

Preliminary—Comments Welcome

**Protecting the Welfare State from International Migration\***

by

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## 1. Introduction

The problems associated with income redistribution in a common labor market are well-known. If a single jurisdiction attempts to redistribute income from high-income residents to mobile low-income residents, then it will attract additional low-income individuals from other jurisdictions, until the utilities of low-income residents fall to the levels available in these other jurisdictions. Consequently, there will be a “race to the bottom” in welfare payments, with a system of many jurisdictions engaging in little or no income redistribution.<sup>1</sup> To the extent that high-income individuals are also mobile, they will be induced to leave a jurisdiction attempting to redistribute income, further reducing its ability to redistribute income. The latter issue has been studied extensively as part of the analysis of the “brain drain” from developing countries to developed countries.<sup>2</sup>

In both cases, there are strong justifications for coordinated policy interventions. For example, Wildasin (1991) models the undersupply of income redistribution when the poor are mobile across jurisdictions and proposes a solution consisting of a system of matching grants on the subsidies that jurisdictions give to the poor. As a response to the brain drain, Bhagwati (1973, 1976a, 1976b, 2004) has proposed that a tax be levied on emigrants from developing countries who reside in developed countries, with the revenue returned to the developing countries.<sup>3</sup> The problem with both solutions is that it is not clear how countries could implement them in practice. Raff and Wilson (1997) emphasize the informational problems that a central government would encounter if it

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<sup>1</sup> See Dahlberg and Edmark (2004) for recent evidence of a race to the bottom in welfare benefits, along with the references therein.

<sup>2</sup> See Wilson (2006a) for a recent review of income taxation and skilled migration.

<sup>3</sup> See Wilson (2006b) for a recent review of this tax proposal.

tried to implement Wildasin's system of matching grants. Second-best grant policies of the type considered by Raff and Wilson seem more practical, but even these policies require the existence of a strong central authority.<sup>4</sup> Whereas brain-drain taxes continue to have their proponents [e.g, Bhagwati (2004) and Desai et al. (2002)], it is now widely recognized that developing countries would not be able to collect them without considerable help from developed countries, which is unlikely to be forthcoming.

In this paper, I propose policy responses to both unskilled and skilled migration that do not require a central authority or cooperative agreements among governments. For the case of unskilled migration, the response is immigration controls; that is, policies that split the common labor market into multiple labor markets. At first glance, restrictions on immigration might seem to be an anti-redistribution device. However, they remove a major impediment to income redistribution in a common labor market: by restricting inflows of migrants, a jurisdiction can raise the net incomes of its resident poor above the net incomes earned by similar individuals elsewhere. For this reason, the jurisdiction is now able to redistribute income, even in a system of many jurisdictions.

While it is reasonably clear that immigration controls will improve the well-being of those individuals who are allowed to immigrate, it is less clear what happens to those individuals who are left behind in the source countries. Indeed, a major argument against immigration controls concerns the well-being of the latter. To investigate this issue, I examine a system of countries in which income redistribution is motivated by a more elaborate specification of altruism than the one employed by Wildasin. Because

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<sup>4</sup> As another approach, Dreze, Figuières and Hindriks (2004) propose a system of voluntary matching grants, based on an adjustment process where jurisdictions are induced to reveal their willingness to pay for these grants. This approach is not pursued in the current paper, but its feasibility deserves further study.

migration equalizes the incomes of the mobile poor in Wildasin's model, he is able to model altruistic preferences by including a single income variable for the poor in the utility functions for the rich. In the current paper, the incomes of immigrants and those left behind are allowed to matter separately, along with the number of immigrants residing in the given jurisdiction.

Paradoxically, I find that the use of immigration controls may lead to more immigration. The basic intuition centers on the insight that these controls enable a host country to optimally redistribute income to low-income residents, without this redistribution being thwarted by the entry of new residents. By raising the incomes of immigrants to socially-preferable levels, the host country then makes immigration more attractive from its viewpoint, and, under conditions given in this paper, it then has an incentive to let more of them enter the country. This increase in immigration improves the well-being of similar workers who do not immigrate (by the law of diminishing marginal productivity, applied in reverse).

Turning to the "brain drain," I present a solution to the problem of collecting brain-drain taxes and show that the resulting policy intervention is potentially welfare-improving for the source developing countries. The solution involves the taxes paid by those emigrants who return to their countries of origin, a phenomenon that is becoming increasingly important.<sup>5</sup> In particular, those returning emigrants who previously paid the brain-drain tax face lower tax payments than those who evaded the brain-drain tax. For example, payers of the brain-drain tax might receive a tax credit that is not available to

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<sup>5</sup> For a theoretical analysis of the return-migration decision in a continuous-time model, see Dustmann (2003). To motivate the study, he also provides examples of extensive return migration, noting that 20% to 50% of legal immigrants (depending on nationality) re-emigrated from the United States in the 1970's, and giving examples of much higher rates for Germany and Switzerland.

non-payers. To capture the difficulty of collecting brain-drain taxes, I assume that an emigrant will pay the brain-brain tax only if its value is no greater than the resulting expected tax benefit given to a returning emigrant, given the emigrant's expectation that he or she will eventually return home.

