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On the Contrast between Policies toward Trade and Migration

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Abstract: What prevents free migration from supplementing the potential gains from free trade? For one thing, when individuals can migrate, Walrasian equilibrium may not exist because of non-convex feasible sets. Under standard assumptions, however, equilibrium does exist if a continuum of agents have dispersed ability to afford various migration plans. Then the basic conclusion is that the same conditions that ensure potential Pareto gains from trade also ensure similar gains from migration. Furthermore, unlike the standard literature on fiscal externalities, here appropriate policies for providing national public goods, especially those subject to congestion, allow free migration to bring potential Pareto improvements.

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1 Introduction: Trade versus Migration

Among policy-minded economists, surely one of the most widely accepted claims must be that international free trade generally has desirable consequences. Propositions concerning the gains from trade are routinely taught. Also, it seems that economists have helped provide the intellectual impetus behind the drive toward liberalizing international trade which has been taking place under GATT and now the World Trade Organization. Economists also seem to be helping to promote the new free trade areas that are emerging in several different regions of the world.

Most economists also seem pre-disposed to applaud measures that encourage labour mobility within nations. They worry about rigidities in housing markets that make it harder for workers to move to better jobs. Nobody seems willing to defend the internal passport controls that used to operate in the former Soviet Union. There might be some concern about cities becoming too crowded, or about remote areas becoming depopulated. But these seem generally to be regarded as exceptions to the general idea that labour mobility has facilitated desirable economic growth, especially in the U.S.A.

On the other hand, except perhaps for a few specialists in international economics, there are not many in the profession who seem willing to speak out in favour of migration across national borders. Generally, even many of the politicians who would never dream of advocating trade restrictions for economic reasons feel little need to hesitate in condemning "economic" migration as a threat to the employment and other prospects of their electorates. The most obvious current exception concerns the right to migrate within the European Union. [1] But here the explicit aim of many European politicians has been to make national borders irrelevant, as far as possible. One other prominent exception is the freedom and even encouragement for Jews to migrate to Israel under that nation's "Law of Return".[2] Finally, there was a period after the Second World War when Australia and South Africa in particular seemed to keen to encourage migration from Europe at the same time as they maintained fairly severe trade restrictions. These immigration policies, however, had as their rationale the racial objectives of those in power at the time; economic arguments appear to have had little role.

So the question naturally arises whether economic theory can possibly do anything to justify this stark contrast between the apparently widespread desires to promote trade on the one hand and to restrict migration on the other. Here, much of traditional trade theory seems of little help because it often considers only special models in which free trade leads to international factor price equalization. This, of course, makes the free movement of either capital or labour entirely irrelevant. But these special models often ignore land diversity and other economically relevant aspects of geography. Also,

[1] Or to be more accurate, the European Economic Area, which is made up of the 15 member states of the E.U., plus Iceland, Liechtenstein, and Norway. A notable exception is Switzerland, which appears to disadvantage many young Swiss graduates whose job opportunities have recently become much more limited than those of foreign graduates of Swiss universities.

[2] A law whose effect has recently been extended to allow a significant minority of non-Jewish immigrants from the former Soviet Union.

if history had been different, we suspect that international economics might instead have concentrated on other special models where the free movement of both capital and labour leads to international product price equalization, thus making the trade of goods irrelevant — see, for example, Mundell (1957) and Wong (1986).

Similar considerations have led Freeman (1993, p. 449) to put the issue in rather eloquent terms: "Given that the economic analyses of immigration and trade are similar, why do economists lead the charge for free trade but not for free immigration? Support free trade, and you are mainstream. Express doubts, and your friends wonder which industry/union pays your rent (or if you imbibed excessively of an increasing returns drug). But declare yourself for open-door immigration, and you are dismissed as an idealist, maybe even a card-carrying member of a human rights or amnesty group."

The question therefore remains: to the extent that moves toward free trade really are beneficial, is there anything fundamentally different about migration which prevents it conferring similar benefits? On the other hand, to the extent that international migration is likely to harm the economic interests of some existing residents of a nation, why is it any different from free trade, which can also harm the interests of those holding significant stakes in industries destined to become uncompetitive?

Our main conclusion will be that, for the situations we consider, there is really no purely theoretical argument which can justify free trade without at the same time justifying free migration. Both trade and migration bring gains to some and losses to others. Moreover, except in a few special cases of little practical relevance, the policy measures needed to avoid any individual losses and to ensure that there is a Pareto improvement are much the same for both. To the extent that the situations we consider are unrestrictive, this leaves those who wish to defend one and not the other without any purely theoretical arguments.

In the end, it seems to us that too many of those who advocate free trade but condemn "economic" migration are merely pandering to the widespread intolerance of immigrants one finds among the general population in too many countries. Of course, there may be cultural and sociological reasons for a lack of what Freeman (1993) calls "receptivity to immigrants". However, if the economic advantages of migration were unambiguous, economists should be trying to overcome such lack of receptivity, just as they readily condemn hostile attitudes to "foreign" imports of traded goods. However, as with free trade, in fact the gains to migration are ambiguous. So there may still be a legitimate economic case for restricting migration. But our work shows that, as with trade restrictions, any economic justification must depend in an essential way on particular empirical facts rather than on any generally applicable theoretical analysis.

2 Theoretical Background

Our formal argument is based on counterparts to the classical results on the gains from trade, as originally stated by Samuelson (1939, 1962) and by Kemp (1962). However, these early works only showed that if trade were freed and if an equilibrium with free trade then came about, the resulting allocation would be Pareto non-inferior. It was not until 1972 that three articles by Chipman and Moore, by Grandmont and McFadden, and by Kemp and Wan, published virtually simultaneously, established when equilibrium would exist under appropriate conditions of free trade. This was a significant step because, if an existence result of this kind were not true, the earlier results would have lacked all content.

Much later, Kemp (1993) discussed the parallels between the gains from free migration and those from free trade by treating labour services like any other commodity in an Arrow–Debreu economy. Then the previous results apply and show the potential gains from trade in all commodities, including labour. However, his paper does not properly link migration to other consumption decisions. In his formulation, no allowance is made for the fact that migrating to a different country changes the feasible set of net trades available to the migrant, especially as regards non-traded goods. This limits substantially the practical relevance of his results.

