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Ability Drain

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ABSTRACT

Ability Drain[*]

Is ability drain (*AD*) economically significant? That immigrants or their children founded over 40% of the Fortune 500 US companies suggests it is. Moreover, brain drain (*BD*) induces a brain gain (*BG*). This cannot occur with ability. Nonetheless, while *BD* has been studied extensively, *AD* drain has not. I examine migration's impact on ability (*a*), education (*h*), and productive human capital or 'skill' (*s*) – which includes both *a* and *h* – for source country residents and migrants, under the points system (*PS*), 'vetting' system (*VS*), which accounts for *s* (e.g., US H1-B visa), and 'new' points system (*NS*), which combines *PS* and *VS* (e.g., Canada, 2015+). I find that i) Migration reduces (raises) source country residents' (migrants') average ability and has an ambiguous (positive) impact on their average education and skill, with a net skill drain more likely than a net *BD*; ii) *AD* is greater than *BD*; iii) the effects increase with ability's inequality or variance *V(a)*; iv) the policies in turn raise *V(a)*, *V(h)* and *V(s)*, with *V(a)* > *V(h)*; v) effects in i) - iv) are larger under *VS* than *PS*; vi) residents' (migrants') consumption is lower (higher) under either policy than under a closed economy; vii) consumption falls with ability's inequality; viii) contrary to the situation with education and skill, consumption inequality is lower under *VS* than *PS*; viii) ability, education and skill (consumption) under *NS* are identical (is larger than) the combined values under *PS* and *VS*. Orders of magnitude, empirical research plans, and policy implications are provided.

JEL Classification: F22, J24, J61, O15

Keywords: migration, points system, vetting system, ability drain, brain drain, brain gain

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1. Introduction

A large number of theoretical and empirical studies have examined the international migration of educated labor or brain drain, its determinants, its impact on human capital in migrants' source and host countries, growth (Mountford 1997; Beine et al. 2001, 2008) and institutions (Docquier et al., 2011), as well as brain gain (e.g., Mountford 1997; Vidal 1998; Beine et al. 2004, 2008; Schiff 2006; Docquier et al. 2011) and brain waste (e.g., Ozden 2006, Mattoo et al. 2008). Surveys of brain drain issues include Commander et al. (2004) and Docquier and Rapoport (2012).

Migrants possess additional characteristics that may affect their migration and education decisions and impact, an important one of which is their innate ability. The latter includes the ability to learn, communicate, cooperate, take risks, adapt, motivate people, work in groups, as well as attributes such as ambition, creativity, intelligence, responsibility, leadership, work ethic, consideration of others' viewpoints, and more. Given that returns to ability are typically higher in developed countries, average ability is likely to be greater among migrants than among source country residents, i.e., migrants are likely to be positively selected for ability (Schiff 2006).

Given the difficulty in measuring ability, its economic significance has not been ascertained to date, though the fact that over 40 percent of the US Fortune 500 companies were founded either by immigrants or their children (Partnership for a New American Economy, 2011)[1] suggests that the "ability drain" may be important. One reason an ability drain may have a greater impact than a brain drain is that the latter induces a brain gain while an ability drain does not, Thus, while a brain drain may or may not deplete the average human capital stock (i.e., the net brain drain sign is ambiguous), an ability drain unambiguously does. In fact, this paper finds the ability drain to be greater than the brain drain under both the points and the vetting systems,[2] [3] with a greater difference between them under the vetting than under

[1] Companies include Kraft, Procter & Gamble, ATT, Dupont, Goldman Sachs, eBay, Google, Yahoo, and many more.

[2] The points system – e.g., Canada's pre-2015 immigration policy – accounts for prospective migrants' education (and other attributes, such as age), while the vetting system – e.g., the US H1-B visa program (when properly run; see Section 8) – also accounts for their ability. New points systems – e.g., in Australia, New Zealand and Canada – are combinations of the old points systems and the vetting system.

[3] This paper deals with permanent economic migration, i.e., it does not examine issues related to refugees, asylum seekers, or return migration.

the points system. Table 1 (2) in Section 3 (4) shows the points (vetting) system' impact on education, ability and 'skill' (i.e., their sum).

Despite the fact that ability drain and its impact may be important, I have only found three studies that use a direct measure of ability to examine its relationship with migration. Miguel and Hamory (2009) find a higher rural-urban migration rate in Kenya for individuals scoring higher on a primary school test. Kleven et al. (2010) show that football players in Europe respond to the host country's tax rate, with a greater migration response for the more successful players. And Akgüç et al. (2015) look at one component of ability listed above, namely that related to risk, and find that it is substantially greater for Chinese rural-urban migrants (and family members) than for non-migrants, that substantial changes in the environment does not affect their attitude towards risk, and that these are correlated across generations. The fact that more able individuals are more likely to migrate is incorporated in the model in Section 2.

A few additional studies that do not use a direct measure of ability but infer some aspect of its relationship with migration are Özden (2006), Mattoo et al. (2008), and Piracha et al. (2015). The first two studies examine the success of highly educated migrants in the US in terms of the degree to which there is an education-occupation match or mismatch (with migrants overeducated for the job they hold). They find, among others, that the migration distance has a positive impact on their degree of success. Given that the cost of the migration project rises with the distance between the US and migrants' home country, the expected return on that project must increase with distance to make migration worthwhile, i.e., migrants' ability must increase with distance.

Piracha et al. (2012) similarly look at migrants' education-occupation mismatch but they also include the mismatch that prevailed in the migrant's country of origin. They find a strong relationship between worker-job mismatch in migrants' country of origin and in Australia, concluding that the information associated with the mismatch in the country of origin constitutes an "ability signal" for potential employers in Australia.

Given the potential importance of the relationship between migration and ability, the paucity of studies on this issue is unfortunate. Moreover, none of these studies examined the ability drain and its impact. This study constitutes a small step in filling this gap.

The paper is organized as follows. Section 2 presents the model and the closed economy case. Sections 3 and 4 examine the points and vetting systems, respectively, and compare them to each other and to the closed economy and non-selective case. Section 5 solves for average consumption (or utility) and examines the impact of the ability drain under the two policies. Section 6 examines the new points systems. Section 7 presents some quantitative assessment of the contribution of the ability drain to the average income gap between migrants and home country residents (i.e., non-migrants) and discusses planned empirical research. Section 8 presents some policy implications and Section 9 concludes.