The plan of this paper is as follows. The next section of the paper describes a model of low-income migration model and decentralized redistribution without controls on immigration. These controls are then investigated in Section 4. The brain drain is then considered in Section 5. Section 6 concludes.

## **2. Low-Income Migration without Immigration Controls**

Consider a system of countries that are initially linked by a common labor market. Following Wildasin, assume that each country is characterized by a production function that relates total output to the number of internationally-mobile workers residing in the country. For our purposes, it is useful to assume only two types of countries, those that receive immigrants and those that supply immigrants. The former are called the host countries and possess the production function,  $f(n_h)$ , where  $n_h$  is the supply of mobile workers to host country  $h$ ,  $h = 1, \dots, H$ . The latter are called the source countries, and their production function is denoted,  $F(N_s)$ , where  $N_s$  is the number of mobile workers residing in source country  $s$ ,  $s = 1, \dots, S$ . I focus on the income redistribution activities of the host countries, while, for simplicity, treating as passive the source countries. The functions  $f$  and  $F$  exhibit diminishing marginal productivity, reflecting the presence of a fixed factor. They are specified, along with the initial values of  $n_h$  and  $N_s$  so that the

host countries receive a net inflow of immigrants in equilibrium.<sup>6</sup> Assuming perfect competition, a host country's fixed factor earns income  $y_h = f - f'n_h$ , whereas the mobile factor is paid the wage  $w(n_h) = f'(n_h)$ . Similarly,  $W(N_s) = F'(N_s)$ . Owners of the mobile factor are referred to as "poor," whereas owners of the fixed factor are "rich." The latter possess altruistic preferences, which lead them to support income transfers to the poor, in the form of a subsidy per worker,  $z_h$ . Poor consumption in country  $h$  is  $c_h = w(n_h) + z_h$ , whereas poor consumption in a source country is simply  $c_s = W(N_s)$ . I also allow the host countries to be characterized by "external congestion costs," represented by the function  $e(n_h)$ , where  $e' > 0$ , reflecting marginal congestion costs. One interpretation is that there is crowding in public good or infrastructure usage, but for simplicity I do not exogenize either of these variables. These costs will play a role in the determination of  $z_h$  and subsequent migration controls. Since no such policies are modeled for the source countries, I assume for simplicity that these costs equal zero there.

The specification of altruism takes into account the possibility that the rich view residents and non-residents differently. To specify welfare for a given host country  $h$ , assume that all host countries other than  $h$  provide the same consumption to poor workers,  $c_{-h}$ , as will be the case in the equilibria considered in this paper. The subscript " $-h$ " is used here and below to denote a host country other than  $h$ . Similarly, assume that  $c_s$  is the common consumption for poor workers in the source countries. To measure how much  $c_h$ ,  $c_{-h}$ , and  $c_s$  contribute to the welfare of  $h$ 's rich residents, I next introduce a strictly concave function,  $u(c)$  and write welfare as follows:

$$V_h = y_h + \alpha(n_h)u(c_h) + \beta(P_{-h})u(c_{-h}) + \gamma(P_s)u(c_s), \quad (1)$$

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<sup>6</sup> If  $f$  and  $F$  are identical, then immigration is generated by specifying initial values of  $N_s$  that are high relative to the initial  $n_h$ 's.

where  $\alpha$ ,  $\beta$ , and  $\gamma$  are weights that take into account in differences in preferences towards consumption by poor residents of  $h$ , consumption by residents of other host countries, and consumption by residents of source countries. The welfare weights are allowed to depend on the distribution of a fixed total number of residents and “potential immigrants,” totaling  $P_h$  in host countries other than  $h$ , and  $P_S$  in the source countries. In other words,  $n_h + P_h + P_S$  is an exogenous constant. For simplicity, (1) has been specified as quasi-linear, thereby eliminating income effects.

