination countries. To clarify this issue, consider the effect of a worker moving from the foreign to the home country. This move reduces labor supply in the foreign country and increases it at home. Differentiating (2), one readily checks that the consumption of workers residing in the home country fall by $-LC'(L) = (1-\beta)C(L) + (\beta\gamma/2)C(L) + (\beta\gamma/2)(L/L^*)C(L)$. In this expression, the first term relates to the wage reduction caused by increased congestion, the second to the fall in export revenues due to the lower relative export price and the last to the loss in consumption due to the higher relative import prices. Similarly, workers in the origin country have a rise in their consumption given by $L^*C^{*\prime}(L) = (1-\beta)C^*(L) + (\beta\gamma/2)C^*(L) + (\beta\gamma/2)(L^*/L)C^*(L)$, which reflects the exact opposite effects. From these expressions it can be seen that the externality works mainly through the effect of trade. When no trade occurs ($\gamma = 0$) the fall and rise in consumptions exactly offset each other at the equilibrium where $C(L) = C^*(L)$. The planner will therefore choose the allocation that corresponds to that equilibrium. However, when countries trade ($\gamma > 0$), the last terms in each expression do not cancel out in any non-symmetric equilibrium ($L > L^*$). In particular, the loss in consumption due to higher relative import prices in the destination country will be larger than the rise in consumption caused by lower relative import prices in the origin country. The planner will then prefer to allocate fewer workers to the destination country. This effect of the movement of workers on the terms of trade and workers' welfare is generally overlooked in the traditional migration literature. However, it may be non-negligible in the case of economic unions where trade and migration potential (or threat) are important and where free labor movement policies are under discussion or being implemented.

To measure the excess agglomeration of workers we define an excess agglomeration index $e \equiv (\hat{L}/\hat{L}^*)/(\tilde{L}/\tilde{L}^*)$ where $(\tilde{L},\tilde{L}^*)$ is the planner's labor allocation that solves $W'(\tilde{L}) = 0$ (see Appendix C). Figure 1 plots the value of excess agglomeration index e in the space of congestion and trade parameters (β,γ). The figure confirms that there is no excess agglomeration in the three following special cases. First, when all goods are traded ($\gamma = 1$), the terms of trade exactly absorb productivity differences and eliminates any incentives to migrate. The welfare optimum naturally coincides with

the equilibrium. Second, when no goods are traded ($\gamma = 0$), local workers evenly share a local production factor that is subject to congestion. Wages then reflect local productivity and also the local consumption of local goods. Wages fall when there is an inflow of workers and provide workers an appropriate signal for their decisions to move. The equilibrium also exactly replicates the planner's outcome. Finally, when production is highly congestible ($\beta \to 0$), the economy approximates a situation where local workers evenly share a fixed crop that depends only on the productivity parameters. The planner is indifferent to the location of workers because he/she can redistribute the global crop ($\alpha + \alpha^*$) to risk neutral individuals through lump sum transfers. So, the equilibrium simply coincides with the labor allocation that the planner chooses when she needs to make no transfer. Wages and incomes are therefore also appropriate signals for location decisions. Note that the migration literature often focuses on the above second case where labor flows but products do not. The omission of trade patterns is unfortunately not innocuous in the discussion of the E.U. and N.A.F.T.A. integration processes. As some trade and some congestion are reasonably expected features of any real economy, the free movement of workers is likely to yield excessive agglomeration into the most productive country and generate short run costs for the country receiving migrants.

Figure 1 also shows that the excessive agglomeration of workers becomes more severe as β rises. More formally, it can be shown that the equilibrium labor level $\hat{L}$ increases faster than the planner's level $\tilde{L}$ as β rises. When local factor congestion is weaker, agglomeration in the higher productivity country is more pronounced both in the free labor movement equilibrium and in the planner's allocation. The externality in the location decisions however exacerbates the agglomeration process at the cost of reducing aggregate consumption. This is because, as β increases, equilibrium wages become less elastic to the relocation of workers and do not give appropriate location incentives to workers. Therefore, *the agglomeration of workers becomes increasingly excessive for weaker local factor congestion*. As shown in Figure 1, the excessive agglomeration of workers can be strong. To make this clear, a moderate expenditure on tradeable goods of $\gamma = 0.2$ and a weak congestion factor of $\beta = 0.8$ yield a population ratio $\hat{L}/\hat{L}^* \simeq 4.6$ and an excessive agglomeration $e \simeq 2$. This means that the high productivity country gets 4.66 times larger than the low productivity country in equilibrium whereas the planner would call for the more modest proportion of 2.33.

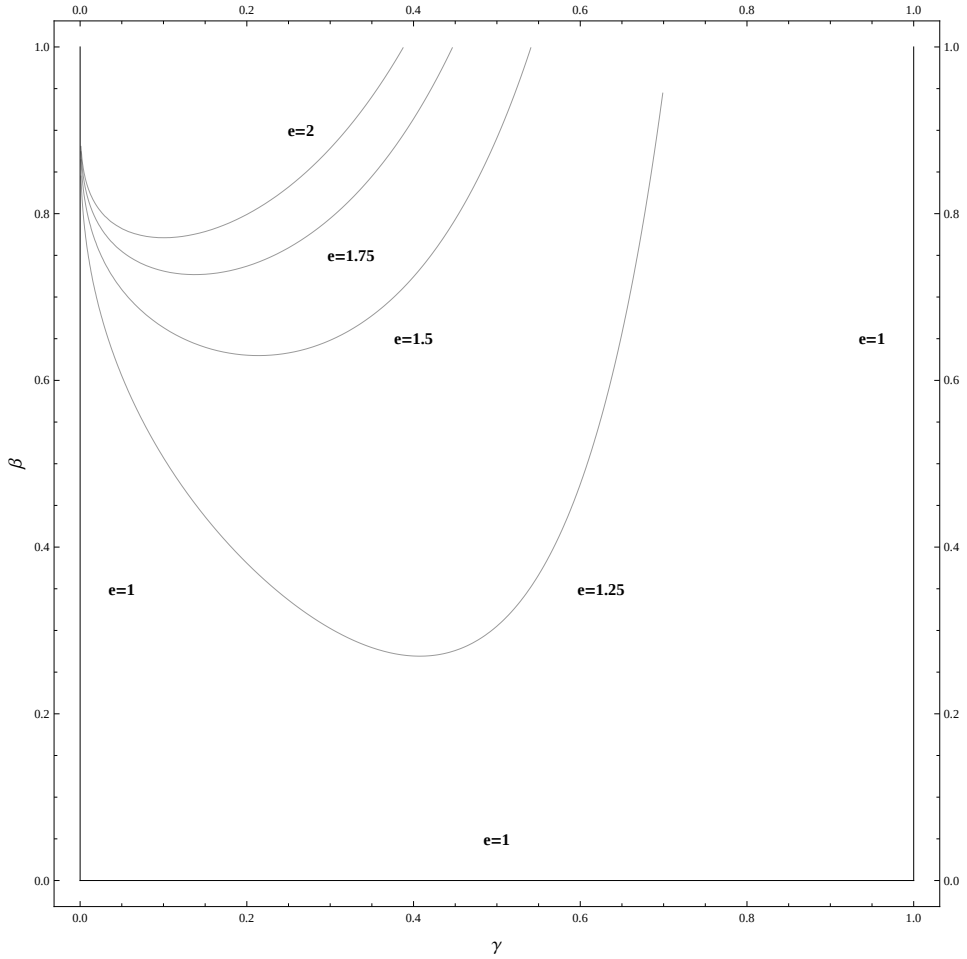


FIGURE 1: LOCI OF EXCESSIVE AGGLOMERATION - (γ,β)-SPACE $(\alpha/\alpha^* = 2, \bar{L} = 1)$.

Figure 1 also shows that the impact of trade on excess of agglomeration is non-monotonic with respect to the size of the tradeable sector. Excessive agglomeration increases with γ for small γ while it decreases with it for large γ. Therefore, *the agglomeration of workers is most excessive for intermediate shares of trade*. At the extremes, we have that $W'(\hat{L}) = 0$ if $\gamma = 0$ whereas $W'(\hat{L}) = W'(\bar{L}/2) = 0$ if $\gamma = 1$. So, the welfare optimum and the equilibrium allocation coincide for those two parameter values. Hence, we expect that the agglomeration of workers becomes more inefficient when γ lies between those two bounds

As a result, the excessive agglomeration of workers culminates when production faces weak congestion and each country trades a small share of its production. In particular, the more productive

country attracts too many migrants when there exists no congestion or constant returns to scale. A standard argument is that migration is innocuous under constant returns to scale because workers move with both their constant productivity and consumption to the hosting country. However, in this model with productivity differences, workers increase their productivity when they move to the more productive country. As a result, they produce more of the good of the destination country, increase congestion and depress its price and local wages. They also demand more of the good produced in the low productivity country and increase its price. Native workers in the more productive country therefore see their wage fall and the price of imports rise. A planner would prefer to reduce labor movements to partly restore the wages and consumption levels of those in the more productive country. Such a conclusion only applies where consumers purchase a mix of tradeable and non-tradeable goods.

To sum up, policies promoting free movement of workers can lead to excessive agglomeration of labor. Models with no trade, full trade and full congestion are not instructive about this effect.

4. SUSTAINABLE POLICIES FOR FREE MOVEMENT OF WORKERS

We now study whether policies of free movement of workers will be adopted by the two countries. In the previous section we highlighted the fact that high productivity countries may incur short run costs as too many workers move there. In the long run, countries may face bad productivity shocks and may use the option to let their natives move and work in another country. So, countries balance the short run costs of accepting inflows of migrants in good states of nature and the long run benefit of allowing its population work in foreign countries in bad states.