2. Model

Assume a source and a destination or host country, where productivity of source country individual i depends on productive human capital or 'skill' s_i.[4] Skill is assumed to be a function of innate ability, $a_i \epsilon (0, a_M]$, and education, $h_i \epsilon (0, h_M]$, with average values S, A, and H, respectively, and variance $V(s_i)$, $V(a_i)$ and $V(h_i)$. Without loss of generality, h_i units are chosen such that $h_M = 1$, i.e., $h_i \epsilon (0, 1]$.

Denote the country of origin (destination) by "0" ("d"), source country natives' income by y_{0i} ($y_{\mathrm{d}i}$) for residents (migrants), and the migration probability by $p_i \epsilon [0, 1]$. Skill, income in both countries and expected income y_i are:

$$s_i = a_i + h_i, \quad y_{0i} = \alpha_0 s_i, \; y_{\mathrm{d}i} = \alpha_{\mathrm{d}} s_i, \; \alpha_0 \epsilon (0, \alpha_{\mathrm{d}}),$$

$$y_i = (1 - p_i) y_{0i} + p_i y_{\mathrm{d}i} = y_{0i} + p_i (y_{\mathrm{d}i} - y_{0i}) = [\alpha_0 + (\alpha_d - \alpha_0) p_i] s_i \, . \qquad (1)$$

Individuals are risk-neutral, i.e., utility, u_i, is a linear function of (expected) consumption, c_i (though the analysis holds for other functions, as shown further down). Assume for simplicity that $u_i = c_i$. The cost of education h_i is $h_i^2/2$.

[4] Note that the term "skill" used in migration studies typically refers to education and excludes ability.

Thus, consumption c_i, which is non-negative, is given by:

$$u_i = c_i = y_i - \frac{h_i^2}{2} = [\alpha_0 + (\alpha_d - \alpha_0)p_i]s_i - \frac{h_i^2}{2} \geq 0. \qquad (2)$$

Individuals maximize expected utility by selecting h_i under uncertainty about the realization of p_i at the start of the period, after which a share p_i migrates and earns $y_{\mathrm{d}i} = \alpha_{\mathrm{d}} s_i$ and a share $1 - p_i$ does not and earns $y_{0i} = \alpha_0 s_i$.

Equation (1) assumes that incomes y_{0i} and $y_{\mathrm{d}i}$ are linear in h_i, i.e., the marginal product of education is constant. Equation (2), on the other hand, assumes a quadratic education cost, i.e., the marginal cost of education is increasing in h_i. Thus, investment in education exhibits diminishing returns, which is consistent with empirical findings.

Individuals select an education level h_i that maximizes c_i, taking the host country's immigration policy and their innate ability, a_i, as given. For comparison purposes, assume the number of migrants, M, or migration rate $P = M$ (as population size equals 1) is identical under the two policies examined, i.e., $P_p = P_v = P$, where $P = \int_0^{a_M} p_i f(a_i) da_i$, $p(v)$ denotes the points (vetting) system), and $f(a_i)$ is a_i's pdf. Pre-migration or gross average ability $A^G = \int_0^{a_M} a_i f(a_i) da_i$ is the source country's average ability before migration and the ability drain take place. The immigration probability rises with an individual's education under the points system, and with both education and ability – or skill – under the vetting system.[5]

Importantly, note that the analysis provided in this paper is relevant not only for $u_i = c_i$ (with c_i given in (2)) but also for any function v_i that is monotonically increasing in c_i, since the value of h_i that maximizes c_i also maximizes v_i. In other words, the results hold for any $v_i = v(c_i)$, $\frac{\partial v_i}{\partial c_i} > 0$, $\forall\, c_i \geq 0$. For instance, $v_i = \gamma c_i^{\psi}$; $\gamma, \psi > 0$, $\psi \gtrless 1$. A utility

[5] Thus, average education and skill levels are higher for migrants than for residents, i.e., migrants are positively selected for both. As Docquier and Marfouk (2006) show for education, the share of the highly educated in South-North migrants is three times that among source countries' residents, and larger for poor, landlocked and island countries (e.g., the ratio for Sub-Saharan Africa is 15, and is larger for the Caribbean).

function could be represented by any function v_i where $\frac{\partial^2 v_i}{\partial c_i^2} < 0$, e.g., $v_i = \log(c_i)$ or $v_i = \gamma c_i^{\psi}, \psi < 1$.

2.1. Closed Economy

Before turning to the points and vetting systems, results are provided for the 'closed economy' immigration policy. In that case, the migration probability $p_i = 0$. Denoting the variables in this case with subscript "0", equation (2) becomes:

$$c_{i0} = y_{i0} - \frac{h_{i0}^2}{2} = \alpha_0 s_{i0} - \frac{h_{i0}^2}{2} = \alpha_0(a_i + h_{i0}) - \frac{h_{i0}^2}{2} \geq 0. \tag{2a}$$

Maximizing c_{i0} with respect to h_{i0}, the values for h_{i0}, its average H_0, average ability A_0, skill s_{i0}, average skill S_0 and its variance $V(s_{i0})$, consumption c_{i0} and its average C_0, are:

$$h_{i0} = H_0 = \alpha_0, A_0 = A^G, s_{i0} = a_i + \alpha_0, V(s_{i0}) = V(a_i), S_0 = A^G + \alpha_0,$$

$$c_{i0} = \alpha_0\left(\frac{\alpha_0}{2} + a_i\right), C_0 = \alpha_0\left(\frac{\alpha_0}{2} + A^G\right). \tag{2b}$$

3. Points System

Under the points system (e.g., Canada's pre-2015 policy), applicants receive points for education but not for ability. The immigration probability p_{ip} is πh_{ip}, to which a constant, πA^G, is added to ensure the average immigration probability or average migration rate is identical under the points and vetting systems, i.e., $P_p = P_v = P$, which is assumed for comparison purposes. Note also that $P_v = P_p = P$ implies $H_v^G = H_p^G = H^G$, as can be seen by comparing equation (4) below with equation (11) in Section 4 (with H^G defined after equation (4) below), and also implies that $S_v^G = S_p^G = S^G$.