The set of potential immigrants need not include all non-resident poor workers, but actual immigration is assumed not to eliminate all potential immigrants at the equilibria considered in this paper (i.e.,  $P_h + P_S$  remains positive). To maintain symmetry in the choice problems facing each host country, I assume that that these countries do not differ in their views about how many potential immigrants exist in other host countries and in the source countries. Defining an exogenous set of potential immigrants is analytically convenient, because it will allow us to increase the number of competing jurisdictions while holding fixed the weights in the welfare function.<sup>7</sup>

A special case of (1) is the utilitarian specification, where we sum the values of  $u(c)$  across all poor residents and non-residents. This specification seems unlikely to describe actual practice, particularly if the given country is “small,” because then most of the weight would go on the non-resident poor. An alternative possibility is where only a fixed subset of the poor receives positive weight, such as the residents and potential

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<sup>7</sup> To maintain a symmetric equilibrium in this model, the host countries must draw the same number of immigrants from each source country, though which particular mobile workers immigrate from a particular country is not determined by the model and may therefore be specified by the given host country. In a more elaborate model, we might allow a host country to specify immigration controls that depend on the immigrant’s country of origin, reflecting differences in altruistic preferences. The potential for abusing such controls would then become an important issue.

immigrants defined above. If each poor individual receives the same weight, then the derivatives of  $\alpha$ ,  $\beta$ , and  $\gamma$  all equal the same constant value. If residents receive more weight, then  $\alpha$  has the higher derivative. If only a fixed number of resident poor receive weight, then  $\alpha$  is a positive constant, and  $\beta$  and  $\gamma$  equal zero. Of these three possibilities, the first two will be found to possess similar implications for immigration controls, but not the third. I assume throughout the analysis that at least  $\alpha > 0$ .

To close this section, I consider the case of equilibrium redistribution without immigration controls. The host governments then play a Nash game in subsidies,  $z_h$  for country  $h$ . Country  $h$ 's optimization consists of choosing  $z_h$  to maximize  $V_h$ , given by (1). With free migration, equilibrium is obtained only when consumption levels  $c_s$ ,  $c_h$ , and  $c_{-h}$  equal a common value,  $c$ :

$$c = w(n_h) + z_h = w(n_{-h}) + z_{-h} = W(N_s). \quad (2)$$

The marginal impact of an increase in  $z_h$  on  $c$  satisfies

$$dc = w'(n_h)dn_h + dz_h = w'(n_{-h})dn_{-h} = W'(N_s)dN_s. \quad (3)$$

The change in rich income is

$$dy = (w - c - e')dn_h - n_h w' dn_h - n_h dz_h. \quad (4)$$

In words, we first compute the marginal product of labor, calculated net of consumption and congestion costs, and then we subtract the costs of any increases in the wage  $w$  and subsidy  $z_h$ . The difference is the change in the output available to rich residents.

Now let us use the first equality in (3) to substitute for  $dz_h$  in (4):

$$dy = -n_h dc + (w - c - e') dn_h. \quad (5)$$

We may then take the total differential of  $V_h$ , given by (1), substitute from (5) for  $dy$ , and set the result to zero to get the following first-order condition:

$$\begin{aligned} & \{ [\alpha(n_h) + \beta(P_{-h}) + \gamma(P_S)] u'(c) - n_h \} \frac{dc}{dn_h} \\ & + \left[ \alpha' u(c) + \left( \beta' \frac{dP_{-h}}{dn_h} + \gamma' \frac{dP_S}{dn_h} \right) u(c) + w(n_h) - c - e'(n_h) \right] = 0, \quad (6) \end{aligned}$$

where  $dP_{-h}/dn_h$  and  $dP_S/dn_h$  sum to minus one. Thus, increasing  $z_h$  has two effects. First, it leads to a higher  $n_h$ , which directly affects the weighted sum of utilities by shifting weight towards resident utilities. If  $\alpha' = \beta' = \gamma'$ , implying equal treatment of marginal residents and non-residents, then this effect is zero. But the rise in  $n_h$  also affects welfare through any difference between the wage and the sum of consumption and congestion costs. Second, the rise in  $z_h$  leads to a rise in the common consumption level for the poor, and the first term gives the resulting rise in welfare, net of the cost to the host country of supplying the higher  $c_h$ . Setting the sum of these two effects to zero gives the optimal  $n_h$  for country  $h$ .

To solve for  $dc/dn_h$ , observe that equilibrium in the labor market requires

$$dn_h + (H - 1)dn_{-h} + SdN_s = 0 \quad (7)$$

By using the second and third equalities in (2) to substitute for  $dn_{-h}$  and  $dN_s$ , we obtain

$$dn_h + \left[ (H - 1) + S \left( \frac{w'}{W'} \right) \right] \left[ dn_h + \frac{dz_h}{w'} \right] = 0. \quad (8)$$

Equation (8) may be solved for  $dz_h$  in terms of  $dn_h$  and the result substituted into the expressions for  $dc$  given by (3), yielding

$$\frac{dc}{dn_h} = -w' \frac{dn_{-h}}{dn_h} = -W' \frac{dN_s}{dn_h} = \frac{-w'}{H-1+S \frac{w'}{W'}}. \quad (9)$$

Thus, we have the usual result that the ability of a single country to influence the consumption of mobile workers in a common labor market goes to zero as the number of countries ( $H$  or  $S$ ) goes to infinity. For this “small country” case, we may therefore treat the first term in (6) as negligible and write:

$$\alpha' u(c) + \left( \beta' \frac{dP_{-h}}{dn_h} + \gamma' \frac{dP_s}{dn_h} \right) u(c) + w(n_h) - c - e'(n_h) = 0. \quad (10)$$