In the absence of public goods, the main obstacle to be overcome in proving results concerning the potential gains from migration arises because of the obvious difficulty a potential migrant faces in being in more than one place at a time. As argued by Malinvaud (1972, pp. 22–3 and 165) in connection with consumption in the two cities of Paris and Lyon, such obstacles give rise to non-convexities in consumers' feasible sets. Specifically, an internationally mobile worker may be able to offer one day's labour today on either side of the Atlantic, but even a worker who can afford to fly by Concorde finds it difficult to supply half a day's labour in North America and another half on the same day in Europe. Because of these non-convexities, the usual existence proofs, which rely on demand correspondences being convex-valued and upper hemi-continuous, do not apply directly even to economies with a continuum of agents. Instead, it seems easiest to follow Khan and Yamazaki (1981), who considered compensated demand in a continuum economy, and then follow Yamazaki (1978, 1981) in using a dispersion assumption to guarantee that a compensated equilibrium is an equilibrium in the usual sense. The same approach is also used in Coles and Hammond (1995) and in Sempere (1994).

A second apparent obstacle concerns public goods and externalities. Of course, the existing literature on gains from trade has largely neglected these. Indeed, it is precisely this neglect which leaves the door open for environmentalist pressure groups to argue that exceptions to free trade policies should be made when exporting industries in foreign countries face lenient or non-existent controls designed to protect the environment. In the case of migration, the neglect of public goods and the need to finance them seems especially damaging. After all, in (Alta) California one of the most popular arguments against migration from across the border in Baja California has been the fiscal burden migrants impose when their children receive free public education, or when any person in a migrant family is given free emergency medical care. One does not have to accept these arguments, or overlook the many offsetting benefits that migrants bring to Californian tax-payers, in order to see the need for a more general economic model in which these issues can be properly discussed.

In fact, we shall argue that public goods and externalities by themselves do not invalidate either the gains from trade or the gains from migration. After all, the usual gains from trade results require that those who would otherwise lose from free trade or migration be compensated by those who gain. So they really only apply when the authorities arranging such compensation enjoy complete information, thus allowing first-best economic policies to be pursued. In the same spirit of first-best, we assume in Section 7 that providers of public goods who face additional costs because of increased congestion can be compensated, while those who face lower costs because of decreased congestion can have their budgets reduced. Otherwise we assume that the provision of public goods is frozen; of course, this does not rule out the possibility of additional potential Pareto gains from appropriate changes in public good supply which are responsive to consumers' willingness to pay. Our point is that such changes are not needed in order to allow potential Pareto gains to emerge from a combination of free trade and free migration.

Policy makers in real economies are incompletely informed. In Hammond and Sempere (1995), we argued in particular that workers' private information about their career plans would make the standard lump-sum compensation payments of first-best theory incentive incompatible. Thus, the first-best gains from trade arguments generally lack practical content. We were able to devise alternative second best policies ensuring that all individuals would benefit from free trade and other forms of economic liberalization. However, these policies involved unrealistic freezes of consumer prices and after tax dividends. In future work, we intend to explore what similar second-best policies, if any, are able to ensure that free migration leads to a Pareto superior (or non-inferior) allocation. In particular, we shall see whether there are any theoretical reasons why, in a second-best economy with private information, free migration is less likely to be beneficial than free trade.

In the remainder of the paper, Section 3 sets up a general equilibrium model of an international economy with a continuum of agents and complete markets for dated contingent commodities. Section 4 sets out the definitions of wealth distribution rules and equilibrium. Next, Section 5 proves our main result, showing that there are potential Pareto gains from adding free migration to free trade. In Section 6, it is shown that this main result extends easily when there are pure public goods whose supplies in each nation are frozen at their status quo levels. Then Section 7 deals with the more challenging case of public goods subject to congestion. Finally, Section 8 contains concluding remarks.

3 Notation, Model and Assumptions

Suppose the world consists of a finite set K of different countries indexed by k. To allow time for migration as well as uncertainty, consider an intertemporal Arrow–Debreu economy in which D is the finite set of relevant date–event pairs.

Assume that there is a finite set of commodities at each date. Suppose this set is partioned into pairwise disjoint components $T \cup (\cup_{k \in K} N_k)$, where N_k is the set of goods specific to country k that are not traded internationally, and T is the set of internationally traded goods. It is assumed that N_k includes all kinds of labour, since labour is not traded directly across borders. Rather, migrants move across borders to supply labour in other nations. Then the relevant set of dated commodities is $G := [T \cup (\cup_{k \in K} N_k)] \times D$. Let $G_k := [T \cup N_k] \times D$ denote the subset of goods that can be traded in nation k.

Suppose there is a continuum of consumers $I = [0, 1] \subset \Re$ indexed by i. Let $\Im$ be the σ-field of Borel measurable subsets of I, and ν Lebesgue measure. Then $(I, \Im, \nu)$ is an atomless measure space of consumers. A continuum exchange economy, as defined in Aumann (1964), is a measurable mapping $\mathcal{E} : I \to \Theta$ from the measure space of agents into the space Θ of agents' characteristics. The model we present will also have a finite set of producers. Our next task is to describe consumers' characteristics.

Each individual consumer $i \in I$ is assumed to have a *migration plan* in the form of a mapping $k^{iD} : D \to K$. Thus, $k^i(d)$ indicates the nation in which consumer i plans to reside

and function as an economic agent at each date $d \in D$. Obviously, the set of all possible migration plans is the Cartesian product set K^D. At the original date $d = 0$, history determines $k^i(0)$ as the nation which the agent inhabits as the economy starts. For simplicity, we assume that the set of agents is fixed.[3]

Each consumer's net trade vector $x^i \in \Re^G$ must be compatible with the chosen migration plan k^{iD}. Obviously, unless $k^i(d) = k^i(0)$ for all $d \in D$, the vector x^i must include at least some minimal level of consumption of particular commodities such as transport and shipping. It may also include foreign language instruction. Obviously different migration plans incur different costs. For instance, staying in one place for an extended period requires many fewer airline tickets than living two years in Italy, then two years in California, then one year in Germany, and so on.

[3]Of course, it would be more realistic to model agents being born and raised where their parents choose to reside. But we are unaware of any general equilibrium model which includes the results of demographic decisions like this. Moreover, though such a model could be formulated without undue difficulty, it would be hard to apply the Pareto criterion when some individual decisions affect whether other individuals ever come into existence.

In order to rule out all non-convexities except those arising from migration, we make the following simplifying assumption:

(A.1) For every migration plan $k^{iD} \in K^D$, each agent $i \in I$ has a closed and convex *conditional feasible set* $X^i(k^{iD})$ of net trade vectors in $\Re^G$ with a *lower bound* $\underline{x}^i(k^{iD})$ such that $x^i \in X^i(k^{iD})$ implies $x^i \geqq \underline{x}^i(k^{iD})$.