To discuss this trade-off between costs and benefits in the short and long run, we focus on a discrete time dynamic model with an infinite horizon. First, we assume that individuals are infinitely lived and have the same discount factor $\delta \in (0,1)$. Under this assumption agents can also be interpreted as dynasties where each generation has an altruism coefficient δ. Second, we assume that countries are hit by productivity shocks. In each period of time t, a state of nature $s \in \mathscr{S} \equiv \{1,...,S\}$ determines the domestic and foreign productivity (α_s, α_s^*). States of nature are i.i.d. and have non-zero probability p_s where $\sum_s p_s = 1$. The operator $\mathrm{E}_s[\ ]$ denotes the expected value, i.e. $\mathrm{E}_s[x_s] = \sum_s p_s x_s$. Note that

because the states of nature are i.i.d., agents' decisions depend only on the current state, so that we can analyze all decisions in the current time period and to drop the reference to time. To highlight the state dependence, we denote the consumption of a worker residing in the domestic and foreign country by $C_s(L_s)$ and $C_s^*(L_s)$ while we denote the corresponding utility by $u_s(L_s) = U[C_s(L_s)]$ and $u_s^*(L_s) = U[C_s^*(L_s)]$.

In this context, we define a policy of *free movement of workers* as the removal of any control over the movement of workers between countries. More precisely, it is a *common* policy in which both countries *unconditionally* grant *non-permanent* work permits to any workers who obtain a job in their jurisdiction. As is typical of many actual migration policies, these non-permanent work permits are automatically associated with non-permanent residence permits. In this section, we also keep a distinction between, on the one hand, work permits and, on the other hand, citizenship and the socioeconomic and political rights that are associated with it. This distinction is important for two reasons. First, it fixes the group of individuals that each government considers as its nationals wherever they work and reside. When workers do not change citizenship or nationality, this group is invariant to the possible relocation of labor between countries. Second, this distinction determines the alternative policy of a country that does not adopt free movement of workers or that decides to breach from this policy. In such cases, we assume that the opting out and breaching countries are able to exert a control on the issue of work permits by putting restrictions and conditions on the number of non-permanent work permits. As a result they are able to stop renewing existing work permits granted to non-citizens and therefore to legally reduce the local labor supplies. We discuss this distinction further in Section 5.

Many practical situations correspond to the above setting. Common policies allowing non-nations to local labor markets are often embedded in third-country association agreements or guest worker programs. Those agreements and programs permit the economic immigration of third-country nationals into a host country under the control of quotas or individualized labor certifications. For example, the E.U. had such agreements with many Eastern European countries during the 1990s and still has such agreements with some neighboring countries including Turkey and Morocco. Hence, our discussion relates to the E.U. decision to adopt a policy of free movement of workers with Eastern

European countries in the 1990s or to the current debate about Turkey's access to the E.U. labor market. Our discussion may be relevant for the popular concerns about migration issues during the 2005 French referendum about the European Constitution. Similarly, N.A.F.T.A. includes policies in favor of free movement of workers. In particular, the TN status grants the equivalent of a non-permanent U.S. visa to Canadian and Mexican citizens who get the opportunity to work in each other's countries. The TN status is limited to three years and to for certain designated professional occupations but can be renewed indefinitely. In practice, the U.S. has implemented a different treatment for the access for Canadians and Mexicans. Whereas the TN status has been easily granted to Canadians at the U.S. border without quotas, it has been offered under stricter conditions to Mexican nationals who are subject to control procedures and to quotas. So, the present discussion also relates to the U.S. and Canadian decision to adopt a common uncontrolled mobility of their nationals within the N.A.F.T.A. and to the U.S. and Mexican decision to remove the present controls and quotas on Mexicans. The present discussion is also applicable to the extension of the TN status to other professional occupations and other countries and in addition to the U.S. H1B visa or to the U.S. employment-based green cards, etc.

We give each country two options: either to adopt the policy of free movement of workers or to control the flow of workers. However, when a country chooses the second option, it is unable to alter the welfare of its natives working in the other country and it puts no weight on the immigrants residing in its own jurisdiction. Hence, the Nash equilibrium of the non-cooperative game in which each country independently controls the inflow of workers within its borders is a situation where no labor movements exist. The second option therefore reduces to the absence of movement of workers.

In order for the policy of free movement of workers to be adopted both countries must comply with the policy. For the sake of exposition, citizenship is assumed to be evenly distributed across countries initially so that each country has $\bar{L}/2$ citizens. We shall assume that when a country does not adopt the policy of free movement of workers or when it breaches the agreement about the free movement of workers, both countries stop delivering work permits to non-citizen workers. In such a case, the spatial distribution of workers is forced back to the initial distribution $(\bar{L}/2, \bar{L}/2)$. For simplicity,

we assume that once the agreement about the policy of free movement of workers is breached, it is breached for ever, though this last assumption can be relaxed without qualitatively altering the results.

Under the policy of free movement of workers, individuals are free to relocate at no cost to any country. Because individuals move freely, they get the same intertemporal utility in the next period irrespectively of the location they choose in the current period. So, their current location decision depends only on the current state s and labor spatial distribution $\hat{L}_s$. As a result, in equilibrium, agents locate so that they are indifferent between locations: $u_s(L_s) = u_s^*(L_s) \iff C_s(L_s) = C_s^*(L_s)$. *The long run equilibrium coincides with the short run equilibrium given by* (3) in the previous section.[13] As we now deal only with the free movement outcome $\hat{L}_s$ and the initial allocation $\bar{L}/2$, we drop the "hat" and refer to the equilibrium allocation as L_s.

A policy of free movement of workers is *sustainable* if and only if each country's government evaluates that this policy is beneficial to its citizens at each date and every possible state. That is, a country will breach the policy if it ever finds it in its own interest to do so. As citizens are homogeneous, each government compares the intertemporal utility of a representative citizen under free labor mobility with his/her intertemporal utility in the absence of the policy. Consider some state $r \in \mathscr{S}$. Free movement of workers implies a contemporaneous gain/loss relative to the alternative at any date t of $u_r(L_r) - u_r(\bar{L}/2)$. As we have seen in the previous section, a country will incur a contemporaneous loss if it becomes more productive ($\alpha_r > \alpha_r^*$) and must host an uncontrolled flow of immigrants. Free movement of worker will be adopted by countries if contemporaneous losses are offset by future benefits. Future benefits will only arise if there are some future states $q \in \mathscr{S}$ where the country has relatively low productivity ($\alpha_q < \alpha_q^*$). Since the equilibrium allocation of labor is history independent, the expected future benefits at any date t is equal to $\mathrm{E}_s[u_s(L_s) - u_s(\bar{L}/2)]$. The policy of free movement of workers will therefore only be sustainable if

$$u_r(L_r) - u_r(\bar{L}/2) + \frac{\delta}{1-\delta}\mathrm{E}_s[u_s(L_s) - u_s(\bar{L}/2)] \geq 0 \quad \forall r \in \mathscr{S}. \tag{4}$$

[13] Note that this property is valid only under free movement of workers. It is not valid under policies that control migrations because future utility levels then differ across countries.

We refer to these conditions as *participation* or *self-enforcement* constraints. Condition (4) is most stringent for the state(s) with the highest contemporaneous loss, $\bar{s} \in \arg\max_r\{u_r(\bar{L}/2) - u_r(L_r)\}$. Similarly the equivalent of Condition (4) for the foreign country is more stringent in the state(s) $\bar{s}^* \in \arg\max_r\{u^*_r(\bar{L}/2) - u^*_r(L_r)\}$. Rewriting Condition (4), we can state that the policy of free movement of workers is sustainable if and only if

$$
\begin{aligned}
u_{\bar{s}}(L_{\bar{s}}) - u_{\bar{s}}(\bar{L}/2) + \frac{\delta}{1-\delta}\mathrm{E}_s[u_s(L_s) - u_s(\bar{L}/2)] \geq 0, \\
u^*_{\bar{s}^*}(L_{\bar{s}}) - u^*_{\bar{s}^*}(\bar{L}/2) + \frac{\delta}{1-\delta}\mathrm{E}_s[u^*_s(L_s) - u^*_s(\bar{L}/2)] \geq 0.
\end{aligned} \tag{5}
$$

These conditions lead to the following conclusions. First, sustainability is possible only if there are positive future expected gains. This implies that countries should expect to incur negative productivity shocks in the future. Second, because $\delta/(1-\delta)$ is an increasing function $[0,1] \to \mathscr{R}^+$, policies promoting free movement of workers are sustainable if discount factors are large enough. This is a result reminiscent of the Folk Theorem in repeated games (Friedman 1971). Finally, by Condition (5), sustainability is less likely if the probabilities of going to the states $\bar{s}$ and $\bar{s}^*$ are higher.

The next subsection discusses sustainability when the benefit of free movement of workers stems only from labor market flexibility. The subsequent subsection introduces risk aversion.

4.1. Sustainability and labor market flexibility

To highlight the benefit of labor market flexibility, we first ignore any insurance motives by supposing workers are risk neutral: $u_s(L_s) = C_s(L_s)$. Also, to get insight about the impact of trade and congestion factors on the adoption of policies of free movement of workers, we simplify the model. Here we focus on a simple shock structure that permits analytical investigation. We assume that countries face a two-state anti-correlated shocks where $S = 2$, $\alpha_1 = \alpha^*_2 = \alpha > 1$ and $\alpha_2 = \alpha^*_1 = 1/\alpha < 0$ with $p_1 = p_2 = 1/2$. Hence the domestic country incurs a high productivity shock in state 1 and a low productivity shock in state 2. The opposite occurs for the foreign country. Countries have no common shocks so that there exists a clear benefit to pool the labor markets.