With the difference between  $c$  and  $w(n_h)$  equaling  $z_h$ , we then solve for

$$-z_h = e'(n_h) - \left( \alpha' u(c) + \left( \beta' \frac{dP_{-h}}{dn_h} + \gamma' \frac{dP_s}{dn_h} \right) u(c) \right). \quad (11)$$

This is a modified marginal-cost-pricing rule for the efficient taxation of mobile workers in a common labor market. If there were no altruism, then each worker would pay a tax equal to marginal congestion cost, represented by  $e'$ . If, however, altruism is specified so that bringing another worker into the given country raises the welfare of the immobile residents, then the tax should be set below  $e'$ . In the Wildasin model, neither of these two features is present, and so  $z_h = 0$  in the small country case. But if host countries weight the well-being of the resident poor more than the non-resident poor at the margin

$(\alpha' > \beta', \gamma')$ , then positive subsidies will survive in equilibrium, even if no community has market power.

Indeed, we could conceivably obtain a case where there is overprovision of income redistribution in a first-best sense. If  $e'$  were zero, and  $\alpha' = 1$  and  $\beta' = \gamma' = 0$ , then (11) would give  $z_h = u(w+z_h)$ . Given  $u(0) = 0$  and diminishing marginal utility, this equality implies that  $u'(c_h) < 1$ . In this case, transferring a dollar from rich to poor residents, while holding fixed the number of the latter, actually reduces welfare, as measured by  $V_h$ . But this case employs the extreme assumption that the rich exhibit altruism only towards the resident poor.

In what follows, we rule out this case by assuming that competition does indeed lead to underprovision of income redistribution in the sense that  $\alpha u'(c_h) > n_h$  in the Nash equilibrium in  $z_h$ 's; that is, the marginal benefit of another unit of poor-worker consumption exceeds the marginal cost. Assuming that this inequality holds in the absence of redistribution (where  $z_h = 0$ ), we may ensure that it also holds in equilibrium by making the marginal congestion costs,  $e'$  in (11), high enough to offset the utility gain,  $\alpha' u(c) + (\beta' \frac{dP_{-h}}{dn_h} + \gamma' \frac{dP_S}{dn_h}) u(c)$ , so that countries set  $z_h < 0$  to discourage immigration.

#### 4. Equilibrium Immigration Controls

Suppose now that the host countries play a Nash game in both subsidies,  $z_h$ , and also immigration controls, defined as upper bounds on the  $n_h$ 's. Observe first that these controls will indeed be used. Suppose instead that the host countries continued to

compete in the  $z_h$ 's alone. Then any single country would benefit by unilaterally fixing its  $n_h$  at its current level and using its  $z_h$  to raise  $c_h$  above the level offered elsewhere. With  $n_h$  fixed, there would be no change in the behavior of any other country, and so this redistribution would be purely lump-sum. Since the level of redistribution is below the first-best level initially, it would follow that country  $h$ 's welfare rises.

Thus, the equilibrium is characterized by immigration controls. With these controls, each host country raises its  $c_h$  to the first-best level, where

$$\alpha(n_h)u'(c_h) = n_h \quad (12)$$

The left side measures the marginal benefit of raising  $c_h$  a unit for all  $n_h$  resident poor, and the right side is the marginal cost. First-order condition (6) remains the rule for how many immigrants to admit, except now (12) allows us to eliminate the terms involving  $dc_h$ , and the terms involving  $dc_{-h}$  also drop out because the immigration controls in other host countries insulate them from changes in  $h$ 's immigration level. Thus, we are left with the following first-order condition:

$$-\gamma(N_s)u'(c_s)\frac{W'(N_s)}{S} + [(\alpha'u(c_h) - c_h) - \gamma'u(c_s) + w(n_h) - e'(n_h)] = 0 \quad (13)$$

I now show that immigration controls may actually lead to more immigration in equilibrium, leaving everyone better off.

**Proposition 1.** *If  $\alpha' \geq \alpha/n_h$ ,  $\beta' \geq \gamma'$ , and the number of countries is sufficiently large,<sup>8</sup> then introducing immigration controls leads to a rise in the equilibrium level of immigration, leaving all poor workers better off, regardless of where they reside.*

**Proof.** Starting from the equilibrium without immigration controls, let us introduce these controls by holding  $n_h$  fixed at its no-controls value, satisfying (6), while raising  $c_h$  in each country to the level satisfying (12). The benefit of a unit expansion in a single country's  $n_h$  is then given by the left side of (13). I now demonstrate that this benefit is positive.