Then for each $i \in I$ we can define consumer i's *overall* feasible set as

$$F^i := \{ (x^i, k^{iD}) \in \Re^G \times K^D \mid x^i \in X^i(k^{iD}) \}$$

Next, concerning consumers' preferences, we assume that

(A.2) Each consumer i has a weak preference relation $\succsim_i$ defined on F^i that is reflexive, complete, transitive, continuous, and locally non-satiated in commodities.

Because $\succsim_i$ is complete, note that

$$(x^i, k^{iD}) \in F^i \iff (x^i, k^{iD}) \succsim_i (x^i, k^{iD})$$

So each consumer $i \in I$ can be characterized completely by the closed graph

$$\Gamma^i := \{ (x^i, k^{iD}, \tilde{x}^i, \tilde{k}^{iD}) \in \Re^G \times K^D \times \Re^G \times K^D \mid (x^i, k^{iD}), (\tilde{x}^i, \tilde{k}^{iD}) \in F^i \quad \text{and} \quad (x^i, k^{iD}) \succsim_i (\tilde{x}^i, \tilde{k}^{iD}) \}$$

of the preference relation $\succsim_i$. As has become standard since the work of Hildenbrand (1974), we assume:

(A.3) The space of feasible sets F and of preference relations $\succsim$, as represented by their closed graphs $\Gamma \subset \Re^G \times K^D \times \Re^G \times K^D$, is endowed with the topology of closed convergence and the associated Borel σ-field $\mathcal{B}$. Moreover, the mapping $i \mapsto \Gamma^i$ from I to $\Re^G \times K^D \times \Re^G \times K^D$ is measurable w.r.t. the respective σ-fields $\Im$ and $\mathcal{B}$.

Next, suppose that there is a finite set of producers $j \in J$. We assume that, even though the owners of a firm can migrate and offer their labour and management services in other countries, they cannot transport any production activities with them. In fact, as Konishi (1996) has suggested for a different model, in our framework too a freely mobile firm or transnational corporation can be decomposed into several different firms, with no more than one in each separate nation.

So one may usefully regard each j as a production unit in one location that does not straddle any national border. Let J_k denote the set of firms based in nation k. Then the different sets J_k are assumed to be pairwise disjoint, with $J = \cup_{k \in K} J_k$. It is also assumed that each producer $j \in J_k$ based in nation k must have a zero net supply of every good except those in the set $G_k = N_k \cup T$ of goods that can be traded in nation k. Thus:

(A.4) Each producer $j \in J$ has a closed and convex production set $Y^j \subset \Re^G$ that satisfies $0 \in Y^j$ and also $y^j_g = 0$ whenever $j \in J_k$, $g \notin G_k$, and $y^j \in Y^j$. Each net output vector $y^j \in Y^j$ measures the net output per head of world population.

The aggregate production set of the firms in country k is $Y_k := \sum_{j \in J_k} Y^j$, with elements denoted by y_k. The collection Y_k $(k \in K)$ is also assumed to satisfy the requirement that:

(A.5) For each aggregate lower bound $\underline{y}$, the constrained set of international production allocations

$$Y^K(\underline{y}) = \{ y^K \in Y^K = \prod_{k \in K} Y_k \mid \sum_{k \in K} y_k \geqq \underline{y} \}$$

is bounded.

This means that bounded inputs only allow bounded outputs in each separate country, as well as in the international economy as a whole.

Assume that producers maximize profits taking the prices of all goods $g \in G$ as given. For every price vector $p \in \Re^G$ with $p \neq 0$ and every $j \in J$, define producer j's net supply set as

$$\eta^j(p) := \arg\max \{ p\, y^j \mid y^j \in Y^j \}$$

The correspondence η^j will be non-empty valued and have a closed graph for all price vectors at which profits are bounded. Furthermore, define producer j's profit function as

$$\pi^j(p) := \max \{ p\, y^j \mid y^j \in Y^j \}$$

Furthermore, for each nation $k \in K$, define the aggregate net supply correspondence $\eta_k(p) := \sum_{j \in J_k} \eta_j(p)$ and the aggregate profit function $\pi_k(p) := \sum_{j \in J_k} \pi_j(p)$.

An *allocation* is a collection $(\mathbf{x}^I, \mathbf{k}^{ID}, \mathbf{y}^J)$ of a jointly measurable function pair $i \mapsto (x^i, k^{iD}) \in \Re^G \times K^D$ specifying the net trade vector and migration plan of each individual $i \in I$, together with a profile of net output vectors $\mathbf{y}^J$. The allocation is *feasible* if $(\mathbf{x}^I, \mathbf{k}^{ID}, \mathbf{y}^J)$ together satisfy:

(i) $(x^i, k^{iD}) \in F^i$ a.e. in I;

(ii) $y^j \in Y^j$ for all $j \in J$;

(iii) $\int_I x^i d\nu = \sum_{j \in J} y^j$.

Note that (iii) requires the average net demand vector of consumers worldwide to match the aggregate net output of producers per head of population.

The combined gains from free trade and migration will accrue from an allocation that is Pareto superior to a prespecified status quo feasible allocation $(\bar{\mathbf{x}}^I, \bar{\mathbf{k}}^{ID}, \bar{\mathbf{y}}^J)$. Notice that if there is no migration at all in the status quo, then $\bar{k}^i(d) = k^i(0)$ for all $d \in D$ a.e. in I.

For each consumer i and $(\hat{x}^i, \hat{k}^{iD}) \in F^i$, define also the two upper preference sets

$$\begin{array}{rrcl} & P^i(\hat{x}^i, \hat{k}^{iD}) & := & \{ (x^i, k^{iD}) \in F^i \mid (x^i, k^{iD}) \succ_i (\hat{x}^i, \hat{k}^{iD}) \} \\ \text{and} & R^i(\hat{x}^i, \hat{k}^{iD}) & := & \{ (x^i, k^{iD}) \in F^i \mid (x^i, k^{iD}) \succsim_i (\hat{x}^i, \hat{k}^{iD}) \} \end{array}$$

Then assume that what could be called the *aggregate gains from trade and migration* set has a lower bound in the sense that:

(A.6) Each upper preference set $R^i(\bar{x}^i, \bar{k}^{iD})$ has a lower bound $\underline{x}^i \in \Re^G$ such that $(x^i, k^{iD}) \in R^i(\bar{x}^i, \bar{k}^{iD})$ implies $x^i \geqq \underline{x}^i$; also, the mapping $i \mapsto \underline{x}^i$ is measurable and has the property that the mean lower bound $\int_I \underline{x}^i d\nu$ is a finite vector in $\Re^G$.