The immigration probability is:

$$p_{ip} = \pi(A^G + h_{ip}), \pi > 0. \tag{3}$$

From (1), consumption in this case is:

$$c_{ip} = \left[\alpha_0 + \pi(\alpha_d - \alpha_0)\left(A^G + h_{ip}\right)\right]\left(a_i + h_{ip}\right) - \frac{h_{ip}^2}{2} \geq 0. \tag{1'}$$

Defining $\phi \equiv 1 - 2\pi(\alpha_d - \alpha_0)$ and $\lambda \equiv \frac{\pi(\alpha_d - \alpha_0)}{\phi}$, the solutions for h_{ip}, H^G, p_{ip}, P_p, and s_{ip} are given by:

$$h_{ip} = \frac{\alpha_0}{\phi} + \lambda(a_i + A^G),\ H^G = \frac{\alpha_0}{\phi} + 2\lambda A^G,\ s_{ip} = \frac{\alpha_0 + a_i}{\phi} - \lambda(a_i - A^G),$$

$$S_p^G = S_v^G = S^G = A^G + H^G = \frac{1}{\phi}(\alpha_0 + A^G),$$

$$p_{ip} = \pi\left[\frac{\alpha_0 + A^G}{\phi} + \lambda(a_i - A^G)\right], P_p = \frac{\pi}{\phi}(\alpha_0 + A^G) = P, \tag{4}$$

where $\phi > 0$ is the second-order condition and H^G denotes the average 'gross' education level, i.e., the level given the incentives associated with the policy but before migration takes place. In other words, H^G includes the brain gain generated by the points system but not the brain drain.[6] The brain gain, $H_p^G - H_0$, is equal to: $H_p^G - H_0 = 2\lambda(A^G + \alpha_0)$.

Equation (16) in Section 5 shows that $\lambda < \frac{1}{2}$. With $\frac{1}{\phi} = \frac{\phi + 2\pi(\alpha_d - \alpha_0)}{\phi} = 1 + 2\lambda$, we have $V(s_{ip}) = V\left[\frac{\alpha_0 + a_i}{\phi} + \lambda(A^G - a_i)\right] = V\left[\left(\frac{1}{\phi} - \lambda\right)a_i\right] = V[(1+\lambda)a_i] = (1+\lambda)^2 V(a_i) = (1+\lambda)^2 V(s_{i0}) > V(s_{i0})$. Thus, the points system raises the variance of individual skills or skills inequality, relative to the closed economy case. The greater skill inequality can also be seen from the derivatives $\frac{\partial s_{i0}}{\partial a_i} = 1$ and $\frac{\partial s_{ip}}{\partial a_i} = 1 + \lambda$. The reason for the latter is that $s_{ip} = a_i + h_{ip}$ varies with a_i directly and varies also with a_i's impact on h_{ip} – which is equal to λ, so that a_i's total impact on s_{ip} is $1 + \lambda$.

The host country's policy change from a closed economy to a points system raises the expected return on education, with an impact on residents' education and skill $h_{ip} - h_{i0} = s_{ip} - s_{i0} = \lambda(a_i + A^G + 2\alpha_0) > 0$. However, residents' *average* skill need not increase because education increases with ability, which raises the migration probability. Thus, the

[6] The brain drain does not lower average education under a constant migration probability, which is not the case here.

migration rate is higher (lower) at higher (lower) ability and education levels, which reduces both average ability and average education.

Denote the average value of a variable x_i by X, and by $X_p \equiv \frac{1}{1-P}\int_0^{a_M} x_i(1-p_{ip})f(a_i)da_i$ for source-country residents, by $X_p^M \equiv \frac{1}{P}\int_0^{a_M} x_i p_{ip} f(a_i)da_i$ for migrants, by $X_{pN} \equiv (1-P)X_p + PX_p^M$ for natives, and by S_p^G ($S_p^G = A^G + H_p^G$) for gross (pre-migration) average skill. Solutions for X_p, X_p^M and X_{pN} $(X = A, H, S)$ are:

$$A_p = A^G - \frac{\pi\lambda}{1-P}V(a_i),\ A_p^M = A^G + \frac{\pi\lambda}{P}V(a_i),\ A_{pN} = A^G,$$

$$H_p = H^G - \frac{\pi\lambda^2}{1-P}V(a_i),\ H_p^M = H^G + \frac{\pi\lambda^2}{P}V(a_i),\ H_{pN} = H^G,$$

$$S_p = S^G - \frac{\pi(\lambda+\lambda^2)}{1-P}V(a_i),\ \ S_p^M = S^G + \frac{\pi(\lambda+\lambda^2)}{P}V(a_i),\ S_{pN} = S^G. \qquad (5)$$

As shown in (5), the brain drain is λ times the ability drain. Since $\lambda < \frac{1}{2}$, it follows that the ability drain is larger than (at least twice) the brain drain. The reason is that, as shown in (4), a_i enters into h_i with coefficient λ, and this is reflected in the equations for H_p and A_p. Note also that a_i's variance is greater than h_{ip}'s (over four times; see (4) and Table 1).

Another result from (5) is that residents' (migrants') average ability, education and skill levels fall (rise) with inequality in the source country's ability distribution, as measured by the variance of a_i. Thus, the host country benefits from greater a_i inequality as it raises the average skill level of its immigrants. And, as shown above, the policy itself also raises inequality in migrants' source country. Finally, the variance of a_i does not affect natives' average ability, education or skill as its impact on residents' and migrants' values cancel each other out. Table 1 presents the impact of the points system on the ability drain and on the brain and skill drain and gain, relative to the closed economy case.

What is the policy's impact on ability, education and skill, relative to a closed economy policy ($\pi = 0$), i.e., $\Delta X_p \equiv X_p - X_0$ $(X = A, H, S)$? Since there is no ability gain, average ability declines, with:

$$\Delta A_p \equiv A_p - A^G = -\frac{\pi\lambda}{1-P}V(a_i) < 0,\ \Delta H_p \equiv H_p - H_0 = 2\lambda(\alpha_0 + A^G) - \frac{\pi\lambda^2}{1-P}V(a_i) \gtreqless 0,$$

$$\Delta S_p \equiv S_p - S_0 = 2\lambda(\alpha_0 + A^G) - \frac{\pi(\lambda+\lambda^2)}{1-P}V(a_i) \gtreqless 0.^7 \qquad (6)$$

Thus, the policy's impact on (ability) education and skill is (negative) ambiguous.