Under free movement of workers, the equilibrium conditions imply equal consumption in both states, $C_s(L_s) = C_s^*(L_s)$, $s \in \{1,2\}$, whereas the symmetry of productivity shocks imposes symmetric employment and consumption levels across states: $L_1 = L_2^*$ $(= \bar{L} - L_2)$ and $C_1(L_1) = C_2^*(L_2)$. Therefore, consumption is identical in any country and state of nature: $C_1(L_1) = C_2(L_2) = C_1^*(L_1) = C_2^*(L_2)$. From equation (3) we have

$$L_1 = \frac{\rho^2}{1+\rho^2}\bar{L} \quad \text{and} \quad L_2 = \bar{L} - L_1 = \frac{1}{1+\rho^2}\bar{L} \quad \text{where} \quad \rho = \alpha^{\frac{1-\gamma}{1-\beta(1-\gamma)}}.$$

By contrast, a planner would maximize the ex-ante welfare

$$\mathrm{E}[W] = \sum_{s=1,2} p_s[\omega(L_s)C_s(L_s) + (1-\omega(L_s))C_s^*(L_s)]$$

with respect to L_s, $s = 1,2$. As the maximization is state-wise, this is equivalent to maximizing the ex post welfare

$$W(L) = \omega(L)C(L) + (1-\omega(L))C^*(L).$$

The optimal distribution of labor in the present dynamic setting corresponds to the utilitarian optimal distribution of workers discussed in Proposition 1. As a result, *free movement of workers leads to excess agglomeration in the high productivity country when* $\beta \neq 0$ *and* $\gamma \notin \{0,1\}$.

The domestic country has the most stringent participation constraint (5) in state 1, whereas the foreign country has the exactly the same most stringent participation constraint (5) in state 2. Given symmetry, the two conditions (5) are identical and simplify to

$$G(\alpha,\beta,\gamma) \leq \frac{\delta}{2-\delta}, \tag{6}$$

where the function

$$G(\alpha,\beta,\gamma) \equiv \frac{C_1(\bar{L}/2) - C_1(L_1)}{C_2(L_2) - C_2(\bar{L}/2)}$$

measures the *relative cost of adopting (the policy of) free movement of workers*. The sustainability of free movement of workers is related to the relative cost of adopting the free movement of workers,

$G(\alpha,\beta,\gamma)$. The function G balances the short run cost of accepting foreign workers in the good state (state 1 for the home country, state 2 for the foreign country) to the short run benefit of the labor movement option in the bad state (state 2 for the home country, state 1 for the foreign country). It is possible that $G > 1$ so that the costs of accepting foreign workers in the good state exceed the benefits of labor movement in the bad state. Because $\delta/(2-\delta)$ is an increasing function ranging in the interval $[0,1]$, the policy of free movement of workers is not sustainable when $G > 1$. When $G < 1$ the policy of free movement of workers is more likely to be sustainable when the relative cost of adopting the policy of free movement of workers falls. That is, when the short run cost of accepting international workers falls or when the benefit of labor mobility increases.

To consider the range of the function G it is instructive to begin with the discussion of the cases where γ and β are set to their extreme values. We start with the case where all goods are traded.

All trade When all goods are traded ($\gamma = 1$), it can be shown that $G(\alpha,\beta,1) = 1$. Because the terms of trade fully absorb productivity differences, there is no incentive for workers to relocate and the labor force remains evenly distributed. Trade is a perfect substitute for labor mobility. Free movement of workers has no value and is not a sustainable policy for any discount factor.

No trade When no goods are traded ($\gamma = 0$) the relative cost of adopting free movement of workers, $G(\alpha,\beta,0) < 1$: free movement of workers is therefore a sustainable policy provided that workers and governments are sufficiently patient (high δ). In the absence of trade, production efficiency can only be restored through relocation of the labor force. To see this, let us first check the case of immobile labor. Per capita consumption is given by the domestic and foreign individual productivities so that $C_1(\bar{L}/2) = \alpha(\bar{L}/2)^{\beta-1}$ and $C_2(\bar{L}/2) = \alpha^{-1}(\bar{L}/2)^{\beta-1}$. Workers' consumption is again larger in the domestic, high productivity country. Under the policy of free movement of workers, workers move toward the high productivity country so that $L_1^*/L_1 = (1+\alpha^{2(\beta-1)}) < 1$ and consumption is $C_1(L_1) = \alpha L_1^{\beta-1}$. The short run cost of accepting free movement of workers is equal to $\alpha(\bar{L}/2)^{\beta-1} - \alpha L_1^{\beta-1}$ whereas the benefit of labor mobility is equal to $\alpha L_1^{\beta-1} - \alpha^{-1}(\bar{L}/2)^{\beta-1}$. It can be shown that this short run cost is smaller than the benefit. Therefore, free movement of workers is a sustainable

policy if the discount factor δ is high enough. Furthermore, it is easily checked that as local factor congestion vanishes ($\beta \to 1$) the short run cost falls to zero while the net benefits remain positive so that $G(\alpha,\beta,0)$ tends to zero. As a result, free movement of workers is likely to be sustainable when no goods are traded and congestion is weak enough.

Strong congestion Consider the case where firms face very strong decreasing returns to scale or local factor congestion ($\beta \to 0$). Then, it can be shown that $\lim_{\beta\to 0} G(\alpha,\beta,\gamma) = 1$. Free movement of workers is therefore not a sustainable policy. In this case, each country randomly gets a crop of size α or α^{-1} and trades a share of its crop to get an equal consumption of $A + A^{-1}$ where $A = \alpha^{1-\gamma}$. In the absence of labor mobility consumption is $2A$ in the high productivity country and $2A^{-1}$ in the low productivity country. Thus the short run cost of accepting migrants is $2A - (A + A^{-1}) = A - A^{-1}$ whilst the short term benefit is $(A + A^{-1}) - 2A^{-1} = A - A^{-1}$. Since the short run cost equals the short term benefit, impatient, risk-neutral workers in the high productivity country will never accept incurring this short run cost for a possible benefit of an equal amount in the future. The last two cases highlight the fact that free movement of workers may not be an enforceable policy simply because of the delays between costs and benefits. As seen before, those cases indeed do not involve any excess agglomeration of workers.

No congestion Suppose finally that there exists no local factor congestion but some trade occurs ($\beta = 1$, $\gamma > 0$). In this case it can be shown that $G(\alpha) = (\alpha^{1-\gamma} - 1)/(1 - \alpha^{\gamma-1}) \in (1, \alpha]$ and G monotonically decreases from α to 1 as γ rises from 0 to 1. As a result, free movement of workers is not a sustainable policy. This can be seen as follows. In the absence of labor mobility, the domestic and foreign individual consumption is given by the high and low productivities so that $C_1(\bar{L}/2) = \alpha^{1-\gamma}$ and $C_2(\bar{L}/2) = \alpha^{\gamma-1}$. Workers' consumption is of course larger in the high productivity country so that workers have incentives to move to the high productivity country under free movement of workers. Nevertheless, because there exists a demand for the good produced in the low productivity country ($\gamma > 0$), there still exists a demand for labor in that country and workers never fully agglomerate in the high productivity country. In equilibrium, labor is allocated so that $L/L^* = \alpha^{2(1-\gamma)/\gamma}$ and

workers' consumption is given by $C_1(L_1) = \alpha^{1-\gamma}(L/L^*)^{-\gamma/2} = 1$. Comparing this to consumption in the absence of labor mobility, we observe that the short run cost of accepting migrants is then equal to $\alpha^{1-\gamma} - 1$ whereas the benefit of labor mobility is equal to $1 - \alpha^{\gamma-1}$. Because $\alpha^{1-\gamma} + \alpha^{\gamma-1} > 2$ provided $\alpha > 1$, this short run cost is larger than the benefit. Thus the high productivity country never finds it profitable to accept migrants in exchange of the promise of a possible outflow of its natives in a future bad state of nature. This is a remarkable result given the common claim that migration is irrelevant in a world with constant returns to scale because workers move with both their demand and production capabilities. However, we have shown in the previous section that there exists excess agglomeration of workers in the high productivity country even under constant returns to scale. This effect increases both the short run cost and benefit of migration. Yet, because of the presence of inefficiencies, it increases the short run cost of migration more than its benefit and hence weakens the sustainability of a policy of free movement of labor.

PROPOSITION 2: *Suppose that individuals are risk neutral and that countries face a two-state anti-correlated shocks. Free movement of workers is never a sustainable policy in an economy with only tradeable goods ($\gamma = 1$) or with either very low or very high congestion costs ($\beta \in \{0,1\}$). In an economy where no goods are tradeable ($\gamma = 0$), free movement of workers becomes a sustainable policy if and only if individuals are sufficiently patient (high δ).*

The four cases discussed above suggest that free movement of workers is less likely to be a sustainable policy in economies with large trade and high congestion of local factors. Figure 2 depicts, for all congestion and trade parameters (β, γ), the locus of the equality $G(2,\beta,\gamma) = \delta/(2-\delta)$ where $\delta/(2-\delta) = 0.25$, 0.50, 0.75 and 1. These values respectively correspond to critical discount factors $\delta = 0.40$, 0.66, 0.85 and 1. The area (a) corresponds to the situation where $G(2,\beta,\gamma) > 1$ and the areas (b) and (c) to the situation where $G(2,\beta,\gamma) < 1$. The relative cost of adopting free movement of workers $G(2,\beta,\gamma)$ becomes larger as we move to the North-West of the figure. As a result, free movement of workers is more likely to become a sustainable policy in economies with smaller local factor congestion and lower trade.