4 Wealth Distribution Rules

Let $P := \{ p \in \Re^G \mid p \neq 0 \}$ be the domain of possible price vectors. Note that negative prices are allowed. This in order to accommodate public goods or other aspects of the "public environment" that are usually beneficial, but could harm some individuals if provided in excess.

Define a *wealth distribution rule* $\mathbf{w}^I(p)$ as a measurable mapping $w : I \times P \to \Re$. This mapping specifies each consumer i's wealth level $w^i(p)$ as a function that depends on the price vector p. Assume that:

(A.7) Each function $w^i(p)$ is continuous and homogeneous of degree one in p, whereas the wealth distribution rule $\mathbf{w}^I(p)$ is also *budget feasible* in the sense that, for each $p \in P$, the map $i \mapsto w^i(p)$ is measurable, with $\int_I w^i(p) d\nu = \sum_{j \in J} \pi^j(p)$.

Thus, distributed wealth per head is required to match aggregate profit per head. Note that international transfers of wealth are allowed, and create imbalances of trade in any resulting equilibrium.

Given any price vector $p \neq 0$, define $E^i(p, \bar{x}^i, \bar{k}^{iD})$ as the minimum wealth needed to make possible the standard of living associated with i's status quo allocation $(\bar{x}^i, \bar{k}^{iD})$. That is,

$$E^i(p, \bar{x}^i, \bar{k}^{iD}) := \min_{x^i, k^{iD}} \{ p\, x^i \mid (x^i, k^{iD}) \in R^i(\bar{x}^i, \bar{k}^{iD}) \}$$

Then a *sagacious* wealth distribution rule $\mathbf{w}^I(p)$ (cf. Grandmont and McFadden, 1972) is one that, for all $p \in P$, satisfies:

(i) $w^i(p) \geq E^i(p, \bar{x}^i, \bar{k}^{iD})$ a.e. in I;

(ii) whenever $\int_I E^i(p, \bar{x}^i, \bar{k}^{iD}) d\nu < \sum_{j \in J} \pi^j(p)$, then $w^i(p) > E^i(p, \bar{x}^i, \bar{k}^{iD})$ a.e. in I.

Note that expenditure minimization implies $E^i(p, \bar{x}^i, \bar{k}^{iD}) \leq p\, \bar{x}^i$. Also, profit maximization together with feasibility of the status quo allocation imply that

$$\int_I p\, \bar{x}^i d\nu = \sum_{j \in J} p\, \bar{y}^j \leq \sum_{j \in J} \bar{\pi}^j(p)$$

It follows that (i) is always possible. So is (ii). Indeed, an obvious example of a sagacious distribution rule is

$$w^h(p) = E^h(p, \bar{x}^h, \bar{k}^{hD}) + \theta^h[\sum_{j \in J} \bar{\pi}^j(p) - \int E^i(p, \bar{x}^i, \bar{k}^{iD}) d\nu]$$

for any measurable function $i \mapsto \theta^i$ satisfying $\theta^i > 0$ a.e. in I and $\int_I \theta^i d\nu = 1$. So we assume that:

(A.8) The wealth distribution rule $\mathbf{w}^I(p)$ is sagacious.

Given any wealth distribution rule $\mathbf{w}^I(p)$, consumer i's budget set is

$$B^i(p) := \{ (x^i, k^{iD}) \in F^i \mid p\, x^i \leq w^i(p) \}$$

Then a *Walrasian equilibrium* is a feasible allocation $(\hat{\mathbf{x}}^I, \hat{\mathbf{k}}^{ID}, \hat{\mathbf{y}}^J)$, as defined in the previous section, together with a price vector $p \neq 0$, such that:

(i) $\hat{y}^j \in \eta^j(p)$ for all $j \in J$;

(ii) $(\hat{x}^i, \hat{k}^{iD}) \in B^i(p)$ a.e. in I;

(iii) $(x^i, k^{iD}) \in P^i(\hat{x}^i, \hat{k}^{iD}) \Longrightarrow p\, x^i > w^i(p)$ a.e. in I.

Here (ii) and (iii) together mean that $(\hat{x}^i, \hat{k}^{iD})$ is a *Walrasian* or *uncompensated demand* for almost all consumers. By contrast, a *compensated equilibrium* satisfies both (i) and (ii) but replaces (iii) with:

(iii^C) $(x^i, k^{iD}) \in R^i(\hat{x}^i, \hat{k}^{iD}) \Longrightarrow px^i \geq w^i(p)$ a.e. in I.

Then $(\hat{x}^i, \hat{k}^{iD})$ is a *compensated demand* for almost all consumers. Because of local non-satiation, (iii^C) is trivially implied by (iii). The reverse, however, is not true in general. Indeed, it typically relies on being able to apply the following extension of the well known "cheaper point lemma."

LEMMA: Suppose that $(\hat{x}^i, \hat{k}^{iD})$ is a compensated demand for consumer i when faced with the price vector p. Then, whenever $(x^i, k^{iD}) \in P^i(\hat{x}^i, \hat{k}^{iD})$ and the migration plan k^{iD} allows the existence of a "conditional cheaper point" $\tilde{x}^i \in X^i(k^{iD})$ satisfying $p\,\tilde{x}^i < w^i(p)$, it follows that $p\,x^i > w^i(p)$.

PROOF: Because $X^i(k^{iD})$ is convex and preferences are continuous, the hypotheses of the Lemma imply that $(x^i(\epsilon), k^{iD}) \in R^i(\hat{x}^i, \hat{k}^{iD})$ for some $x^i(\epsilon) := x^i + \epsilon\,(\tilde{x}^i - x^i) \in X^i(k^{iD})$ with $\epsilon > 0$ sufficiently small — in particular, for some $\epsilon \in (0,1)$. Because $(\hat{x}^i, \hat{k}^{iD})$ is a compensated demand, it follows that

$$w^i(p) \leq p\,x^i(\epsilon) = p\,x^i + \epsilon\,p\,(\tilde{x}^i - x^i) < (1-\epsilon)\,p\,x^i + \epsilon\,w^i(p)$$

Because $\epsilon < 1$, this evidently implies that $p\,x^i > w^i(p)$. ∎

5 Proving Gains from Trade and Migration

The purpose of this section is to prove the existence of a Walrasian equilibrium that is Pareto superior to the given status quo. Obviously, one possible status quo could be an allocation resulting from free trade but with some consumers prevented from migrating freely. Then our result implies that there are Pareto gains from freeing migration.