Table 1: Points System – Residents' Ability, Brain and Skill Drain and Gain [a]

	Ability (1)	Education (2)	Skill (1 + 2)	Ratio (1)/(2)
Drain (i)	$-\frac{\pi\lambda}{1-P}V(a_i)$	$-\frac{\pi\lambda^2}{1-P}V(a_i).$	$-\frac{\pi(\lambda+\lambda^2)}{1-P}V(a_i).$	$\frac{1}{\lambda} > 2.$
Gain (ii)	--	$2\lambda(A^G + \alpha_0)$	$2\lambda(A^G + \alpha_0)$	--
Net Gain (i) + (ii)	$-\frac{\pi\lambda}{1-P}V(a_i).$	$2\lambda(A^G + \alpha_0) - \frac{\pi\lambda^2}{1-P}V(a_i) \gtreqless 0.$	$2\lambda(A^G + \alpha_0) - \frac{\pi(\lambda+\lambda^2)}{1-P}V(a_i) \gtreqless 0.$	--
Variance	$V(a_i)$	$\lambda^2\, V(a_i)$	$(1 + \lambda^2)\, V(a_i)$	$\frac{1}{\lambda^2} > 4.$

a: Results are relative to the closed economy case.

Since $\Delta S_p = \Delta H_p + \Delta A_p = \Delta H_p - \frac{\pi\lambda}{1-P}V(a_i) < \Delta H_p$, the policy's impact on skill is more likely to be negative than that on education, i.e., $\Delta S_p < 0 < \Delta H_p$ is a distinct possibility. Some studies (e.g., Beine et al. 2012) find a net brain gain is more likely in larger source countries ($\Delta H_p > 0$) – though the net skill impact is ambiguous ($\Delta S_p \gtreqless 0$), and most countries exhibit a net brain drain ($\Delta H_p < 0$), implying a larger net skill drain. On the other hand, the points system raises migrants' ability, education and skill, with:

$$\Delta A_p^M \equiv A_p^M - A^G = \frac{\pi\lambda}{P}V(a_i) > 0,\ \Delta H_p^M \equiv H_p^M - H_0 = 2\lambda(\alpha_0 + A^G) + \frac{\pi\lambda^2}{P}V(a_i) > 0,$$

[7] Equation (6) results from $H_0 = \alpha_0, S_0 = A^G + \alpha_0$ and $S_p = A^G + H_p^G - \frac{\pi(\lambda+\lambda^2)}{1-P}V(a_i)$.

$$\Delta S_p^M \equiv S_p^M - S_0 = 2\lambda(\alpha_0 + A^G) + \frac{\pi(\lambda+\lambda^2)}{P} V(a_i) > 0. \quad (7)$$

What about the source country's natives as a whole (or "naturals" as referred to by Clemens et al., 2009)? Denoting variables for natives by subscript N, we have:

$$H_{pN} - H_0 = S_{pN} - S_0 = 2\lambda(\alpha_0 + A^G) > 0, \; A_{pN} - A_0 = 0. \quad (8)$$

In other words, natives' average education and skill levels are higher under the points system than under a closed economy, while their average ability is unchanged.

Finally, consider a non-selective policy, where immigration probability for all individuals is equal to the points system average, i.e., $p_i = P$. Then, average education (skill) for both residents and migrants is H^G (S^G). Thus, residents' (migrants') average skill level is higher (lower) under a non-selective policy than under the points system.

4. Vetting System

Employers obtain the benefit of good hiring decisions and bear the burden of bad ones, and are therefore likely to thoroughly vet prospective employees in order to assess their productive human capital or skill. I refer to an immigration policy that takes both ability and education into account as a "vetting system," with variables designated by subscript 'v'. One such system is the US H1-B visa program, where employers' hiring decisions determine whether or not immigration takes place.[8] Probability p_{iv} under this policy is:

$$p_{iv} = \pi(a_i + h_{iv}) = \pi s_{iv}, \; \pi > 0. \quad (9)$$

In this case, c_{iv} is:

$$c_{iv} = y_{iv} - \frac{h_{iv}^2}{2} = \alpha_0 s_{iv} + \pi(\alpha_d - \alpha_0) s_{iv}^2 - \frac{h_{iv}^2}{2} \geq 0. \quad (1'')$$

Maximizing c_{iv} with respect to h_{iv}, the solution for h_{iv}, s_{iv}, p_{iv} and for $h_{iv} - h_{ip} = s_{iv} - s_{ip}$ is:

[8] This assumes a well-functioning policy visa program, which is not necessarily the case. See Section 8 for more on this issue.

$$h_{iv} = \frac{\alpha_0}{\phi} + 2\lambda a_i,\ \ s_{iv} = \frac{1}{\phi}(a_i + \alpha_0) = \frac{s_{i0}}{\phi},\ \ p_{iv} = \frac{\pi}{\phi}(a_i + \alpha_0) = \frac{\pi s_{i0}}{\phi},$$

$$h_{iv} - h_{ip} = s_{iv} - s_{ip} = \lambda(a_i - A^G) \gtreqless 0 \Leftrightarrow a_i \gtreqless A^G. \tag{10}$$

Thus, high- (low-) ability individuals attain a higher (lower) education level under the vetting system than under the points system, resulting in greater education and skill inequality under the former than under the latter system.

Since $\frac{1}{\phi} = 1 + 2\lambda$, we have $s_{iv} = (1 + 2\lambda)s_{io} > s_{io}$, and $s_{iv} - s_{io} = 2\lambda s_{io} > 0$, i.e., the vetting system results in an increase in residents' individual skill relative to the no-migration case. From (10), we have: $V(s_{iv}) = \frac{V(s_{io})}{\phi^2} = (1 + 2\lambda)^2 V(s_{io}) > V(s_{io}) = V(a_i)$. Since $V(s_{ip}) = (1 + \lambda)^2 V(s_{io})$, it follows that $V(s_{iv}) = \frac{(1+2\lambda)^2}{(1+\lambda)^2} V(s_{ip}) > V(s_{ip})$. The fact that $\lambda \in \left(0, \frac{1}{2}\right)$ implies that $\frac{V(s_{iv})}{V(s_{ip})} \in \left(1, \frac{16}{9}\right)$. Moreover, $V(h_{iv}) = 4\lambda^2 = 4V(h_{ip})$. Thus, inequality of residents' skills is greater under the vetting system than under the points system or the closed economy policy. Solutions for H_v^G and P_v are:

$$H_v^G = \frac{\alpha_0}{\phi} + 2\lambda A^G = H_p^G = H^G,\ \ P_v = \frac{\pi}{\phi}(\alpha_0 + A^G) = \frac{\pi S_0}{\phi} = P_p = P. \tag{11}$$