To begin, re-state (6) by substituting from (9):

$$\begin{aligned} & \left[ (\alpha(n_h)u'(c) - n_h) + \beta(P_{-h})u'(c) + \gamma(P_S)u'(c) \right] \frac{-W'}{(H-1)\frac{W'}{w'} + S} \\ & + \left[ (\alpha'u(c) - c) + \beta' \frac{dP_{-h}}{dn_h} u(c) + \gamma' \frac{dP_S}{dn_h} u(c) + w(n_h) - e'(n_h) \right] = 0. \end{aligned} \quad (6')$$

For a large number of countries (large  $H$  or  $S$ ), the first of the two terms in (6') is close to zero and therefore cannot be significantly higher than the first term in (13). With  $\alpha' \geq \alpha/n_h$  by assumption, raising resident consumption from the inefficiently low level  $c$  in (6') to the efficient level  $c_h$  in (13), where  $c_h$  satisfies (12), causes the term  $\alpha'u(c_h) - c_h$  in (13) to exceed  $\alpha'u(c) - c$  in (6'). Finally, the assumption that  $\beta' \geq \gamma'$  implies that the elimination of  $\frac{dP_{-h}}{dn_h}$  in the move from (6') to (13), with  $\frac{dP_S}{dn_h}$  now equal to  $-1$ , does not contribute to a reduction in (13). Combining these results, we conclude that the left side

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<sup>8</sup> This condition can be satisfied by increasing either  $H$  or  $S$ .

of (13) is positive. Thus, every host country has an incentive to increase its  $n_h$ . A new equilibrium is then established at a higher value of  $n_h$ . As a result the non-immigrant poor are made better off, through the rise in the source-country wage.

Turn now to the well-being of the poor residents of  $h$ . Holding  $n_h$  fixed, we know that immigration controls enable  $c_h$  to be increased to its efficient level, satisfying (12). By the inequality,  $\alpha' \geq \alpha/n_h$ ,  $\alpha/n_h$  is a non-decreasing function of  $n_h$ . Thus, the increase in  $n_h$  identified in the previous paragraph either leaves (12) unchanged or causes the  $c_h$  satisfying (12) to rise further. Thus, the resident poor must also be better off. Q.E.D.

To better understand this proposition, note first that it applies to the case where little redistribution occurs in the absence of immigration controls, because an individual host country is too small to exert much influence over the utilities of the mobile poor. But once immigration controls are implemented in all host countries, any single host country realizes that if it lets more poor enter the country, then they will come only from the source countries, because poor are already restricted from entering other host countries. Under the assumption that  $\beta' \geq \gamma'$ , this consideration will not create a welfare loss. Next, immigration controls enable each host government to raise its  $c_h$  to its first-best level. Under the assumption that  $\alpha' \geq \alpha/n_h$ , this improved “consumption efficiency” means that the marginal immigrant in the given host country is more valuable than before. We are then able to conclude that the host countries possess the incentive to increase immigration beyond their no-control levels.

The condition,  $\alpha' \geq \alpha/n_h$ , will be satisfied with equality if altruism enters  $V_h$  as the sum of utilities of both the resident poor and potential immigrants. To have  $\beta' = \gamma' > 0$ ,

potential immigrants in both the source countries and other host countries must receive the same weights in the measure of welfare.

Examples where the non-resident poor are made worse off by immigration controls may be constructed by assuming that only a fixed number of resident poor receive weight in the welfare function, independently of how much immigration occurs. This result is stated as follows:

**Proposition 2.** *If  $\alpha(n_h)$  is a positive constant and  $\beta = \gamma = 0$ , then introducing immigration controls leads to a reduction in the equilibrium level of immigration. The immigrants are better off, but the non-immigrant poor are worse off.*

**Proof.** To show that  $n_h$  declines, again compare (6') and (13), holding  $n_h$  fixed at its no-control level. Condition (12) implies that the fall in  $n_h$  raises  $c_h$  further above the no-control level. Q.E.D.

These different results flow quite naturally from the different assumptions about altruism. Moving from Proposition 1 to Proposition 2, we have eliminated all non-residents from the host-country welfare function, thereby eliminating incentives to let more of them immigrate when we make the current resident poor better off through immigration controls.

The welfare preferences in Proposition 1 certainly seem more defensible than those in Proposition 2, which allow the current resident poor to receive unequal treatment in the host-country welfare function, along with giving no weight to the non-resident poor. But an important question is whether the optimization of either welfare function would be the outcome of a reasonable political process. Grossman and Helpman (1994) and others have formulated models in which special-interest politics implies the

maximization of a weighted social welfare function. Proposition 2 seems most applicable to cases where lobbies represent fixed sets of domestic residents, who naturally do not want to bring more immigrants into the economy because their presence raises the cost of redistribution (eq. (12)), lowering the equilibrium amount. On the other hand, Proposition 1 might apply to the case where some groups of potential immigrants are represented by lobbies, perhaps through their connection to current immigrants.