We start by proving the existence of a compensated equilibrium. Later, we shall give conditions for this equilibrium to be Walrasian. Because of the sagacious wealth distribution rule, when the equilibrium is Walrasian it will turn out to be Pareto superior to the status quo except in the special case when the status quo allocation is already a compensated equilibrium in the economy with free migration.

THEOREM 1: Assuming (A.1) to (A.8), there exists a compensated equilibrium $(\hat{\mathbf{x}}^I, \hat{\mathbf{k}}^{ID}, \hat{\mathbf{y}}^J, p)$ with $(\hat{x}^i, \hat{k}^{iD}) \in R^i(\bar{x}^i, \bar{k}^{iD})$ a.e. in I.

This theorem can be demonstrated along the lines of Khan and Yamazaki's (1981) proof that compensated equilibrium exists — see also Coles and Hammond (1995). However, instead of the usual compensated demand correspondence, here we substitute a *modified* compensated demand correspondence which is restricted to the gains from trade set. This is defined by

$$\bar{\xi}^i(p) := \{\, x^i \in \Re^G \mid \quad \exists k^{iD} \in K^D \text{ s.t. } (x^i, k^{iD}) \in R^i(\bar{x}^i, \bar{k}^{iD}) \cap B^i(p)$$
$$\text{and } (\tilde{x}^i, \tilde{k}^{iD}) \in R^i(x^i, k^{iD}) \Longrightarrow p\,\tilde{x}^i \geq w^i(p) \,\}$$

By (A.8), for all $p \in P$ this correspondence has non-empty values a.e. in I.

Because of (A.1)–(A.7), it is easy to see that $\int_I \bar{\xi}^i(p) d\nu$, the mean of this correspondence, satisfies essentially the same conditions as the mean demand correspondence considered by Khan and Yamazaki or by Coles and Hammond. So existence of compensated equilibrium follows from their previous results.

By construction, the lump-sum transfers of wealth give each consumer more than enough to afford the status quo standard of living. However, in our model, this is not enough to prevent the existence of a non-null set of individuals who can more than afford their status quo standard of living, achieved with their (possibly restricted) status quo migration plan, but whose compensated equilibrium demands $(\hat{x}^i, \hat{k}^{iD})$ are nevertheless on the lower boundary of the relevant conditional feasible set $X^i(\hat{k}^{iD})$ given the migration plan $\hat{k}^{iD}$. This boundary problem could prevent the existence of Walrasian equilibrium. The same phenomenon arises in the models of

Dasgupta and Ray (1986) and of Coles and Hammond (1995), where its implications are further analysed.

To avoid this problem entirely, we invoke an additional assumption motivated by Yamazaki's (1978, 1981) *dispersed endowments* and Coles and Hammond's (1995) *dispersed needs* assumptions. To state the new assumption formally, first define

$$\underline{w}^i(p, k^{iD}) := \min_{x^i} \{ p\, x^i \mid x^i \in X^i(k^{iD}) \}$$

as the minimum wealth needed by consumer i at prices p in order to sustain the migration plan k^{iD}. Next, as i's migration plan varies over the set K^D, define the set

$$W^i(p) := \underline{w}^i(p, K^D) := \bigcup_{k^{iD} \in K^D} \{ \underline{w}^i(p, k^{iD}) \}$$

as the corresponding range of possible minimum wealth levels for consumer i facing the price vector p. These are the *critical* wealth levels which just allow consumer i to afford an additional migration plan. Clearly, $W^i(p)$ is finite because K^D is.[4] Define also

$$I^*(p) := \{ i \in I \mid w^i(p) \in W^i(p) \}$$

as the set of consumers who, at prices p, have a critical wealth level. Then assume

(A.9) (Dispersion) For all $p \neq 0$ the set $I^*(p)$ has measure zero in I.

[4]Actually, the ensuing assumption (A.9) can be weakened still further by redefining $W^i(p)$ as the (possibly empty) set of values which $\underline{w}^i(p, k^{iD})$ may attain as i's migration plan varies over the subset of $k^{iD} \in K^D$ with the property that $(x^i, k^{iD}) \in R^i(\bar{x}^i, \bar{k}^{iD})$ for some point x^i on the boundary of $X^i(k^{iD})$.

Now we can present our theorem on the existence of Walrasian equilibrium.

THEOREM 2: Assuming (A.1)–(A.9), the compensated equilibrium is a Walrasian equilibrium.

PROOF: (A.9) ensures that there is at most a null set of consumers $i \in I$ whose compensated equilibrium net trade vector $\hat{x}^i$ is at a cheapest point of the relevant conditional feasible set $X^i(\hat{k}^{iD})$. Thus, almost all consumers satisfy the conditions of the cheaper point lemma, and so are in uncompensated equilibrium. ∎

Finally comes our main result:

MAIN THEOREM: Unless the status quo is already a compensated equilibrium, there exists a Walrasian equilibrium with Pareto gains from freeing both trade and migration.

PROOF: Because of (A.8) and local non-satiation of preferences, the Walrasian equilibrium of the previous theorem satisfies $(\hat{x}^i, \hat{k}^{iD}) \in P^i(\bar{x}^i, \bar{k}^{iD})$ a.e. in I unless $\int_I E^i(p, \bar{x}^i) d\nu = \sum_{j \in J} \pi^j(p) = \int_I w^i(p) d\nu$. In this exceptional case, however, it is possible to have $w^i(p) \geq E^i(p, \bar{x}^i)$ a.e. in I only if $w^i(p) = E^i(p, \bar{x}^i)$ a.e. in I. Then the definition of E^i implies that $p\, x^i \geq E^i(p, \bar{x}^i) = w^i(p)$ whenever $(x^i, k^{iD}) \in R^i(\bar{x}^i, \bar{k}^{iD})$. Because of local non-satiation, this implies that $(\bar{x}^i, \bar{k}^{iD})$ is already a compensated demand a.e. in I at the price vector p, with $p\, \bar{x}^i = w^i(p) = E^i(p, \bar{x}^i)$. But then

$$\int_I p\, \bar{x}^i d\nu = \int_I E^i(p, \bar{x}^i) d\nu = \sum_{j \in J} \pi^j(p)$$

Now, feasibility of the status quo allocation implies that $\int_I \bar{x}^i d\nu = \sum_{j \in J} \bar{y}^j$, and so $\sum_{j \in J} \pi^j(p) = \sum_{j \in J} p\, \bar{y}^j$. Hence, in the status quo firms are already maximizing profits at the price vector p. So the status quo is a compensated equilibrium. ∎

6 Pure Public Goods

Most public sentiment against migration seems to be based on the argument that migrants increase the cost of providing public goods. Two different kinds of public good can be distinguished. The first are pure public goods, such as broadcast radio or television, streetlighting, etc. Evidently, the cost of providing these is not directly related to population, so is unaffected by migration. Nevertheless, it is useful to consider them first as a simple case, as will be done in this section. The second kind of public goods are those subject to congestion, such as public health services or schooling. The cost of providing these is obviously affected by migration. Such public goods are the subject of Section 7 below.