Solutions for resident, migrant and native average ability, education and skill, are:

$$A_v = A^G - \frac{\pi}{\phi(1-P)} V(a_i),\ \ A_v^M = A^G + \frac{\pi}{\phi P} V(a_i),\ A_{vN} = A^G;$$

$$H_v = H^G - \frac{2\pi\lambda}{\phi(1-P)} V(a_i),\ \ H_v^M = H^G + \frac{2\pi\lambda}{\phi P} V(a_i),\ H_{vN} = H^G;$$

$$S_v = A^G + H^G - \frac{\pi}{\phi^2(1-P)} V(a_i),\ \ S_v^M = A^G + H^G + \frac{\pi}{\phi^2 P} V(a_i),\ S_{vN} = S^G, \tag{12}$$

with $\frac{\pi}{\phi} + \frac{2\pi\lambda}{\phi} = \frac{\pi}{\phi^2}$ (since $1 + 2\lambda = 1/\phi$), and $S^G = A^G + H^G$.

The fact that $\lambda < \frac{1}{2}$ together with the results in (12) imply that the ability drain, $\frac{\pi}{\phi(1-P)}V(a_i)$, is larger than the brain drain, $\frac{2\pi\lambda}{\phi(1-P)}V(a_i)$, with the ratio of the former to the latter equal to $\frac{1}{2\lambda} > 1$. The results are summarized in Table 2.

Table 2: Vetting System – Residents' Ability, Brain and Skill Drain and Gain

	Ability (1)	Education (2)	Skill (1 + 2)	Ratio (1)/(2)
Drain (i)	$-\frac{\pi}{\phi(1-P)}V(a_i)$.	$-\frac{2\pi\lambda}{\phi(1-P)}V(a_i)$.	$-\frac{\pi}{\phi^2(1-P)}V(a_i)$.	$\frac{1}{2\lambda} > 1$.
Gain (ii)	--	$2\lambda(A^G + \alpha_0)$.	$2\lambda(A^G + \alpha_0)$.	--
Net Gain (i) + (ii)	$-\frac{\pi}{\phi(1-P)}V(a_i)$.	$2\lambda(A^G + \alpha_0) - \frac{2\pi\lambda}{\phi(1-P)}V(a_i) \gtreqless 0$.	$2\lambda(A^G + \alpha_0) - \frac{\pi}{\phi^2(1-P)}V(a_i) \gtreqless 0$.	--
Variance	$V(a_i)$	$4\lambda^2 V(a_i)$	$(1 + 4\lambda^2)V(a_i)$	$\frac{1}{4\lambda^2} > 1$

Though the points and vetting systems have the same qualitative impact relative to a closed economy policy, with residents (migrants') average education, ability and skill levels falling (rising) with inequality in the ability distribution, the vetting system's quantitative impact is greater than that of the points system. The reason is, first, that migration probability p_{iv}, but not p_{ip}, is a function of a_i, with the impact of a_i on s_{iv} equal to twice the impact on s_{ip} and, second, that average education depends on both individual education and the migration probability.

Ability drain (in absolute value) is $\frac{\pi\lambda}{1-P}V(a_i)$ under the points system, and $\frac{\pi}{\phi(1-P)}V(a_i) = \frac{\pi(1+2\lambda)}{(1-P)}V(a_i)$ under the vetting system. The brain drain under the vetting system is $\frac{2\pi\lambda}{\phi(1-P)} = \frac{\pi(2\lambda+4\lambda^2)}{1-P}V(a_i)$, which is greater than the brain drain $\frac{\pi\lambda^2}{1-P}$ under the points system. Since

$H_p^G = H_v^G = H^G$ and $S_p^G = S_v^G = S^G$, it follows that the difference between S_v and S_p is equal to the difference in the skill drain $\frac{\pi}{\phi^2(1-P)}V(a_i) = \frac{\pi(1+4\lambda+4\lambda^2)}{(1-P)}V(a_i)$ for S_v, and $\frac{\pi(\lambda+\lambda^2)}{(1-P)}V(a_i)$ for S_p, with the former larger than the latter.

The same relationships hold in the case of migrants, e.g., migrants' skill gain is greater under the vetting than under the points system (over five times).

We have:

$$H_v = H_p - \frac{\pi(2\lambda+3\lambda^2)}{1-P}V(a_i),\ H_v^M = H_p^M + \frac{\pi(2\lambda+3\lambda^2)}{P}V(a_i),\ H_{vN} = H_{pN}$$

$$A_v = A_p - \frac{\pi(1+\lambda)}{1-P}V(a_i),\ A_v^M = A_p^M + \frac{\pi(1+\lambda)}{P}V(a_i),\ A_{vN} = A_{pN},$$

$$S_v = S_p - \frac{\pi(1+3\lambda+3\lambda^2)}{1-P}V(a_i),\ S_v^M = S_p^M + \frac{\pi(1+3\lambda+3\lambda^2)}{P}V(a_i),\ S_{vN} = S_{pN} \quad (13)$$

From (13), and from $H_0 = \alpha_0$ and $S_0 = \alpha_0 + A^G$ (as shown in (2b)), it follows that whether the vetting system results in a net education and skill gain or drain is ambiguous, though a net skill drain is more likely under the vetting than under the points system. Since $P_p = P_v = P$ by construction, it follows that natives as a whole have the same average ability, education and skill levels under the points and vetting systems, though this does not hold for residents and migrants taken separately.

The host country benefits from greater inequality in ability under both the points and the vetting systems as it raises migrants' average skill level, with the benefit under the vetting system being over four times the benefit under the points system. Moreover, the two policies themselves raise inequality, and more so under the vetting system.

Compared to the vetting system, a non-selective policy where $p_{ip} = p_{iv} = P, \forall\, i$, results in higher average skill level for residents by $\frac{\pi}{\phi^2(1-P)}$, and a lower one for migrants by $\frac{\pi}{\phi^2 P}$.