Finally, Figure 2 also shows that the relative cost of adopting free movement of workers, G, increases as more goods are traded (larger γ). Because trade is a substitute for labor movement,

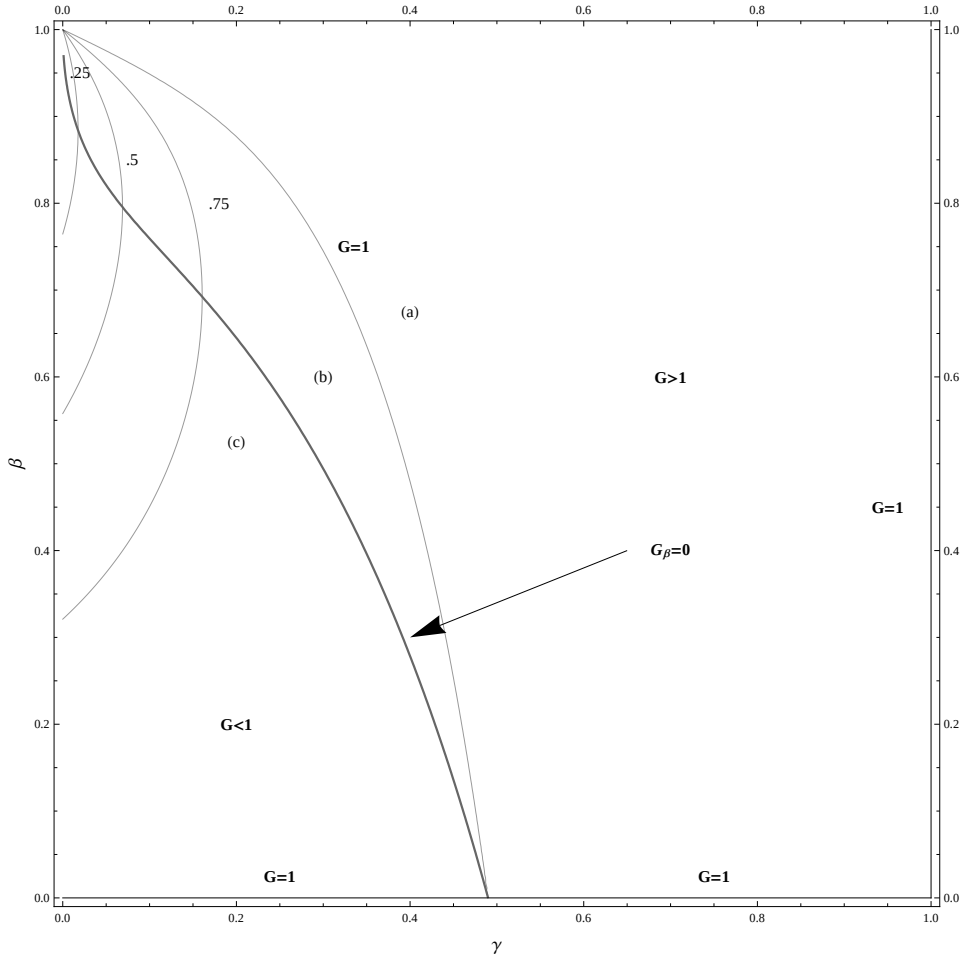


FIGURE 2: RELATIVE COST OF ADOPTING THE FREE LABOR MOBILITY POLICY - $G(2,\beta,\gamma)$.

free movement of workers is less useful when trade is large. On the other hand, the relative cost of adopting free movement of workers, $G(2,\beta,\gamma)$, is not monotone with respect to the intensity of congestion parameter β. Indeed, as we move downward in Figure 2 (β falls), $G(2,\beta,\gamma)$ firstly decreases when the parameters (β,γ) lie in the area (b) but it increases when those parameters lie in the area (c). In the figure, areas (b) and (c) are separated by a thicker curve which corresponds to the locus where the partial derivative $G_\beta = \partial G(2,\beta,\gamma)/\partial\beta = 0$. This locus therefore shows, for a given γ, the value of β for which free movement of workers can be supported for the lowest discount factor. Whereas lower congestion or decreasing returns to scale implies that domestic workers' productivity and wages are less affected by the inflow of international workers, it also implies that the incentive

for migration is not offset enough by any upward pressure on wages in the low productivity country. Excessive agglomeration of labor occurs and can be so inefficient that the domestic country does not find it profitable to opt for free movement of workers. In this case, the short run cost of accepting an excessive inflow of foreign workers in good states of nature does not outweigh the benefit of the migration option in bad states of nature.

We summarize our result in the following proposition. Let the set $\Gamma(\alpha,\beta,\gamma) = \{(\alpha,\beta,\gamma) : G(\alpha,\beta,\gamma) < 1\}$. From the above discussion about the case $\gamma = 0$, we know that this set is non-empty.

PROPOSITION 3: *Suppose that individuals are risk neutral and that countries face two-state anti-correlated shocks. Consider a free labor mobility policy such that work permits are granted on the condition of employment. Then, we get the following:*
(i) The free labor mobility policy is not sustainable if $(\alpha,\beta,\gamma) \notin \Gamma(\alpha,\beta,\gamma) \neq \emptyset$. *Otherwise there exists a discount factor* $\underline{\delta} \in (0,1)$ *such that free migration policies are sustainable if* $\delta \geq \underline{\delta}$.
(ii) The free labor mobility policy is more likely to be sustainable as fewer goods are traded. It also is more likely to be sustainable for intermediate values of local factor congestion.

In this subsection, we have analyzed the sustainability of free movement of workers under the assumption of risk neutrality. Countries benefit from a more efficient spatial distribution of workers in each state of nature. When individuals are risk averse, free movement of workers may also provide insurance to individuals because it allows them to smooth incomes and consumptions through relocation. We develop this idea in the following subsection.

4.2. Sustainability, insurance and labor flexibility

When individuals are risk averse, the free movement of workers allows countries to smooth income fluctuation by pooling the risk of productivity shocks. This property becomes significant as soon as shocks are not perfectly positively correlated.

It is firstly interesting to study the case where individuals are infinitely risk averse. In this case, for any set of states, individuals take into account only the payoff in the worst state of nature they can reach, say state $\underline{s}$. It is then clear that the free movement of workers always improves consumption in

the worst state relative to the no mobility option. Thus, from condition (4), it can be seen that the expected future gain is always positive so that there must be a large enough discount factor above which free movement of workers becomes a sustainable policy.

The impact of risk aversion on the adopting free movement of workers can be made more precise in the above context of the two-state anti-correlated shocks. Under risk aversion, *the relative cost of adopting (the policy of) free movement of workers* becomes

$$G(\alpha,\beta,\gamma) \equiv \frac{u_1(\bar{L}/2) - u_1(L_1)}{u_2(L_2) - u_2(\bar{L}/2)},$$

where $u_s(L_s)$ denotes the contemporaneous utility $U[C_s(L_s)]$.

Let us here review some polar cases when all goods are traded and when congestion is very strong or very weak.

All trade When all goods are traded ($\gamma = 1$), we know that the terms of trade fully absorb any productivity differentials. Individuals therefore reach a constant utility and the function $G(\alpha) = 1$.[14] As before, free movement of workers is not useful and therefore it is not sustainable.

Strong congestion When congestion is very strong ($\beta \to 0$), the model works as if the world supplied a fixed amount of output that was asymmetrically divided across the countries. Although free movement of workers offers no efficiency gain in labor markets, it allows countries to reach an allocation of output closer (but not equal) to an even distribution of output. Free movement of workers provides an (imperfect) insurance contract. As individuals become more risk averse the expected benefit of the policy, $E_s u_s(L_s) - E_s u_s(\bar{L}/2)$, increases compared to its short term cost, $u_{\bar{s}}(\bar{L}/2) - u_{\bar{s}}(L_{\bar{s}})$. Therefore, the relative cost of adopting free movement of workers, $G(\alpha) < 1$ and *there must exist discount factors for which free movement of workers is a sustainable policy*.

[14] We drop the notational dependence of G on β and γ in what follows.

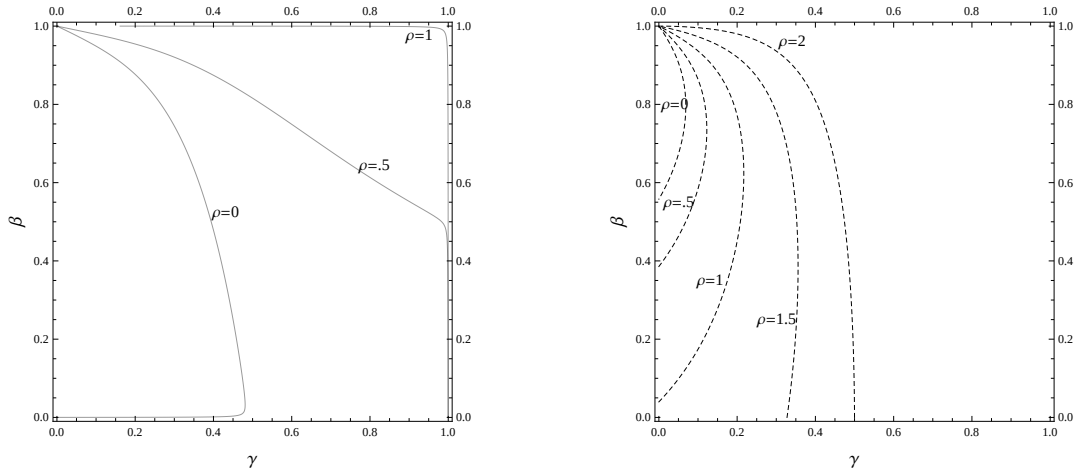
No congestion When there is no congestion and some tradeable goods ($\beta = 1$, $\gamma > 0$), the relative cost of adopting free movement of workers is $G(\alpha) = [U(\alpha^{1-\gamma}) - U(1)]/[U(1) - U(\alpha^{\gamma-1})]$, which is smaller than one if and only if $U(\alpha^{1-\gamma}) + U(\alpha^{\gamma-1}) < 2U(1)$. It can be shown that this is always true for any utility function which has a coefficient of relative risk aversion greater than or equal one for all relevant levels of consumption. As a consequence, *when coefficient relative risk aversion is larger than one, there always exist discount factors* $\delta \in (0,1)$ *for which free movement of workers is a sustainable policy*.