In fact, pure public goods can be accommodated rather simply. For each $k \in K$, let P_k denote the set of public goods produced in country k in each date–event. Let $z_k(d) \in \Re^{P_k}$ be the public goods vector supplied in country k at date–event d. Let $z_k^D = \langle z_k(d) \rangle_{d \in D} \in \Re^{P_k D}$ be the intertemporal vector of public goods produced in country k over all date–events $d \in D$. Finally, let $\mathbf{z}^{DK} \in \prod_{k \in K} \Re^{P_k D} = \Re^{PD}$, where $P := [\cup_{k \in K} P_k] \times D$, be the profile of public good vectors supplied in all countries of the world.

As in section 3, a net trade vector x^i is feasible for individual $i \in I$ if it is compatible with k^{iD}, the chosen migration plan. But now it must also be compatible with the public good vector $\mathbf{z}^{DK}$. So let $X^i(k^{iD}, \mathbf{z}^{DK})$ be the set of net trade vectors that are feasible provided that k^{iD} is the migration plan chosen and $\mathbf{z}^{DK}$ is the public good vector. Typically $X^i(k^{iD}, \mathbf{z}^{DK})$ depends only on $\langle z_{k^i(d)}(d)\rangle_{d\in D}$, which is the history of contingent public good supply in the countries that i chooses to inhabit at different date–events $d \in D$. But the notation used here is simpler.

Now, for each consumer i and each $\mathbf{z}^{DK} \in \Re^{PD}$, define the conditional feasible set

$$F^i(\mathbf{z}^{DK}) := \{ (x^i, k^{iD}) \in \Re^G \times K^D \mid x^i \in X^i(k^{iD}, \mathbf{z}^{DK}) \}$$

Also, for each consumer $i \in I$ and each $\mathbf{z}^{DK} \in \Re^{PD}$, define the conditional preference relation $R^i(\mathbf{z}^{DK})$ on $F^i(\mathbf{z}^{DK})$ so that

$$(x^i, k^{iD})\ R^i(\mathbf{z}^{DK})\ (\hat{x}^i, \hat{k}^{iD}) \iff (x^i, k^{iD}, \mathbf{z}^{DK})\ \succsim^i\ (\hat{x}^i, \hat{k}^{iD}, \mathbf{z}^{DK})$$

where $\succsim^i$ is i's unconditional preference ordering on the set F^i of all feasible triples $(x^i, k^{iD}, \mathbf{z}^{DK})$.

Assume that public goods in each country k are produced to order by the firms in that country, whose costs are met out of tax revenue. In addition, firms in any country k may also benefit directly from the pure public goods provided in that country. Accordingly, assume that each firm $j \in J_k$ faces a production set $Y^j(z_k^D)$ conditional on the vector z_k^D of public goods in nation k. Let

$$\pi^j(p, z_k^D) := \max_{y^j} \{ p\, y^j \mid y^j \in Y^j(z_k^D) \}$$

be firm j's maximum profit per head of world population. Note that the aggregate profit function $\pi_k(p, z_k^D) := \sum_{j\in J_k} \pi^j(p, z_k^D)$ in nation k is typically a decreasing function of z_k^D to the extent that producing more public goods requires more costly inputs of private goods. But it can also be an increasing function of z_k^D to the extent that firms in nation k benefit directly from national public goods.

In this case the *wealth distribution rule* $\mathbf{w}^I(p, z^{DK})$ specifies each consumer i's wealth level $w^i(p, z^{DK})$ as a function that depends on the price vector p and the world production of public goods z^{DK}. Budget feasibility for the world as a whole requires that

$$\int_I w^i(p, z^{DK})\, d\nu = \sum_{k \in K} \pi_k(p, z_k^D)$$

This implies that the private good inputs involved in producing public goods are being financed internationally through lump-sum taxes. One case is when all the national governments coordinate to choose a Pareto efficient vector of public goods, as well as the taxes needed to finance them, as in any public competitive equilibrium of the kind that was formalized by Foley (1967) for the case of a national economy in which production occurs under constant returns to scale. However, there is no need for us to assume such efficient coordination.

If national governments adjust their plans to supply public goods and finance them, there will be some gainers and some losers. It is obviously difficult to imagine that such adjustments will be carried out in a way that ensures a potential Pareto improvement. So we simply assume that all pure public goods are kept at the levels $\bar{\mathbf{z}}^{DK}$ they would be at in the status quo. Then it is obvious that all the theorems of section 5 still hold for an economy in which consumers maximize conditional preferences $R^i(\bar{\mathbf{z}}^{DK})$ over their conditional feasible sets $F^i(\bar{\mathbf{z}}^{DK})$, while producers maximize conditional profits over their conditional production sets $Y^j(z_k^D)$ ($j \in J_k$; $k \in K$). Wealth distribution should be adjusted to permit each country to finance its status quo public good vector after as well as before the liberalizing reform. As before, let $\bar{\mathbf{y}}^J$ denote the status quo allocation of production in the world economy, including the inputs needed to produce public goods. Feasibility of the potential Pareto improvement is ensured because

$$\sum_{k \in K} \pi_k(p, z_k^D) \geq \sum_{j \in J} p\, \bar{y}^j$$

so total profit is no lower after the reform than it would be by remaining at the status quo allocation of production. Then choosing a sagacious wealth distribution rule will enable each consumer to afford at least the status quo level of private consumption.

7 Public Goods Subject to Congestion

No doubt more relevant to any realistic discussion of migration is the case when public goods are subject to congestion. In the absence of additional policy measures, free migration might well raise the cost of maintaining the status quo qualities of the public goods that are provided in countries or localities that receive many immigrants. Indeed, the additional costs may be sufficiently high to remove all potential Pareto gains from free migration.