5. Consumption

This section solves for individual and average consumption under the vetting and points systems. Optimal individual education levels were obtained by maximizing *expected* consumption c_{ij} $(j = p, v)$ in Sections 3 and 4, though realized consumption, denoted by c_{ijR} (c_{ijM}) for residents (migrants), is lower (higher) than its expected value. Residents' realized consumption under the points system, the vetting system and the closed economy, are given by $c_{ijR} = \alpha_0 s_{ij} - \frac{h_{ij}{}^2}{2}$ $(j = 0, p, v)$, with h_{i0} and s_{i0} (closed economy) given in (2b), h_{ip} and s_{ip} (points system) in (4), and h_{iv} and s_{iv} (vetting system) in (10).

As shown in (2b), home country residents' consumption under a closed host country is $c_{i0} = \alpha_0\left(a_i + \frac{\alpha_0}{2}\right)$. The difference between residents' actual (as opposed to expected) consumption and c_{i0} under the points and vetting systems is:

$$c_{ipR} = c_{i0} - 2\lambda^2\left[\left(\alpha_0 + \frac{A^G}{2}\right)^2 + \frac{a_i^2}{4}\right] - [\lambda(1-\alpha_0) + \lambda^2(2\alpha_0 + A^G)]a_i < c_{i0},$$

$$c_{ivR} = c_{i0} - 2\lambda^2(\alpha_0 + a_i)^2 < c_{i0}. \tag{14}$$

Thus, equation (14) shows that, even though home country residents' expected consumption is higher under the points and vetting systems than under a closed economy, their actual level of consumption is lower. The reason is that the return on residents' education is identical in the three cases – namely, α_0 per unit of education – but they overinvest in it under the two policies relative to the ex-post optimum because they do not know, at the time they make their education investment decisions, that the realized value of p_i will turn out to be zero in their case. Had they known, they would have acquired the optimal education level α_0, with consumption equal to c_{i0}.

From (10), we have $h_{iv} - h_{ip} = s_{iv} - s_{ip} = \lambda(a_i - A^G)$, i.e., education and skill inequality is higher under the vetting than under the points system. From (14), individual consumption is greater (smaller) under the vetting than under the points system for low (high) a_i values.[9] In other words, and contrary to the case with education and skill, consumption inequality is lower under the vetting system than under the points system.

Average consumption exhibits an additional loss due to the fact that p_{ip} increases with education under the points system (and education increases with ability), and p_{iv} increases with both education and ability under the vetting system. With average consumption under the closed economy $C_0 = \alpha_0\left(A^G + \frac{\alpha_0}{2}\right)$, home country residents' average consumption under the points and vetting systems is:

$$C_{pR} = C_0 - \lambda^2\left[2(\alpha_0 + A^G)^2 + \frac{V(a_i)}{2} - (2\alpha_0 + A^G)\frac{\pi\lambda}{1-P}V(a_i)\right],$$

$$C_{vR} = C_0 - 2\lambda^2[\alpha_0^2 + 2\alpha_0 A_v + V(a_i) + (A^G)^2]. \tag{15}$$

Thus, average consumption under either policy is lower than under a closed economy and falls with $V(a_i)$ or with inequality in ability. Residents and migrants of a given ability acquire the same level of education and thus have the same education cost. Hence, the difference between their individual consumption is exclusively due to the fact that migrants earn α_d while residents earn α_0 per skill unit under both policies. Thus, migrants earn $(\alpha_d - \alpha_0)s_{ij}$ more than residents, $j = p, v$, and their actual consumption is greater under the new than under the old points system and greater under the vetting system than under the new points system.

Finally, from (14), $c_{ivR} = \alpha_0\left(a_i + \frac{\alpha_0}{2}\right) - 2\lambda^2(\alpha_0 + a_i)^2 \geq 0$, and thus:

$$\lambda \leq \psi^{\frac{1}{2}} < \frac{1}{2}, \psi = \frac{\alpha_0\left(a_i + \frac{\alpha_0}{2}\right)}{2(a_i + \alpha_0)^2}. \tag{16}$$

[9] From (11), $\frac{\partial(c_{ivR} - c_{ipR})}{\partial a_i} < 0$ and $\frac{\partial^2(c_{ivR} - c_{ipR})}{\partial a_i^2} < 0$, i.e., the difference in vetting and points systems' consumption declines at an increasing rate as a_i increases.

The reason for the second inequality in (16) is that $\frac{\partial \psi^{1/2}}{\partial a_i} = -\frac{\alpha_0 a_i \psi^{-1/2}}{4(a_i+\alpha_0)^3} < 0$, so that $\psi^{1/2}$ is at a maximum at $a_i = 0$, in which case $\psi^{1/2} = \frac{1}{2}$. With $a_i \in (0, a_M]$, it follows that $\psi^{1/2} < \frac{1}{2}$, and thus $\lambda < \frac{1}{2}$.

6. New Vetting System

Various host countries, e.g., Australia, New Zealand and Canada, undertook a reform of their points system in order to attract immigrants with skills that better reflect labor market needs, i.e., they moved to a new points system, which entails a combination of the points and vetting systems. The reform raises migrants' average ability, education and skill. On the other hand, it reduces them for home country residents.

Under Canada's new points system (denoted by "c"), up to half the maximum number of points can be obtained with a job offer. Thus, the new policy's immigration probability can be modeled as a simple average of the probabilities under the points and vetting systems, i.e., $p_{ic} = \frac{1}{2}(p_{ip} + p_{iv}) = \pi\left(\frac{a_i + A^G}{2} + h_{ic}\right)$. The solutions for education and skill are: $h_{ic} = \frac{\alpha_0}{\phi} + \lambda(1.5a_i + 0.5A^G) = \frac{1}{2}(h_{ip} + h_{iv})$, and $s_{ic} = \frac{\alpha_0 + a_i}{\phi} - \frac{\lambda}{2}(a_i - A^G) = \frac{1}{2}(s_{ip} + s_{iv})$. Thus, education and skill levels under Canada's new points system are identical to the average of the levels under the points and vetting systems.

Consumption $c_{icR} = \frac{1}{2}(c_{ipR} + c_{ivR}) + \frac{\lambda^2}{8}(a_i - A^G)^2$, i.e., residents' consumption level under the new points system is larger than the average of the points and vetting systems' levels.[10] Moreover, migrants' average consumption is higher (lower) than that under the points (vetting) system.