As an example of this analysis, consider the possible migration flows that might result from the expansion of the EU to include countries from Eastern Europe. The EU is grappling with the policy implications of a possibly large influx of migrants. Indeed, some commentators have voiced fears that such flows could potentially lead to the “dismantlement” of the EU’s “welfare state.” To prevent such dire consequences, various policy responses have been discussed, including the differential treatment of immigrants, based on their length of stay in a host country. For example, German welfare benefits might not be fully extended to immigrants until they had resided in Germany for a specified number of years (see Sinn, 2004). To the extent that new immigrants respond to economic incentives, the denial of benefits should reduce the amount of immigration, enabling the host country to improve the well-being of the resident poor who meet various length-of-stay requirements.<sup>9</sup> In contrast, the current paper demonstrates that immigration controls have the potential to increase immigration while making immigrants better off.

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<sup>9</sup> In a steady-state equilibrium, however, immigrants would anticipate future benefits, and free immigration by similar immigrants would once again establish an equilibrium where an immigrant would be indifferent about immigrating, now measured in a lifetime utility sense. But by using length-of-stay requirements to treat immigrants differently from citizens with similar attributes, a country could improve the welfare of the latter relative to the former. In contrast, the immigration controls discussed in the current paper affect all mobile residents in the same way, regardless of whether they are citizens or immigrants.

Richter (2004) also proposes a form of length-of-stay requirements, in the form of “delayed integration,” whereby immigrants remain assigned to their country of origin for fiscal purposes for a given period of time after emigrating. In his model, permanent assignment to the country of origin (the “origin principle”) is optimal only in an economy with benevolent governments. Delayed integration responds to the tendency of governments to engage in wasteful expenditures unless they are forced to compete for the tax payments of mobile workers. The current paper does not model waste in government, but it does include possible incentives to tax mobile workers, in the form of “congestion costs” associated with migration. Immigration controls then enable governments to limit these costs without the need to discourage immigration through taxes on low-income immigrants. To the extent that governments are not benevolent, these controls may discourage efficient behavior in the countries of origin by limiting migration opportunities. However, the host countries may also choose to forgo such controls if doing so increases tax payments.

## **5. The Brain Drain**

For my analysis of a brain-drain tax on skilled emigrants, it suffices to consider a single home country, in which skilled residents face exogenous emigration opportunities. Workers live for two periods, and generations overlap. At the start of each period,  $n_u$  unskilled workers and  $n_s$  skilled workers are born. Unskilled workers reside in the home country for both periods, where they each supply one unit of unskilled labor in each period. A skilled worker may remain in the home country for both periods, supplying one unit of skilled labor per period, or emigrate abroad. The two types of labor are

imperfect substitutes in home production. In other words, they enter home's production function as separate arguments. Once abroad, a skilled worker earns exogenous income  $Y$  in the initial period (net of taxes imposed by foreign governments) and has the opportunity to earn random income  $Z$  in the next period. At the end of the first period, the worker learns the value of  $Z$  and chooses whether to remain abroad or return to the home country, depending on where after-tax income is highest. Let  $n_e$  denote the number of skilled workers who initially migrate, and let  $n_r$  denote the number of returning emigrants, each of whom supplies one unit of labor. To account for the accumulation of human capital and technological knowledge abroad, I assume that the labor supplied by returning emigrants is an imperfect substitute with the labor supplied by skilled residents who never emigrated. If  $n_b$  denotes the number of young residents who choose not to emigrate, then  $2n_b$  is the total amount of labor supplied by young and old non-emigrants. The production function,  $f(n_s, 2n_b, n_r)$ , exhibits constant returns to scale, where  $n_b + n_e = n_s$ . Finally, the per-period consumption levels are  $c_s$  for an unskilled worker,  $c_b$  for a non-emigrant,  $c_r$  for a returning emigrant,  $c_e$  for a first-period emigrant, and  $Z$  for a second-period emigrant. The last quantity reflects the assumption that second-period emigrants escape all home-country taxation because they will never return to the home country, and therefore consume their entire income,  $Z$ .

To focus on the problems involved in redistributing income from mobile skilled workers to immobile unskilled workers, let us assume that the government maximizes a weighted sum of consumption levels, with more weight placed on the consumption undertaken by unskilled workers. In symbols,

$$W = \alpha n_u c_u + n_b c_b + n_r c_r + n_e c_e + n_e \int_{c_r}^{\infty} Zh(Z) dZ, \quad (14)$$

where  $\alpha > 1$ ,  $h(Z)$  is the continuous density function for  $Z$ , and the last term reflect the fact that emigrants who learn that their  $Z$ 's are less than  $c_r$  choose to return to the home country. By assuming that welfare is linear in consumption levels, we ignore any risk premia associated with risky income abroad. The home country's production constraint requires that total income equal total consumption in each period:

$$\begin{aligned} f(n_u, 2n_b, n_r) + n_e Y + n_e \int_{c_e}^{\infty} Zh(Z) dZ \\ = n_u c_u + n_b c_b + n_r c_r + n_e \int_{c_e}^{\infty} Zh(Z) dZ + n_e c_e. \end{aligned} \quad (15)$$

For the remaining constraints, we must introduce assumptions about the tax system.