We summarize these results in the following proposition:

PROPOSITION 4: *Suppose that individuals are risk averse and that countries face two-state anti-correlated shocks. Free movement of workers is never a sustainable policy in an economy with only tradeable goods* ($\gamma = 1$)*. In an economy with either very low or very high congestion costs* ($\beta \in \{0,1\}$)*, free movement of workers becomes a sustainable policy if and only if individuals are sufficiently patient (high* δ*).*

Risk aversion has positive impact on the adoption of free movement of workers because it equalizes consumption across countries and reduces the consumption variability across states of the worlds. Risk aversion can also have important impact on the adoption of free movement of workers. To illustrate this, we have plotted the sets of parameters (β, γ) for which the relative cost of adopting the free movement of workers, $G(\alpha) = 1$ (solid lines in Figure 3a) and $G(\alpha) = 0.5$ (dashed lines in Figure 3b). The curves are drawn for constant relative risk aversion (CRRA) preferences with relative risk aversion coefficient ρ varying from 0 to 2. It is worth noting that for any relative risk aversion coefficient larger than one, the relative cost of adopting free movement of workers, $G(\alpha) < 1$ everywhere except at the North and East borders of the figure. *Therefore, for a constant relative risk aversion coefficient larger than one and for almost all parameters of the model* (β, γ)*, there always exists a discount factor for which free movement of workers is a sustainable policy*. Although we have seen that the terms of trade eliminate the potential efficiency gains from a flexible relocation of workers, they do not eliminate the potential insurance gain caused by free movement of workers. Empirical estimates of the coefficient of constant risk aversion give values in a range between 2 and 5.

Therefore, Figure 3 suggests that risk sharing is an important element of the decision to adopt free movement of workers.



(a) $G(\alpha) = 1$ (b) $G(\alpha) = 0.5$

FIGURE 3: COST OF ADOPTING THE FREE LABOR MOBILITY POLICY UNDER RISK AVERSION.

To sum up, we have shown that free movement of workers is a sustainable policy for small enough discount factors, for small enough trade levels and for intermediate local factor congestion. Risk aversion is an important element in the decision to sustain free movements of workers.

5. FULL RIGHT MIGRATION POLICY

We now return to the distinction between non-permanent and permanent work program and between rights for work permits and citizenship. In particular we now study another form of labor mobility where individuals are automatically granted citizenship in the host country.

The policy of free movement of workers analyzed above is based on the distinction between work permits and citizenship. Because guest workers have non-permanent work permits and have no local citizenship, they are not included in the local government's objective. In this section we relax this distinction and assume that immigrants receive citizenship and the associated rights to participate in the local labor market in a permanent way. This assumption addresses the situation where economic shocks last longer than the civil integration (e.g. naturalization) of immigrants into the host country. Indeed, in many countries, a long enough residence in a country allows migrants

to acquire citizenship and therefore to get a permanent right to participate in the local labor market. Similarly, the descendants of non-citizen migrants are often granted or allowed to ask the citizenship of their parents' host country, a right that allows them the right to participate in the local labor market.

Two examples for this setting can be found in the E.U. and the U.S. Under the Treaty of Lisbon, E.U. citizens are allowed to get permanent work permit and resident cards in any E.U. member state where they find work while they keep their initial nationality and most of their political rights in the native country. In E.U. countries, individuals may acquire the local nationality after a certain amount of time and the local nationality can be asked for the descendants born on the local territories. Similarly, the U.S. immigration services grant to foreign workers green cards that offer permanent residence and access to labor market. As a step forward, the green cards give the opportunity to apply for U.S. citizenship after a certain length of time. Descendants born in the U.S. automatically acquire the U.S. citizenship. Therefore it is of interest to study the adoption of migration policy in which immigrants get the same rights as local citizens and in which governments are concerned by the welfare of both native and (naturalized) immigrant workers.

In this section we study the adoption of a *full right migration policy* by which, at the beginning of each time period, immigrants get the full rights to citizenship and labor participation in the country where they locate. Those rights include the political rights so that the welfare of both natives and immigrants becomes the concerns of each government. In particular, we focus on the case where those rights are acquired at the time of entry into the host country and where those rights are exclusive in the sense that migrants loose their former citizenship and rights associated with their former nation.[15] We finally keep the assumption that once the agreement about the policy is breached, it is breached for ever. The full right migration policy includes two main differences with the policy of free movement of workers considered above. First, when a country breaches from the full right migration policy, it is indeed unwilling to reduce its work force because migrants are now part of its political constituency. Secondly, because the number of nationals vary with shocks and related immigration flows, the initial distribution of nationals generally differs from the distributions of nationals in subsequent

[15] In practice, such political rights may take some time to be acquired and may sometimes be cumulated over several countries. However, we assume away such situations for the simplicity of the argument.

time periods. As result, we must distinguish the acceptability and the sustainability of the full right migration policy: acceptability relates to the decision to adopt the policy with the initial population distribution whereas sustainability relates to the decision to continue (or not to breach) the policy given the population distribution in subsequent time periods. We show that a full right migration policy is less likely to adopted than the policy of free movement of workers.

Sustainability We first focus on sustainability of the full right migration policy by assuming that the policy is already agreed. Domestic labor market conditions are given by the number of domestic citizens who have established residence in that country during the previous time period and who have been granted citizenship and labor participation rights. If we denote by r and $q \in \mathscr{S}$ the states of nature in the current and previous time periods and by $u_r(L_r)$ the instantaneous utility $U[C_r(L_r)]$, the full right migration policy is sustainable for the domestic country if and only

$$u_r(L_r) + \frac{\delta}{1-\delta} E_s u_s(L_s) \geq u_r(L_q) + \frac{\delta}{1-\delta} E_s u_s(L_q) \quad \forall r, q \in \mathscr{S}, \tag{7}$$

where L_r and L_q are the short run equilibrium numbers of workers given by (3). This condition is explained as it follows. The right hand side of this condition represents the domestic citizens' intertemporal utility when their government breaches the policy agreement and keeps its L_q citizens.[16] The left hand side of this condition represents the domestic citizens' intertemporal utility under the full rights migration policy. Because the citizens are allowed to move freely, they get the same intertemporal utility in the next period irrespectively of the location they choose in the current period; their current location decision thus depends only on the current state r and spatial labor distribution L_r. As a result, the long run equilibrium coincides with the short run equilibrium where $u_s(L_s) = u_s^*(L_s)$. At the beginning of the current time period, the domestic government represents only L_q citizens. Because of the possibility of relocation, those citizens get an intertemporal utility equal to $u_r(L_r) + (\delta/(1-\delta))E_s u_s(L_s)$.

Because domestic instantaneous utilities decrease with a larger domestic labor force, it follows that Condition (7) is most stringent for state $\overline{q} \equiv \arg\min_s L_s$ and state $\overline{r} \equiv \arg\max_r [u_r(L_{\overline{q}}) - u_r(L_r)]$. The

[16] In the previous analysis $L_q = \bar{L}/2$ for each state q.

domestic country's incentive to breach is the strongest (1) when it just recovers from the strongest negative shock and has kept only a small share of its initial population and (2) when the short run utility gain of restricting access to labor market in the current time period is the largest. In contrast to the policy of free movement of workers, this puts a restriction on the set of shocks that make the full right migration policy sustainable.

To get more insight we establish the following necessary condition. Let us take the expectation of both sides of Condition (7) with respect to states r. Then Condition (7) implies that $E_s u_s(L_s) \geq E_s u_s(L_q)$. Therefore, the full right migration policy is sustainable only if there exists no state of nature $q \in \mathscr{S}$ such the latter inequality is not satisfied. Given our definition of $\overline{q}$, this means that the full right migration policy is sustainable only if

$$E_s u_s(L_s) \geq E_s u_s(L_{\overline{q}}).$$

This puts an upper bound on the labor outflow the domestic country can tolerate: the full right migration policy cannot be sustainable if the labor distribution is too uneven distributed in the domestic country's worst state of nature $\overline{q}$. If it were, the country would be tempted to take advantage of its small population share when its economy returns to good fortune and renege on the policy of free migration.

It is also interesting to consider this necessary condition in the case of the two-state anti-correlated shock that we have analyzed earlier ($\alpha_1 = \alpha_2^* = \alpha > 1$, $\alpha_2 = \alpha_1^* = 1/\alpha < 0$ and $p_1 = p_2 = 1/2$). In this case the necessary condition simplifies to $\# u_1(L_1) \geq u_1(L_2)$, which contradicts the fact that $u_1(L_1) < u_1(L_2)$ because $L_1 > L_2$.# The full rights migration policy is thus not sustainable. We summarize this discussion in the following proposition.

PROPOSITION 5: *Consider a full right migration policy such that immigrants get citizenship in the host country.*
(i) This policy is sustainable if and only Condition (7) holds for $q = \overline{q} \equiv \arg\min_s L_s$ *and* $r = \overline{r} \equiv \arg\max_s [u_r(L_{\overline{q}}) - u_r(L_r)]$.

(ii) The policy is never sustainable if $E_s u_s(L_s) < E_s u_s(L_{\bar{q}})$.

(iii) The policy is never sustainable in the case of two-state anti-correlated shocks.