[10] The reason is that the square of an average is smaller than the average of the squares, i.e., $x^2 < \frac{1}{2}[(x+\varepsilon)^2 + (x-\varepsilon)^2] = x^2 + \varepsilon^2$. Since $c_{ic} = \alpha_0 s_{ic} - \frac{h_i^2}{2}$, $s_{ic} = \frac{1}{2}(s_{ip} + s_{iv})$, and ${h_{ic}}^2 < \frac{1}{2}({h_{iv}}^2 + {h_{iv}}^2)$, it follows that $c_{icR} > \frac{1}{2}(c_{ipR} + c_{ivR})$.

7. Magnitude of the Ability Drain and Research Agenda

Clemens et al. (2009) compare for forty source countries, the average income of migrants from country *i* living in the US and who acquired their education back home, with that of residents in country i with identical levels of education (and levels of other observable characteristics). Thus, they correct migrants' income, $Y_{vd} = \alpha_d S_v^M = \alpha_d(A_v^M + H_v^M)$, for differences in all observables, including education, replacing it by $Y'_{vd} = \alpha_d S_v^{M\prime} = \alpha_d(A_v^M + H_v)$. They find that $Y'_{vd} = 3.2 Y_{v0}$ when averaged over the forty source countries.[11] Next, they correct for differences in unobservables, interpreted here as ability.[12] Migrants' average ability is $A_v^M = A^G + \frac{\pi}{\phi P} V(a_i)$ while that of residents is $A_v = A^G - \frac{\pi}{\phi(1-P)} V(a_i)$, with a difference $A_v^M - A_v = \frac{\pi}{\phi P(1-P)} V(a_i)$.[13]

Define $Y''_{vd} \equiv \alpha_d(A_v + H_v) = \alpha_d S_v = \alpha_d \left\{\left[A_v^M - \frac{\pi}{\phi P(1-P)} V(a_i)\right] + H_v\right\}$, which is the income obtained in the US by someone with the source country's average skill, i.e., with identical observables and unobservables. The authors obtain a ratio of $\frac{Y''_{vd}}{Y_{v0}} = \frac{\alpha_d S_v}{\alpha_0 S_v} = \frac{\alpha_d}{\alpha_0} = 2.6$, which they refer to as the "place premium." Hence, their result implies that $\frac{\pi \alpha_d}{\phi P(1-P)} V(a_i) = Y'_{vd} - Y''_{vd} = 0.6 Y_{v0}$. Thus, based on the results obtained in Clemens et al. (2009), the ability difference is equal to $0.6 Y_{v0} / Y''_{vd} = 0.6/2.6$, or 23 percent of the place premium.

7.1. Research Agenda

New data and econometric methods have become available since Clemens et al.'s (2009) study. The planned research will re-estimate the place premium and the contribution of unobservables to the difference in source country residents' and migrants' income.

[11] I use values obtained under the vetting system as skilled immigrants in the US typically enter the country under the H1-B visa system and are likely to be thoroughly vetted.
[12] Borjas (1989) interprets the random variable in his earnings equation as the component associated with unobserved ability among individuals with the same observable skills. He also suggests it might reflect luck though, since we deal with country averages, individual luck would be expected to average out.
[13] Note that $\frac{\pi}{\phi P} V(a_i) + \frac{\pi}{\phi(1-P)} V(a_i) = \frac{\pi}{\phi P(1-P)} V(a_i)$.

Another issue that will be examined is the contribution of the difference between migrants and residents' education, $H_v^M - H_v$, to the difference in their income, $Y_{vd} - Y'_{vd} = \alpha_d(H_v^M - H_v) = \frac{2\lambda\pi}{\phi P(1-P)}\alpha_d V(a_i)$. This will enable a comparison of the contribution to the income gap between migrants and residents associated with the difference in their average ability with the gap associated with the difference in their average education level.

Since, as was shown in Section 5, $\lambda < 1/2$, the difference in ability between migrants and residents, $\frac{\pi}{\phi P(1-P)}V(a_i)$, is larger than the difference in education, $\frac{2\lambda\pi}{\phi P(1-P)}V(a_i)$. Thus, one would expect a larger share of the income difference between migrants and residents to be explained by the difference in ability than by the difference in education. This will also be examined empirically.[14] [15]

8. Policy implications

Studies of the brain drain have found that a number of countries, particularly the larger ones, experience a net brain gain (e.g., Beine et al. 2008). As migrants are also positively selected for ability, and since there is no ability gain, migration results in an ability drain. Hence, countries might exhibit a net brain gain together with a net skill drain. The situation is obviously worse for countries experiencing a net brain drain – including a large share of small poor island countries – as their average skill level falls due to both ability drain and brain drain.

As shown in equation (13) in Section 4, the vetting system, such as the US H1-B visa program, generates a larger ability drain and a larger net brain drain than the points system, thereby raising the likelihood of a net skill drain. Several immigration countries, e.g.,

[14] One might argue that after accounting for all observables, the remaining income difference, which is associated with unobservables, may reflect not just differences in innate ability but also differences in efforts (to obtain an interview for a position in the host country, of preparing for the interview or preparing for some tests, etc.). However, greater preparation in the face of challenges and the drive to succeed – which may indicate greater ambition – also affects productivity and is something employers would take into account.

[15] For future use, I show here that $\alpha_0 < 1$. From equation (4), $h_{ip} = \frac{1}{\phi}[\alpha_0 + \pi(\alpha_d - \alpha_0)(a_i + A^G)] \leq 1$, so that $\alpha_0 \leq \frac{1-\pi(2+a_i+A^G)\alpha_d}{1-\pi(2+a_i+A^G)} \equiv \alpha_{a_i}$. Assume first that $\alpha_d > 1$. Then, $\alpha_{a_i} < 1$, and thus, $\alpha_0 < 1$. On the other hand, if $\alpha_d \leq 1$, and recalling that $\alpha_0 < \alpha_d$, we have $\alpha_0 < \alpha_d \leq 1$, and thus $\alpha_0 < 1$. QED.

Australia, New Zealand and Canada, have reformed their immigration policy from the old to a new points system that includes elements of the vetting system, thus raising the urgency of devising ways to minimize the skill drain.