To isolate the difficulties involved in taxing emigrants, assume that there are no constraints on taxing home-country residents. Thus, consumption levels  $c_u$ ,  $c_b$ , and  $c_r$  may be chosen independently of the corresponding marginal products of labor, and they may therefore serve as control variables. On the other hand, emigrants will pay taxes to the home country only if it is in their best interests to do so. To induce first-period emigrants to pay a brain-drain tax, the government may offer them a tax credit if they return home. In other words, returning emigrants faces two possible tax burdens, depending on whether they fully paid the brain-drain tax. An emigrant must choose whether to pay the tax prior to the revelation of  $Z$ . Consequently, all emigrants either

choose to pay the brain-drain tax, or choose to evade it.<sup>10</sup> Since total evasion is equivalent to no tax, we may limit our consideration to the welfare effects of brain-drain taxes that emigrants choose not to evade. As a result, no returning emigrants bear the increased tax burden associated with evasion, implying that this burden can be increased as much as desired without creating any direct welfare loss. However, emigrants can always avoid the burden by not returning to the home country. It follows that the maximum possible expected penalty from evading the brain-drain tax equals the expected loss associated with giving up the option of returning to the home country in the event that  $Z$  falls below  $c_r$ . Letting  $B$  denote the brain-drain tax, the no-evasion constraint reduces to

$$B \leq \int_0^{c_r} (c_r - Z)h(Z)dZ \quad (16)$$

As a final constraint, the free mobility of skilled workers in the first period equates the lifetime income on non-emigrants to the expected lifetime income of emigrants:

$$2c_b = Y - B + c_r \int_0^{c_r} h(Z)dZ + \int_{c_r}^{\infty} Zh(Z)dZ . \quad (17)$$

For future use, define

$$s(c_r) = \int_0^{c_r} h(Z)dZ , \quad (18)$$

representing the share of emigrants who choose to return home.

To summarize, the government's optimal tax problem consists of choosing  $c_w$ ,  $c_b$ ,  $c_r$ ,  $B$ , and  $n_e$ , and  $B$  to maximize

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<sup>10</sup> Indifference about paying the tax is assumed to be resolved in favor of paying it.

$$W = \alpha n_u c_u + 2(n_s - n_e)c_b + s(c_r)n_e c_r + n_e(Y-B) + n_e \int_{c_r}^{\infty} Zh(Z)dZ, \quad (14')$$

subject to

$$f(n_u, 2(n_s - n_e), s(c_r)n_e) + n_e Y = n_u c_u + 2(n_s - n_e)c_b + n_e(Y - B) + s(c_r)n_e c_r; \quad (15')$$

$$B \leq \int_0^{c_r} (c_r - Z)h(Z)dZ; \quad (16)$$

$$2c_b = Y - B + c_r \int_0^{c_r} h(Z)dZ + \int_{c_r}^{\infty} Zh(Z)dZ; \quad (17)$$

where (14') and (15') are rearranged forms of (14) and (15).

I now demonstrate that a positive brain-drain tax is a necessary component of any second-best policy, and that its presence implies that a tax should also be collected from non-emigrants.

**Proposition 3.** *The optimal brain-drain tax satisfies*

$$B = \int_0^{c_r} (c_r - Z)h(Z)dZ > 0,$$

*and the taxes paid by a non-emigrant, summed over both periods, equal B. However, returning emigrants are neither taxed nor subsidized.*

**Proof.** Let,  $\lambda_P$ ,  $\lambda_B$  and  $\lambda_R$  denote the Lagrange multipliers on constraints (15'), (16) and (17), all of which are zero or positive. Using subscripts on the production function to represent partial derivatives, the first-order conditions for the optimal tax problem are

$$B: n_e(1 - \lambda_P) - \lambda_R + \lambda_B = 0; \quad (19)$$

$$c_r: s(c_r)[n_e(1 - \lambda_P) - \lambda_R + \lambda_B] + \lambda_P s'(c_r) n_r [f_r - c_r] = 0; \quad (20)$$

$$c_b: 2n_b(1 - \lambda_P) + 2\lambda_R = 0; \quad (21)$$

$$c_u: n_u(\alpha - \lambda_P) = 0; \quad (22)$$

$$n_e: \lambda_P [s(c_r)(f_r - c_r) - 2(f_b - c_b) + B] = 0. \quad (23)$$

From (21) and (22),  $n_e(1 - \lambda_P) < 0$  and  $\lambda_R > 0$  in (19), from which it follows that  $\lambda_B > 0$ . Thus, constraint (16) binds, implying  $B > 0$ . By (19) and (20),  $f_r = c_r$ , implying that returning emigrants are not taxed. Then (23) gives the tax on non-emigrants, which satisfies the remaining part of the proposition. Q.E.D.