Adoption The previous discussion focused on the sustainability of the full right migration policy by assuming that the policy was already agreed. We now analyze the issue of the *adoption* of the policy in the initial time period where population distributions are not the result of free labor movements. In line with the previous section, we suppose that the spatial distribution is initially given by $(\bar{L}/2, \bar{L}/2)$. Let the state in the initial time period be denoted by r_0. So, the full right migration policy is adopted in the initial time period if and only if Condition (7) holds and if the following *adoption condition*

$$u_{r_0}(L_{r_0}) + \frac{\delta}{1-\delta} E_s u_s(L_s) \geq u_r(\bar{L}/2) + \frac{\delta}{1-\delta} E_s u_s(\bar{L}/2) \tag{8}$$

holds. The adoption condition is obvious the counter part of Condition (4) where r is replaced by r_0. It compares the intertemporal utility of a representative citizen under free labor mobility with his/her intertemporal utility when its government maintains the population at its initial distribution by allowing no migration. Because $\bar{L}/2 \geq L_{\bar{q}}$, the right hand side of this condition is smaller than the right hand side of Condition (7). Because this is true for any r_0, the adoption condition is implied by Condition (7). Therefore, if Condition (7) holds and countries are initially evenly distributed, the domestic country adopts the full right migration policy for any initial state of nature. By the same token we have proven that Condition (7) is stronger than Condition (4). This means that a policy of free movement of workers is always sustainable if the full right migration policy is adopted.

We summarize our discussion in the following proposition.

PROPOSITION 6: *Consider a full right migration policy such that immigrants get citizenship in the host country. Then, a full right migration policy will be both adopted and sustainable under the conditions of Proposition* 5 *if initially the population is evenly distributed. The full right migration policy is less likely to be adopted than the policy of free movement of workers.*

The main message of this discussion is that a full right migration policy is less likely to be adopted and sustained than the policy of free movement of workers. The reason lies in the fall-back positions

of the two countries when they face (strong) productivity changes. When the domestic country had low productivity in the previous period and currently experiences a strong rise in its productivity, it has the option to breach the full right migration policy and restrict the benefit of the productivity rise to its local citizens. As a result, the foreign country is unable to offer its citizens the option to move, a situation that is particularly critical when it faces a sudden negative productivity shock at the same time. The harm to the foreign country is greater in the case of a full right migration policy compared to a policy of free movement of workers because it cannot restrict work participation to just the initial $\bar{L}/2$ workers. Hence, we conclude that the fall-back position of countries with respect to citizenship and rights to local labor market participation is an important element of sustainability and adoption of labor mobility policies.

6. EXTENSIONS

Our model can be extended in many directions. We here investigate two effects on the adoption of migration policies: the effect of productivity asymmetries between countries and that of unemployment. For the sake of conciseness, we focus on the policy of free movement of workers. By Proposition 6, the full right migration policy will not be adopted if free movement of workers is not a sustainable policy.

6.1. Country asymmetries

The above discussion suggests that there exist good economic rationales to permit labor flows between countries when the latter face productivity shocks which are not perfectly correlated. Yet, it is readily observed that free labor flows are neither organized nor permitted between many countries of the world. This is particularly true for labor flows between developing and developed countries. As a case in point, the TN status, which offers permission to work within the U.S. under the N.A.F.T.A., has been subject to huge restrictions for Mexican natives whereas it has included very few restrictions for Canadians. The higher reluctance of developed countries to migration flows from less developed countries is usually explained by their concerns about a possible direct redistribution towards the immigrants (e.g. Ortega 2010, Wellisch and Walz 1998). In this section we provide an explanation

without such direct redistribution. We show that large productivity differences make labor mobility policies less sustainable.

To make the argument simple, suppose that agents have an instantaneous utility given by the CRRA utility function, $U(C) = C^{1-\rho}/(1-\rho)$, $\rho \geq 0$ and $\rho \neq 1$. Suppose further the domestic productivity is now given by $\widetilde{\alpha}_s \equiv \theta \alpha_s$, whereas the foreign productivity remains equal to α_s^*, $s \in \mathscr{S}$. The parameter θ ($\theta \geq 1$) measures the domestic productivity advantage. Then, the equilibrium distribution of labor under free labor mobility is given by

$$\frac{\widetilde{L}_s}{\widetilde{L}_s^*} = \left(\frac{\widetilde{\alpha}_s}{\alpha_s^*}\right)^{\frac{1-\gamma}{1-\beta(1-\gamma)}} = \left(\frac{\theta\alpha_s}{\alpha_s^*}\right)^{\frac{1-\gamma}{1-\beta(1-\gamma)}} = \frac{L_s}{L_s^*}\left(\theta^{\frac{1-\gamma}{1-\beta(1-\gamma)}}\right),$$

where the tilde $\widetilde{\ }$ denotes the new variables under country asymmetry. One can compute that $d\widetilde{L}_s/d\theta > 0$ so that $\widetilde{L}_s > L_s, \forall s \in \mathscr{S}$. As a result, a higher productivity advantage yields a stronger incentive to agglomerate in the domestic country. This is true for any state of nature. Also, it can be checked that employment levels are ranked in the same order as in the case where $\theta = 1$. So, $L_s > L_r \iff \widetilde{L}_s > \widetilde{L}_r$, $r \neq s$. Because of the CRRA preferences for risk, the instantaneous utility is

$$\widetilde{u}_s(\widetilde{L}_s) = U\left[(\theta\alpha_s)^{1-\frac{\gamma}{2}}(\alpha_s^*)^{\frac{\gamma}{2}}\left(\widetilde{L}_s\right)^{\beta\left(1-\frac{\gamma}{2}\right)-1}\left(\widetilde{L}_s^*\right)^{\beta\frac{\gamma}{2}}\right] = u_s(\widetilde{L}_s)\left(\theta^{\left(1-\frac{\gamma}{2}\right)(1-\rho)}\right).$$

Following the same argument as for Condition (4), we can state that free movement of workers is a sustainable policy for the domestic country if and only if

$$\frac{\delta}{1-\delta} \geq \frac{\widetilde{u}_{\overline{s}}(\overline{L}/2) - \widetilde{u}_{\overline{s}}(\widetilde{L}_{\overline{s}})}{E_s\widetilde{u}_s(\widetilde{L}_s) - E_s\widetilde{u}(\bar{L}/2)},$$

which is equivalent to

$$\frac{\delta}{1-\delta} \geq \frac{u_{\overline{s}}(\bar{L}/2) - u_{\overline{s}}(\widetilde{L}_{\overline{s}})}{E_s u_s(\widetilde{L}_s) - E_s u_s(\bar{L}/2)}. \tag{9}$$

Condition (9) is the same as Condition (4) except that the variables of domestic employment L_s have been replaced by $\widetilde{L}_s$. The critical state $\overline{s}$ is the same as before. Indeed, one can check that $\overline{s}$,

defined as $\arg\max_r \{\widetilde{u}_r(\bar{L}/2) - \widetilde{u}_r(\widetilde{L}_r)\}$, is equal to $\arg\max_r\{u_r(\bar{L}/2) - u_r(\widetilde{L}_r)\}$ and equivalently to $\arg\max_r\{u_r(\bar{L}/2) - u_r(L_r)\}$ since $\widetilde{L}_r > L_r, \forall r \in \mathscr{S}$. Because instantaneous utility $u_r(L_r)$ is decreasing in L_r, the employment levels $\widetilde{L}_s$ increase and the domestic country's instantaneous utility falls in any state of nature as country asymmetries rise (larger θ). As a result, the numerator of the right hand side of Condition (9) increases whereas its denominator decreases, so that the ratio increases. The critical discount factor for which Condition (9) binds is then larger than the critical factor $\underline{\delta}$ for which Condition (4) binds. Free movement of workers is therefore less likely to be a sustainable policy when country asymmetries become more important.

PROPOSITION 7: *Suppose that individuals have CRRA preferences and that the domestic country's productivity increases relative to the foreign country such that θ satisfies $\widetilde{\alpha}_s \equiv \theta\alpha_s$ ($\theta \geq 1$). Then, the free labor mobility policy is less likely to be sustainable the lager is domestic country's advantage (the larger θ).*

This proposition provides some support to the idea that developed countries are unlikely to accept uncontrolled inflows of immigrants from developing countries. Although there exist gains from a more efficient distribution of labor and from a possible insurance mechanism, the high productivity country does not accept a policy of free movement of workers because such policy would lead to a large and permanent spatial redistribution of workers. Such a redistribution of workers increases the congestion of local factors and reduces the domestic residents' wage and consumption. One can get a very clear idea about this effect when θ is very large. If θ is large enough, the number of workers in the home country under free movement of workers, $\widetilde{L}_s$, is larger than the number of citizens, $\bar{L}/2$, for any state of nature. The home instantaneous utility levels are smaller with the policy than without it and the home country will find the policy unacceptable.

The present discussion is not unrelated to the discussion about the full right migration policy. The latter policy is not sustainable when a country inherits from the previous time period a population that is small compared to the population that would be desired by the social planner. Here, the advantaged country also inherits from the initial time period a population ($\bar{L}/2$) that is small compared to the social planner's current choice of population. As a result, both policies offer no improvement to the country with the (temporary or permanent) advantage.

6.2. Unemployment

The reluctance to opt for free movement of workers is often based on a claim about local labor market problems. In particular, many countries have found it difficult to allow uncontrolled (in)flows of workers in times of high unemployment. Boeri and Brücker (2005) presents evidence of the hardening of migration conditions within the E.U. This being most evident for richer countries with large unemployment levels, such as France and Belgium. We here show that the existence of unemployment stemming from labor market rigidities is not a rationale against the adoption of free movement of workers.