Enforcement of the regulations is likely to be important. For instance, under the H1-B visa program, skilled immigrants can be hired for positions for which no Americans are available. However, as has been widely reported, a few large outsourcing firms have 'captured' a large share of the available visas, enabling some large corporations to replace US professionals with younger and cheaper immigrants.[16] This practice may raise the skill drain from developing source countries (without necessarily raising host countries' average level of human capital), and reducing it requires stricter enforcement of the rules of the H1-B visa program.

Second, host countries could provide H1-B visas or other skilled immigrant visas whose extension or conversion to permanent status would require applicants to make some contribution to their home country, such as imparting their acquired knowledge to home country individuals (whether by working there for some period of time, regular visits, teaching via the internet, or other), through some business relationship, or other.

Similarly, foreign students from developing countries often receive financial support from some public or private agency back home (e.g., government agency, private employer, university) or in the host country (e.g., university, foundation). Source and host countries should cooperate to ensure that foreign students who obtain their degree and apply for an immigrant visa spend some time in the source country (which is the case for foreign students who enter the US with a J visa) or help in some other way.

Finally, as was shown in Sections 5, consumption is lower for both residents and migrants than if they had known whether they would migrate or not – i.e., whether the realized value of p_i is zero or one – when they decided how much to invest in education. Under perfect

[16] A notable example is Southern California Edison, which replaced its IT employees with younger ones brought in through the H-1B program, with the original employees forced to train their replacements and sign nondisclosure agreements, and gag orders. Salaries fell from $110,000 to $70,000 a year on average (based on depositions in a Senate Judiciary Committee hearing spurred by complaints of the practice).

foresight, residents would have invested less in education and migrants would have invested more, and both would have been better off, i.e., their consumption would have been higher. One question that may be worth examining is whether some home or host country policy or measure(s) might help reduce this uncertainty and its associated cost, narrowing the range of migration probability values, including obtaining a better understanding of the policy's actual (as opposed to announced) intent, including information on some individual characteristic that might help narrow the range of probability values.

9. Conclusion

The migration literature has examined the impact of migration on education in source and host countries (including selectivity, brain drain, brain gain, and other education-related issues) but has not done so for ability. This paper is an attempt to start filling this gap.

The analysis shows that:

i) The points and vetting systems generate an ability drain (and no ability gain) for non-migrants, resulting in a smaller net change in skill than in education. Thus, countries that exhibit a net brain gain experience a net skill change that is negative or is positive but smaller than the net brain gain. On the other hand, the policies generate a net ability, education and skill gain.

ii) These policies' impact (in absolute value) on migrants' and non-migrants' ability, education and skill, increases with inequality (as measured by the variance in ability), and the policies themselves also raise the variance of ability, education and skill.

iii) The policies result in a decline (rise) in *actual* consumption for non-migrants (migrants) compared to that under a closed host economy (no immigration).

iv) These effects are larger under the vetting than under the points system, with the effects of the *new* points system being smaller (greater) than those under the vetting (points) system.

v) Whereas education and skill inequality is greater under the vetting than under the points system, the opposite holds for consumption, with greater inequality under the points than under the vetting system.

The paper's findings suggest that analysis and policy should focus on education as well as ability, recognizing that productivity depends on both, and that further research that accounts for both ability and education, particularly empirical research, is warranted.

References

Akgüç, Mehtap, Xingfei Liu, Massimiliano Tani and Klaus F. Zimmermann. 2015. "Risk Attitudes and Migration." *IZA Discussion Paper* No. 9347 (September)

Beine, Michel, Frédéric Docquier and Hillel Rapoport. 2001. "Brain drain and economic growth: theory and evidence." *Journal of Development Economics* 64: 275-89

____, ____ and ____ . 2008. "Brain drain and human capital formation in developing countries: winners and losers," *Economic Journal* 118: 631-652.

Borjas, George J. 1989. "Economic Theory and International Migration." *International Migration Review* 23 (3), Special Anniversary Issue. International Migration: An Assessment for the '90s: 457-85 (Autumn).

Clemens, Michael, Claudio Montenegro and Lant Pritchett. 2009. "The place premium: wage differences for identical workers across the US border." *HKS Faculty Research Working Paper Series* RWP09-004, John F. Kennedy School of Government, Harvard University

Commander, Simon, M. Kangasniemi and L. Alan Winters. 2004. "The Brain Drain: Curse or Boon? A Survey of the Literature," in R.E. Baldwin and L.A. Winters (eds.). *Challenges to Globalization: Analyzing the Economics*, Chicago and London: University of Chicago Press.

Docquier, Frédéric, and Abdeslam Marfouk. 2006. "International Migration by Education Attainment, 1990–2000." In Çaglar Özden and Maurice Schiff (eds.). *International Migration, Remittances & the Brain Drain*, pp. 151–200. New York: Palgrave Macmillan; and Washington, D.C.: World Bank.

Docquier, Frédéric, Elisabetta Lodigiani, Hillel Rapoport and Maurice Schiff. 2011. "Emigration and Democracy." *World Bank Policy Research Working Paper* No. 5557, Washington, DC

Docquier, Frédéric and Hillel Rapoport. 2012. "Globalization, Brain Drain and Development," *Journal of Economic Literature* 50 (3): 681-730.

Kleven, Henrik, Camille Landais and Emmanuel Saez. 2010. "Taxation and International Migration of Superstars: Evidence from the European Football Market." *NBER Working Paper* No. 16545 (November)

Mattoo, Aaditya, Çaglar Özden and Cristina Neagu. 2008. "Brain waste? Educated immigrants in the US labor market." *Journal of Development Economics* 87 (2): 255-69.

Mountford, 1997; "Can a brain drain be good for growth in the source economy?" *Journal of Development Economics*, 53(2), 287-303

Özden, Çaglar. 2006. "Educated Migrants: Is There Brain Waste?" In C. Özden and M. Schiff (eds.), op. cit., pp. 227-44

Partnership for a New American Economy, 2011, "The "New American" Fortune 500" (June)

Piracha, Matloob, Massimiliano Tani and Florin Vadean. 2012. "Immigrant over- and under-education: the role of home country labor market experience." *IZA Journal of Migration* 1: 3.

Schiff, Maurice. 2006. "Brain Gain: Claims About its Size and Impact on Welfare and Growth Are Greatly Exaggerated." In C. Özden and M. Schiff (eds.), op. cit., pp. 201-25

Vidal, J.-P. 1998. "The Effect of Emigration on Human Capital Formation." *Journal of Population Economics* 11 (4): 589-600.