Thus, emigrants voluntarily pay a brain-drain tax, rather than risk the possibility of paying higher taxes in the event that they return home. Non-emigrants are also taxed, at a rate that ensures that the tax system does not distort migration decisions. Taken together, the brain-drain tax and non-emigrant tax represent a residence-based tax on skilled labor.

Returning emigrants are neither taxed nor subsidized, because doing so would distort the decision to return, given that second-period emigrants pay no tax to the home government. In this model, there is no reason to tolerate such a distortion. Since non-emigrants are taxed, however, it follows that returning emigrants receive more favorable tax treatment than emigrants. But they must pay the brain-drain tax to receive this favorable treatment.

An interesting question is how the elimination of the brain-drain tax would affect the other taxes in this model. In this case, first-order condition (19) is eliminated, along with the Lagrange multiplier,  $\lambda_B$ . First-order conditions (20) and (22) then imply that  $f_r > c_r$ ; that is, returning emigrants are now taxed. But then (23) implies that non-emigrants are also taxed.

The taxes on returning emigrants and non-emigrants are easily explained. By taxing returning emigrants, the home government indirectly taxes emigrants, since a potential emigrant realizes that emigration creates the possibility that he or she will become a returning emigrant and therefore be subject to the returning-emigrant tax. In other words, the tax on returning emigrants reduces incentives to emigrate. It is then optimal to offset this tax by taxing non-emigrants [condition (23)]. Raising both taxes therefore enables the government to redistribute income from skilled residents to unskilled residents, without distorting the decision to emigrate. The decision to return from abroad is distorted, but this distortion is second-order for a small tax, whereas the gain from redistribution is first-order.

The finding that non-emigrants are taxed is particularly interesting because it seems to contradict the well-known result that source-based taxes should not be used in an open-economy. But the contradiction is resolved by noting that the combination of taxes on non-emigrants and returning emigrants again represents a residence-based tax; that is, emigrating does not affect a skilled worker's lifetime tax burden, measured in expected value terms. This insight—that taxes paid by returning factors of production may be viewed as expected taxes facing initial emigrating factors—seems to be underappreciated in the international tax literature.

## 6. Concluding Remarks

In this paper, I have proposed some policy responses to the problems that migration poses for the welfare state. For migration of low-income individuals, I have argued that immigration controls have the potential to not only leave low-income immigrants better off, but also improve the well-being of low-income workers left behind in the source countries. For skilled migration—popularly referred to as the “brain-drain”—I have discussed how emigrants may be induced to pay a brain-drain tax, despite the source countries’ well-known difficulties in collecting such taxes.

The analysis reported here raises several questions for future study. Turning first to immigration controls, note that the decentralized use of these controls by independent government does not produce an efficient equilibrium, due to the public-good nature of income redistribution in this model. In particular, raising the net incomes of a given jurisdiction’s immigrants benefits not just that jurisdiction, but also other jurisdictions. Thus, we continue to have underprovision of income redistribution, though not the zero provision that would characterize a system of many jurisdictions without immigration controls. Moreover, there are now separate inefficiencies associated with the choice of immigration levels, which depend on how altruism enters utility functions. In future work, I hope to characterize these various inefficiencies, along with forms of central-government intervention that would reduce or eliminate them. Optimal forms of government intervention are necessarily more complicated than Wildasin’s (1991) system of matching grants, since the number of immigrants and the incomes received by these immigrants become separate choice variables. Finally, I hope to extend the model to

include remittances, modeled as income transfers from immigrants to non-immigrants. Remittances will undoubtedly affect government redistribution policies in interesting ways.

Turning to the brain drain, the simplifying features of the model serve to highlight the usefulness of brain-drain taxes, but they also hide some potential problems. By assuming that all skilled workers are *ex ante* identical, and that *ex post* differences consist only of income differences among second-period emigrants, we have ensured that all emigrants should face the same brain-drain tax. In practice, incomes would differ among emigrants facing a brain-drain tax, creating a role for brain-drain taxes that vary across emigrants. But informational difficulties would again arise in the implementation of such variations, along with the system of tax penalties on returning emigrants. Information obtained from returning emigrants could be used to reduce these information problems to some extent, suggesting that some variation in tax payments would be possible. Moreover, such variations would likely be relatively unimportant for the small brain-drain taxes proposed by Bhagwati (2004). In any case, it is hoped that the analysis in the current paper provides a useful stepping stone to a fuller analysis of the implementability of brain-drain taxes in more complicated environments.

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