In the definition of the economy so far, consumers have been adequately described by their conditional feasible sets $F^i(\mathbf{z}^{DK})$ and conditional preference orderings $R^i(\mathbf{z}^{DK})$ on these sets. Now we need a way of describing the congestion effects that migration can bring about, while recognizing that different consumers place different burdens on the public sectors of the nations or localities they inhabit. In order to do so, we extend the description of each consumer $i \in I$ to include an index $e^i(d) \in E$ of all relevant demographic or other household characteristics for each date–event $d \in D$.

The range of possible characteristics is assumed to be a finite set E. Examples of these characteristics are the particular household's needs in different date–event pairs for publicly provided education, health services, welfare payments, pensions, etc. Let $e^{iD} = \langle e^i(d) \rangle_{d \in D} \in E^D$ denote consumer i's *characteristic history.*

The proportion of the world's inhabitants living in country k and having characteristic e at date–event d is given by

$$\mu_k(e, d) := \nu \left(\{ i \in I \mid k^i(d) = k; \; e^i(d) = e \} \right)$$

So at any date–event d, the distribution of consumers in country k having different characteristics $e \in E$ is specified by the vector of proportions $\mu_k^E(d) \in \Re_+^E$. Let μ_k^{ED} denote the national "demographic history" $\langle \mu_k^E(d) \rangle_{d \in D} \in \Re_+^{ED}$.

Assume that the conditional production set of each firm $j \in J_k$ in country k takes the form $Y^j(z_k^D, \mu_k^{ED})$. This is allowed to depend on the distribution of inhabitants' characteristics in order to recognize that increasing numbers of particular kinds of household may increase the cost of providing the given vector z_k^D of public goods when no reduction in quality is allowed. For each firm $j \in J_k$, define

$$\pi^j(p, z_k^D, \mu_k^{ED}) := \max_{y^j} \{ p \, y^j \mid y^j \in Y^j(z_k^D, \mu_k^{ED}) \}$$

as the maximum profit per head of world population compatible with producing the vector z_k^D of national public goods in country k when its demographic history is μ_k^{ED}.

In this case the *wealth distribution rule* $\mathbf{w}^I(p, \mathbf{z}^{DK}, \mu^{EDK})$ specifies each consumer i's wealth level $w^i(p, \mathbf{z}^{DK}, \mu^{EDK})$ as a function that depends on the price vector p, the world production of public goods $\mathbf{z}^{DK}$, and the distribution $\mu^{EDK} = \langle \mu_k^{ED} \rangle_{k \in K}$ of consumers with different characteristics between different nations at different date–events — in effect, the "demographic history" for the world as a whole. Budget feasibility for the world as a whole then requires that

$$\int_I w^i(p, \mathbf{z}^{DK}, \mu^{EDK})\, d\nu = \sum_{k \in K} \sum_{j \in J_k} \pi^j(p, z_k^D, \mu_k^{ED})$$

We allow each household's characteristics to depend on its own choices, including the choice of migration plan. In fact, each consumer $i \in I$ will be modelled as choosing the triple (x^i, k^{iD}, e^{iD}) that consists of a net trade vector, a migration plan, and a contingent history $e^{iD} = \langle e^i(d) \rangle_{d \in D}$ of household characteristics. Now $F^i(\mathbf{z}^{DK})$ will denote the conditional feasible set of all such triples, and $R^i(\mathbf{z}^{DK})$ the conditional preference ordering on this set.

In this model of the world economy, migration creates externalities by adding to (or reducing) the cost of public good provision in both the source and destination localities. An efficient allocation of these externalities can be assured by a instituting a suitable Pigovian tax scheme. This requires a congestion charge or "poll tax" $t_k(e, d)$ to be paid by each consumer of characteristic e living in country k at date–event d. Obviously, the tax paid by each resident with characteristic e should be the contribution to the higher production cost due to the increased congestion created by an extra consumer having this characteristic. Since all residents contribute to these extra costs, the tax should be levied on them all, regardless of national origin. The only exception arises when national origin directly affects the incremental cost of providing public goods in the relevant locality — perhaps because of the special needs of people who lack the most relevant language skills.

Thus, the taxes that consumers are required to pay depend on where they choose to live and on their choice of characteristic. Confronted with these taxes, the budget constraint of any consumer $i \in I$ takes the form

$$p\,x^i + \sum_{d \in D} t_{k^i(d)}(e^i(d), d) \leq w^i(p, \mathbf{z}^{DK}, \mu^{EDK})$$

Now let us reconsider our main theorem on the gains from migration, as stated in Section 5. Let $\bar{\mathbf{e}}^{ID}$ denote the status quo distribution of personal characteristics in the world population. Then the status quo consists of a feasible allocation $(\bar{\mathbf{x}}^I, \bar{\mathbf{k}}^{ID}, \bar{\mathbf{y}}^J, \bar{\mathbf{z}}^{DK}, \bar{\mathbf{e}}^{ID})$.

As in section 6, assume that in order to attain a Pareto improvement, all the national governments keep their public goods at the status quo levels, as specified by $\bar{\mathbf{z}}^{DK}$. Furthermore, the government of each nation $k \in K$ is assumed to set its poll tax rates or residence charges $t_k^{ED} = \langle t_k(e, d) \rangle_{e \in E,\ d \in D}$, which need not be positive, so that the relevant levels of congestion in each country are Pareto efficient. Obviously, for some of the countries which would otherwise lose too much of their population, this tax would be a subsidy.

Notice that this taxation procedure is formally equivalent to introducing a free market for residence permits in each nation in each date–event. Each consumer chooses their relevant demographic characteristics, as well as where to live, depending on the poll taxes or residence fees charged by each national government in each date–event.