Unemployment generally stems from some form of downward nominal wage rigidities. For the sake of simplicity, let us suppose that the domestic and foreign wages (w, w^*) must lie above some exogenous minimum wage $\underline{w}$. Let the tuple (L, L^*) denote the domestic and foreign populations and let the tuple (l, l^*) denote the numbers of worked hours or employed workers; the tuple $(L-l, L^*-l^*)$ can be interpreted as either under-employment or unemployment. In the latter case, we make the simplifying assumption that governments follow a Rawlsian welfare objective and implement lump sum redistribution to the unemployed so that employed and unemployed workers residing in a same country get the same utility. The analysis of the short run equilibrium is the same as in Section 3 except that (L, L^*) must be replaced by (l, l^*). The wage ratio equality (1) now gives the employment ratio: $l/l^* = w^*/w$. This states that worked hours follow local costs of labor. The domestic instantaneous utility is now given by:

$$\begin{aligned} U(C) &= U\left[\alpha^{1-\gamma/2}(\alpha^*)^{\gamma/2}(l)^{\beta(1-\gamma/2)}(l^*)^{\beta\gamma/2}L^{-1}\right] \\ &= U\left[\alpha^{1-\gamma/2}(\alpha^*)^{\gamma/2}(w^*/w)^{\beta\gamma/2}l^{\beta}L^{-1}\right]. \end{aligned}$$

A symmetric expression holds for the foreign country.

Suppose now that the domestic country faces a good productivity shock relative to the foreign country: $\alpha > \alpha^*$. Then, if labor is immobile and if the minimum wage $\underline{w}$ is high enough, downward wage rigidities imply that the foreign country faces unemployment ($w^* = \underline{w}$ and $l^* < L^*$) whereas the

domestic country has full employment ($w \geq \underline{w}$ and $l = L$). The instantaneous utilities are given by:

$$U(C) = U\left[\alpha^{1-\gamma/2}(\alpha^*)^{\gamma/2}(\underline{w}/w)^{\beta\gamma/2}L^{\beta-1}\right] \quad \text{and}$$
$$U(C^*) = U\left[(\alpha^*)^{1-\gamma/2}(\alpha)^{\gamma/2}(w/\underline{w})^{\beta\gamma/2}(l^*/L^*)^{\beta}(L^*)^{\beta-1}\right].$$

By contrast, when labor is allowed to move across countries, foreign workers move to the domestic country as long as $C/C^* > 1$; that is, if $(\alpha/\alpha^*)^{1-\gamma}(\underline{w}/w)^{\beta\gamma}(l^*/L^*)^{-\beta}(L/L^*)^{\beta-1} > 1$. So, L increases whereas L^* decreases to l^*. At this point, the foreign country reaches full employment; the labor distribution reaches the short run equilibrium distribution (3) that is obtained in Section 3. Therefore, free movement of workers eliminates unemployment. Free movement of workers implies a better use of productive resources in terms of both time and spatial allocation of work. Workers then get the same instantaneous utility levels $u_s(L_s)$ as those defined in Section 3.

Let us now define the instantaneous utilities as $\overline{u}_s(L/2)$ when countries do not adopt or breach the policy of free movement of workers. Note that labor market rigidities imply that $\overline{u}_s(L_s) < u_s(L_s)$ for all L_s, $s \in \mathscr{S}$. Following the same argument as for Condition (4), we can state that free movement of workers is a sustainable policy for the domestic country if and only if

$$\frac{\delta}{1-\delta} \geq \frac{\overline{u}_s(\bar{L}/2) - u_s(L_s)}{E_s u_s(L_s) - E_s \overline{u}_s(\bar{L}/2)}.$$

Since $\overline{u}_s(L_s) < u_s(L_s)$, the right hand side in this condition is smaller than in Condition (4). The free movement of workers is therefore more likely to be a sustainable policy when countries face wages rigidities.

PROPOSITION 8: *The free labor mobility policy is more likely to be sustainable when countries face downward wages rigidities and unemployment.*

7. CONCLUSION

In this paper we have studied the factors that help countries mutually agree common policies of free movement of workers. For the countries to agree on such a common policy, short run costs must be outweighed by long term benefits. Under free movement of workers, countries facing good

productivity shocks incur short run costs as they allow foreign workers to participate in their local labor markets, which reduces local wages and/or purchasing power. By contrast, countries facing bad productivity shocks benefit from free movement of workers because they are able to invite their citizens to work temporarily or permanently in more prosperous countries. When productivity varies through time, free migration policies therefore bring long run benefits in terms of labor market flexibility and income risk sharing.

We considered the economic factors that contribute to the mutual agreement to adopt a policy of free movement of workers. We showed that free movement of workers creates negative externalities on local workers when countries produce some tradeable goods. This externality yields excess agglomeration of labor in the most productive country (which is exacerbated under weak congestion). This externality reduces the incentives of both countries to adopt a common policy for free movement of workers. Also, we showed that, from the view point of labor market efficiency alone, free movement of workers cannot be a sustainable policy in an economy with only tradeable goods or with very high congestion factors (strong decreasing returns to scale). In general, free migration policies become sustainable only if the share of tradeable goods is not too large and congestion factors are neither too high nor to small. In fact, some congestion factors can help. This reverses the conventional wisdom that congestion costs tend to reduce the political acceptability of migration.

We distinguished between two main policies. Under the policy of free movement of workers, migrants are guest workers who receive non-permanent work and residence permits. This policy corresponds to third-country association agreements or usual guest worker programs. Under the full right migration policy, migrants receive permanent work and residence permits as well as local political rights. Such a policy corresponds to a policy of naturalization of migrants or their descendants. In this paper, we have demonstrated that the latter policy is less likely to be sustainable. This is because each country anticipates the problem that may arise when its productivity falls: it may be stuck with too a large (recently naturalized) population and face other countries that block any reverse migration flow by breaching the full right migration agreement.

We considered the case of permanent productivity differences and showed how this factor may explain the reluctance of developed countries to accept uncontrolled inflows of immigrants from

developing countries. The analysis was also extended to a simple case with unemployment caused by wage rigidities to show that free labor mobility policies are more likely to be sustainable when countries face downward rigidities in wages.

The analysis could also be extended in several other directions. For instance, it will be interesting to investigate the acceptability of policies of free movement of workers in the case of heterogeneous workers, public finance issues, controlled migration, etc. These issues are left for further research.

REFERENCES

ACEMOGLU, D., M. GOLOSOV AND A. TSYVINSKI, "Dynamic Mirrlees Taxation under Political Economy Constraints," *Review of Economic Studies* 77 (July 2010), 841–881.

ASDRUBALI, P., B. E. SORENSEN AND O. YOSHA, "Channels of Interstate Risk Sharing: United States 1963-1990," *The Quarterly Journal of Economics* 111 (November 1996), 1081–1110.

BOERI, T. AND H. BRÜCKER, "Why are Europeans so Tough on Migrants?," *Economic Policy* 20 (October 2005), 629–703.

BORJAS, G. J., "The Labor Demand Curve is Downward Sloping: Reexamining the Impact of Immigration on the Labor Market," *The Quarterly Journal of Economics* 118 (November 2003), 1335–1374.

BORJAS, G. J., R. B. FREEMAN AND L. KATZ, "Searching for the Effect of Immigration on the Labor Market," *American Economic Review* 86 (May 1996), 246–251.

CARD, D., "The Impact of the Mariel Boatlift on the Miami Labor Market," *Industrial and Labor Relations Review* 43 (January 1990), 245–257.

CHARI, V. V. AND P. J. KEHOE, "Sustainable Plans," *Journal of Political Economy* 98 (August 1990), 783–802.

CHISWICK, B. AND T. J. HATTON, "International Migration and the Integration of Labor Markets," in *Globalization in Historical Perspective* (National Bureau of Economic Research, Inc, 2003), 65–120.

CLEMENS, M. A., C. E. MONTENEGRO AND L. PRITCHETT, "The Place Premium: Wage Differences for Identical Workers across the US Border," Working Paper wp321, University of Chile, Department of Economics, July 2010.

DOLMAS, J. AND G. W. HUFFMAN, "On the Political Economy of Immigration and Income Redistribution," *International Economic Review* 45 (November 2004), 1129–1168.

FACCHINI, G. AND A. M. MAYDA, "From Individual Attitudes towards Migrants to Migration Policy Outcomes: Theory and Evidence," *Economic Policy* 23 (October 2008), 651–713.

FAINI, R. C., J. DE MELO AND K. ZIMMERMANN, eds., *Migration: The Controversies and the Evidence* (Cambridge University Press, 1999).

FILER, R., "The Effect of Immigrant Arrivals on Migratory Patterns of Native Workers," in *Immigration and the Workforce: Economic Consequences for the United States and Source Areas* (National Bureau of Economic Research, Inc, 1992), 245–270.

FRENCH, K. R. AND J. M. POTERBA, "Investor Diversification and International Equity Markets," *American Economic Review* 81 (May 1991), 222–236.

FRIEDMAN, J. W., "A Non-cooperative Equilibrium for Supergames," *Review of Economic Studies* 38 (January 1971), 1–12.

HAMERMESH, D. S., ed., *Labor Demand* (Princeton University Press, 1993).

KENNAN, J. AND J. R. WALKER, "The Effect of Expected Income on Individual Migration Decisions," *Econometrica* 79 (January 2011), 211–251.

KLEIN, P. AND G. VENTURA, "Productivity Differences and the Dynamic Effects of Labor Movements," *Journal of Monetary Economics* 56 (November 2009), 1059–1073.

KVIST, J., "Does EU Enlargement Start a Race to the Bottom? Strategic Onteraction among EU Member States in Social Policy," *Journal of European Social Policy* 14 (August 2004), 301–318.

LIGON, E., J. P. THOMAS AND T. WORRALL, "Informal Insurance Arrangements with Limited Commitment: Theory and Evidence from Village Economies," *Review of Economic Studies* 69 (January 2002), 209–244.

MARKUSEN, J. R., "Factor Movements and Commodity Trade as Complements," *Journal of International Economics* 14 (May 1983), 341–356.

MARTIN, P., "NAFTA and Mexico-US Migration: What Lessons, What Next?," *CESifo Forum* 11 (December 2010), 38–44.

MAYDA, A. M., "Who Is Against Immigration? A Cross-Country Investigation of Individual Attitudes toward Immigrants," *The Review of Economics and Statistics* 88 (April 2006), 510–530.

MÜLLER, T. AND S. H. T. TAI, "Individual Attitudes towards Migration: A Reexamination of the Evidence," University of Geneva, October 2009.

MUNDELL, R. A., "International Trade and Factor Mobility," *American Economic Review* 47 (June 1957), 321–335.

NEARY, P., "Factor Mobility and International Trade," *Canadian Journal of Economics* 28 (November 1995), 4–23.

OKKERSE, L., "How to Measure Labour Market Effects of Immigration: A Review," *Journal of Economic Surveys* 22 (February 2008), 1–30.

ORTEGA, F., "Immigration, Citizenship, and the Size of Government," *The B.E. Journal of Economic Analysis & Policy* 10 (2010).

OTTAVIANO, G. I. P. AND G. PERI, "Rethinking the Gains from Immigration: Theory and Evidence from the US," Technical Report 5226, C.E.P.R. Discussion Papers, September 2005.

PEEL, Q., "Bonn and Paris Plan EU Ostpolitik," (1994), Financial Times, 25 March 1994.

PEW GLOBAL ATTITUDES SURVEY, *World Publics Welcome Global Trade - But not Immigration*, Pew Research Centre (2007), http://pewglobal.org/files/pdf/258.pdf.

SCHEVE, K. F. AND M. J. SLAUGHTER, "Labor Market Competition and Individual Preferences over Immigration Policy," *The Review of Economics and Statistics* 83 (February 2001), 133–145.

SCHIFF, M., "Substitution in Markusen's Classic Trade and Factor Movement Complementarity Models," Policy Research Working Paper Series 3974, The World Bank, August 2006.

THOMAS, J. P. AND T. WORRALL, "Self-Enforcing Wage Contracts," *Review of Economic Studies* 55 (October 1988), 541–554.

WATERFIELD, B., "France Threatens to 'Suspend' Schengen Treaty," (2011), The Telegraph, 22 April 2011.

WELLISCH, D. AND U. WALZ, "Why do Rich Countries Prefer Free Trade over Free Migration? The Role of the Modern Welfare State," *European Economic Review* 42 (September 1998), 1595–1612.

APPENDIX A.

This appendix derives the short run market equilibrium of Section 3. We proceed in four steps. First, because profits are redistributed locally we have that national income Y is equal to the value of domestic production $P_X X + P_Z Z$ where P_i is the price of good in sector i. Second we calculate labor demand from the condition that the value of the marginal product equals the wage rate, $P_i F_i'(L_i) = w$, or equivalently, $P_i \alpha\beta L_i^{\beta-1} = w$. This implies that the value of production in each sector is proportional to the wage bill: $P_i F(L_i) = \beta^{-1} w L_i$. The national income in wage units is then equal to $Y = \beta^{-1} wL$. Third, given the Cobb-Douglas preference individuals spend a share $\gamma/2$ of their income on each of the tradeable goods and a share $1-\gamma$ on the local non-tradeable good. So, the goods market clearing condition in the non-tradeable sector gives $\beta^{-1} wL_Z = (1-\gamma)Y$ and hence $L_Z = (1-\gamma)L$ since $Y = \beta^{-1} wL$. Then using the labor market clearing condition in the domestic market we have that $L_X = \gamma L$. We can further use these conditions to compute the price of tradeable and non-tradeable goods in wage units as $P_X = (\alpha\beta)^{-1}(\gamma L)^{1-\beta} w$ and $P_Z = (\alpha\beta)^{-1}[(1-\gamma)L]^{1-\beta} w$. Finally, we consider the market clearing conditions for the tradeable good sectors in the domestic and foreign countries. With the Cobb-Douglas preference the value of production is equal to the consumers' expenditure shares: $P_X F_X(L_X) = (\gamma/2)(Y + Y^*)$ and $P_X^* F_X^*(L_X^*) = (\gamma/2)(Y^* + Y)$. Therefore, the value

of production of the tradeable good is the same in both countries: $P_X F_X(L_X) = P_X^* F_X^*(L_X^*)$. Because the value of production in each sector is proportional to the wage bill (with proportion β) the wage bills in each country in the tradeable sectors must be equal: $wL_i = w^* L_i^*$. This then further applies to the non-tradeable sector and hence the equilibrium ratio of wages is $w/w^* = L^*/L$.

APPENDIX B.

We consider a rudimentary model of moving costs. The aim is to show that the assumption of zero moving costs in the main body of the paper can be relaxed provided moving costs are not too high on average. To do this requires two elements. First we assume that a moving cost of μ is equivalent to a reduction in consumption. Suppose that consumption in the home country is higher than consumption in the foreign country when there are $L \geq \bar{L}/2$, $C(L) > C^*(L)$. A foreign worker will move if $U(C(L) - \mu) \geq U(C(L))$ or $\mu \leq C(L) - C^*(L)$. Second assume that moving costs are heterogeneous across workers and that the distribution of moving costs across workers is a negative exponential distribution with an average moving cost of $\bar{\mu}$. That is the distribution of moving costs is given by the cumulative distribution function $F(\mu) = 1 - \exp(-\mu/\bar{\mu})$. This distribution is convenient as there are always some workers with low moving costs and because the distribution is described simply by its mean. Other assumptions on the distribution of moving costs could be made but the exponential is particularly analytically convenient. Using the exponential distribution, the number of foreign workers with moving costs less than or equal to $C(L) - C^*(L)$ is

$$(\bar{L}/2)F(C(L) - C^*(L)) = (\bar{L}/2)\left(1 - \exp(-(C(L) - C^*(L))/\bar{\mu})\right).$$

For there to be an equilibrium in which $C(L)$ and $C^*(L)$ are equated, this number of workers should be no less that $\hat{L} - L$ where $\hat{L}$ is the equilibrium labor force and $L \in [\bar{L}/2, \hat{L})$. That is

$$(\bar{L}/2)\left(1 - \exp(-(C(L) - C^*(L))/\bar{\mu})\right) \geq \hat{L} - L$$

for $L \in [\bar{L}/2, \hat{L})$. If this inequality is satisfied then for any $L \in [\bar{L}/2, \hat{L})$ there are always enough workers prepared to move such that consumption is equated in the two countries. Rewriting this

inequality gives

$$\bar{\mu} \leq \frac{(C(L) - C^*(L))}{-\log\left(1 - \left(\frac{\hat{L}-L}{\frac{\bar{L}}{2}}\right)\right)}$$

for $L \in [\bar{L}/2, \hat{L})$. Note that the term on the right-hand-side is positive and bounded above. To see it is positive, note that $C(L) > C^*(L)$ by assumption and the term inside the logarithm is less than one. It is bounded above for $L \in [\bar{L}/2, \hat{L})$. In the limit as $L \to \hat{L}$ both the numerator and denominator vanish, but using L'Hospital's rule it can be shown that the limit as $L \to \hat{L}$ is positive and finite. Thus provided the average moving cost is not too high, and assuming a similar condition holds for Home workers considering migration to the Foreign country, the equilibrium allocation with moving costs will be the same as when moving costs are zero. The welfare properties will however, be different.

APPENDIX C.

This appendix derives the necessary conditions for the planner's optimization problem. The planner maximizes world per-capita welfare $W(L) = \omega(L)C(L) + (1 - \omega(L))C^*(L)$ where $\omega(L) = L/\bar{L}$. It is easy to check that

$$C'(L) = \left(\beta\left(1 - \frac{\gamma}{2}\right) - 1\right)\frac{C(L)}{L} - \frac{\beta\gamma}{2}\frac{C(L)}{\bar{L} - L}$$

with a similar expression for $C^{*\prime}(L)$. It then follows that

$$W'(L) = \frac{\beta C(L)}{\bar{L}}\left[\left(1 - \frac{\gamma}{2} - \frac{\gamma}{2}\left(\frac{L}{L^*}\right)\right) - \frac{C^*(L)}{C(L)}\left(1 - \frac{\gamma}{2} - \frac{\gamma}{2}\left(\frac{L^*}{L}\right)\right)\right].$$

The planner's optimal labor allocation $\tilde{L}$ solves $W'(\tilde{L}) = 0$ and is given by

$$\frac{C^*(\tilde{L})}{C(\tilde{L})} = \frac{\left(1 - (\gamma/2) - (\gamma/2)(\tilde{L}/\tilde{L}^*)\right)}{\left(1 - (\gamma/2) - (\gamma/2)(\tilde{L}^*/\tilde{L})\right)}.$$

Under free movement of workers, we have $C(\hat{L}) = C^*(\hat{L})$ so that:

$$W'(\hat{L}) = \frac{\beta C(\hat{L})}{\bar{L}}\frac{\gamma}{2}\left[\frac{\hat{L}^*}{\hat{L}} - \frac{\hat{L}}{\hat{L}^*}\right].$$

Likewise, we can check whether the social planner prefers to allocate more labor to the more productive country. Since at $L = \bar{L}/2$, $C^*(\bar{L}/2)/C(\bar{L}/2) = (\alpha^*/\alpha)^{(1-\gamma)}$ we have

$$W'(\bar{L}/2) = \frac{\beta C(\bar{L}/2)}{\bar{L}}(1-\gamma)\left[1 - \frac{C^*(\bar{L}/2)}{C(\bar{L}/2)}\right] = \frac{\beta C(\bar{L}/2)}{\bar{L}}(1-\gamma)\left[1 - \left(\frac{\alpha^*}{\alpha}\right)^{(1-\gamma)}\right].$$