On the other hand, each firm that is required to supply public goods whose costs rise because of increased congestion is appropriately compensated out of the revenue received by selling such permits, by raising the equivalent poll taxes, or by reduced subsidies to firms whose costs fall because of decreased congestion. Specifically, assume that each firm $j \in J_k$ in nation k receives a compensating net subsidy which satisfies

$$s^j(p, \mu_k^{ED}) \geq \pi^j(p, \bar{z}_k^D, \bar{\mu}_k^{ED}) - \pi^j(p, \bar{z}_k^D, \mu_k^{ED})$$

so that, if it provides public goods, then it earns no lower a profit from serving the population described by μ_k^{ED} than it does from serving the population described by $\bar{\mu}_k^{ED}$. Assume too that the residence charges t_k^{ED} are set so that

$$\begin{aligned} & \sum\nolimits_{j\in J_k} \pi^j(p, \bar{z}_k^D, \mu_k^{ED}) + \sum\nolimits_{e\in E} \sum\nolimits_{d\in D} t_k(e,d)\, \mu_k(e,d) \\ \geq & \sum\nolimits_{j\in J_k} \pi^j(p, \bar{z}_k^D, \bar{\mu}_k^{ED}) + \sum\nolimits_{e\in E} \sum\nolimits_{d\in D} t_k(e,d)\, \bar{\mu}_k(e,d) \end{aligned}$$

so that the aggregate revenue in nation k from profits and residence charges is no less at μ_k^{ED} than it would be at the status quo $\bar{\mu}_k^{ED}$. In particular, if the aggregate restricted net profit function $\sum_{j\in J_k} \pi^j(p, \bar{z}_k^D, \mu_k^{ED})$ happens to be concave in μ_k^{ED}, then this can be ensured by setting t_k^{ED} equal to the supergradient at the point μ_k^{ED}. The previous inequality implies that

$$\begin{aligned} & \sum\nolimits_{k\in K} \left[\sum\nolimits_{j\in J_k} \pi^j(p, \bar{z}_k^D, \mu_k^{ED}) + \sum\nolimits_{e\in E} \sum\nolimits_{d\in D} t_k(e,d)\, \mu_k(e,d) \right] \\ \geq & \sum\nolimits_{j\in J} p\, \bar{y}^j + \sum\nolimits_{k\in K} \sum\nolimits_{e\in E} \sum\nolimits_{d\in D} t_k(e,d)\, \bar{\mu}_k(e,d) \\ = & \int_I \left[p\, \bar{x}^i + \sum\nolimits_{d\in D} t_{\bar{k}^i(d)}(\bar{e}^i(d), d) \right] d\nu \end{aligned}$$

where the last equality follows from the status quo resource balance constraint $\int_I \bar{x}^i\, d\nu = \sum_{j\in J} \bar{y}^j$ and from the definition of the proportions $\bar{\mu}_k(e,d)$. So the total profit available for distribution permits each consumer to be given enough wealth to afford at least the status quo level of well-being.

The same inequality also ensures that the compensating subsidies to public goods producers can be chosen to satisfy

$$\sum_{j\in J_k} s^j(p, \mu_k^{ED}) \leq \sum_{e\in E} \sum_{d\in D} t_k(e,d)\,[\mu_k(e,d) - \bar{\mu}_k(e,d)]$$

which implies that they can be paid entirely out of the net addition to the total tax liability of the residents of nation k.

An alternative weaker hypothesis than that producers of public goods are compensated in this way would be that the various national demographic histories are frozen at their status quo levels $\bar{\mu}_k^{ED}$ $(k \in K)$. Even then, there can still be gains from migration in the form of population exchanges between different countries, allowing each household to go wherever the kind of labour it is able to supply enjoys a comparative advantage.

Now it can be shown that, in the conditional economy for fixed public goods, there exist compensated equilibrium market clearing prices and residence charges relative to a sagacious wealth distribution. This is a trivial extension of Theorem 1 in Section 5, where now the market clearing condition for residence permits has been added, with prices equivalent to poll taxes.

In order to show that a compensated equilibrium is Walrasian, as in the main theorem of Section 5, it remains only to reformulate the dispersion assumption to take into account the residence charges. To abbreviate notation slightly, for each $i \in I$ let

$$t^{iD}(k^{iD}, e^{iD}) := \langle t_{k^i(d)}(e^i(d), d)\rangle_{d\in D}$$

denote the history of residence charges for which i becomes liable as a result of choosing the migration plan k^{iD} and characteristic history e^{iD}. Then we extend the dispersion assumption of Section 5 by first defining

$$\begin{aligned} & \underline{w}^i(p, k^{iD}, e^{iD}, t^{iD}(k^{iD}, e^{iD})) \\ := \; & \min_{x^i} \{ p\, x^i + \textstyle\sum_{d \in D} t_{k^i(d)}(e^i(d), d) \mid x^i \in X^i(k^{iD}, e^{iD}) \} \end{aligned}$$

as the minimum wealth needed by consumer i at prices p in order to sustain the migration plan k^{iD} and characteristic history e^{iD}, after allowing for the need to pay the history of residence charges $t^{iD}(k^{iD}, e^{iD})$. Next, as i's migration plan k^{iD} and characteristic history e^{iD} vary over the set $K^D \times E^D$, define the set

$$W^i(p, t^{EDK}) := \{ \underline{w}^i(p, k^{iD}, e^{iD}, t^{iD}(k^{iD}, e^{iD})) \mid k^{iD} \in K^D, \; e^{iD} \in E^D \}$$

as the corresponding range of possible minimum wealth levels for consumer i facing the price vector p and pattern of residence charges t^{EDK}. As before, $W^i(p, t^{EDK})$ is finite because both K^D and E^D are. Finally, define

$$I^*(p, t^{EDK}, \mu^{EDK}) := \{ i \in I \mid w^i(p, \mathbf{z}^{DK}, \mu^{EDK}) \in W^i(p, t^{EDK}) \}$$

as the set of consumers who have at least one critical wealth level. With these modifications, the new dispersion assumption will be that the set $I^*(p, t^{EDK}, \mu^{EDK})$ always has measure zero in I. Then our main result still holds for the conditional economy with congestion, fixed public goods, and congestion charges in the form of poll taxes.

8 Concluding Remarks

The classical gains from trade theorem shows the Pareto non-inferiority of free trade relative to autarky, without any need for international lump-sum transfers of wealth. If the status quo involves even limited trade, however, compensation for price changes and for losses of tariff revenue may require international transfers. This is also true if the status quo involves free trade but restricted migration and the reform consists in freeing migration.

In our model, proving that there are gains from combining free trade with free migration involves essentially the same technical problems and the same need to compensate potential losers. In fact, proving that there are gains from free migration alone requires starting from a status quo involving free trade and restricted migration, so that the status quo is not even a compensated equilibrium.

However, as shown in Hammond and Sempere (1995), even without other distortions such as incomplete markets, there are severe practical difficulties in arranging suitable compensation for potential losers. These limit the relevance of potential gains like those considered in the present paper. But, to repeat our main point, these practical difficulties apply equally to labour and to commodity market liberalization, so there is no a priori theoretical reason to favour these over free migration.

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