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ABSTRACT

The selection of immigrants by skill and education is a central issue in the analysis of immigration. Since highly educated immigrants tend to be more successful in host country labour markets and less of a fiscal cost it is important to know what determines the skill-selectivity of immigration. In this paper we examine the proportions of highly educated among migrants from around 80 source countries who were observed as immigrants in each of 29 OECD countries in 2000/1. We develop a variant of the Roy model to estimate the determinants of educational selectivity by source and destination country. Two key findings emerge. One is that the effects of the skill premium, which is at the core of the Roy model, can be observed only after we take account of poverty constraints operating in source countries. The other is that cultural similarities and physical distance are often more important determinants of the proportion of high educated immigrants from a source country to an OECD destination than wage incentives or policy.

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Introduction

In this paper we examine, and attempt to explain, the selection of immigrants by education to OECD countries from a wide range of source countries. The immigration literature has been much concerned with the mechanisms involved in immigrant selection, including economic incentives, immigration policy filters and constraints operating in source countries. The debate has been fuelled by concerns about the performance of immigrants in developed country labour markets and the general finding that the higher are the skills of immigrants, the higher are their earnings and employment probabilities, the more positive is their net fiscal contribution and the more positive is public opinion towards them and towards immigration more generally. Not surprisingly a number of leading immigration countries have moved towards greater skill selection in their immigration policies.

These trends have been accompanied by renewed interest in the 'brain drain'. The gradual increase in migration from poor to rich countries, together with trends in skill-selective immigration policy, have given rise to concerns that some of the poorest countries are being disadvantaged as their best and brightest leave to seek employment in high-wage OECD countries. The recent debate has focused on whether the process of high skilled emigration improves education incentives in poor countries, thereby replacing some or all of the highly educated emigrants. It has also dwelt at length on whether the size and composition of diasporas influence development through generating remittances and creating trade as well as through return migration and technological transfer. By contrast, relatively few studies have focused on what explains the educational selectivity of out-migration across source countries and what combination of incentives and policy determines the skill content of immigration among the main destinations.

The basic framework used in models of skill selection is the Roy model (Roy, 1951), which was introduced to the literature on international migration in a series of influential papers by Borjas (1987, 1994, 1999). The essence of the Roy model is illustrated in Figure 1, which plots the destination and origin wage-by-skill schedules (assumed to be in present values) facing potential emigrants. In this illustration, the destination wage schedule, w(y), is increasing in the individual's skill or education level

with a slope that reflects the return to education. If the wage schedule in the origin country is w(x)1, the return to education is lower in the origin than at the destination. Only those with an education level exceeding s_1 will have an incentive to migrate and hence there will be positive selection. By contrast if the origin wage schedule is w(x)2 then only those with education below s_2 will emigrate and there will be negative selection.

The position of the home country reservation wage schedule w(x) depends on a number of other factors that can be considered as costs. One is the individual's preference for (or compensating differential in favour of) the home country, which may differ across individuals thereby introducing greater heterogeneity into selection by skill. A second component is the direct cost of migration, which also displaces w(x) upwards and may vary by skill level. A third is the cost associated with gaining admission through the policy filter, which could vary across individuals and by skill level. Finally, some individuals may be constrained from migrating by poverty, an issue to which we return below. Two points follow from this analysis. One is that even if the wage schedule in country y lies everywhere above the wage schedule in x (country x is much poorer) the other components may still ensure that the reservation wage schedule crosses the destination wage schedule. Thus selection can still be important even when income gaps are large. The second point is that these other components may influence the slope of the reservation wage schedule w(x) so that the relative slopes of the 'raw' (or unadjusted) wage schedules may not be a good guide to the skill-selectivity of migration from x to y.

In his studies using this framework Borjas (1987, 1992, 1994, 1999) finds that the adjusted wage differential for recent immigrants to the US depends negatively on source country inequality and positively on average source country income, which implies that immigrants from poor and unequal countries are negatively selected relative to immigrants from other source countries. Comparison between the US and Canada suggests that immigration policies might also matter as more skill-selective policies in the latter are associated with better immigrant labour market outcomes (Borjas 1993). But this appears to operate largely through the source country composition of immigration rather than through differences in the selectivity of migrants from a given source country (Borjas 1993; Antecol et al., 2003).

More recently, attention has focused on micro-level comparisons of movers and stayers, where the probability of migration is related to the estimated return to skills at home and abroad. Using this approach Ramos (1992) and Borjas (2008) find that migrants from Puerto Rico to the US have less education than non-migrants and that returnees are somewhat less educated than out-migrants. This is consistent with higher returns to education in Puerto Rico as compared with the US, where there are no immigration policy barriers between the two countries. However in a study of 32 source countries Feliciano (2005) finds that Puerto Rico is the only country for which migrants to the US are negatively selected on education relative to the source population. This suggests that the presence of immigration policy increases positive selection, although there is still a weak negative relationship between the degree of positive selection and source country inequality. Interestingly, Aydemir (2003) finds that, for migration from the US to Canada, the high-educated are less likely to apply but are more likely to be accepted through Canada's points system. Overall they are positively selected because the effect of skill-selective immigration policy outweighs the incentive effect that would otherwise favour low skilled migration.

Much of the recent attention has focused on the large flow across the southern US border from Mexico, a much poorer country with a higher return to skills. Estimating the wage distribution for migrants had they stayed in Mexico, Chiquiar and Hanson (2005) find that migrants are drawn disproportionately from the middle and upper middle of the income distribution and that they are over-represented among those with 10-15 years of education (see also Orrenius and Zovodny, 2006; Caponi, 2007). This could be accounted for by the low-educated facing higher migration costs, which in terms of Figure 1, could make the reservation wage function w(x) convex. Other studies have stressed the effects of migration networks in reducing costs and increasing the returns to migration. Thus McKenzie and Rapoport (2009) find that networks identified in the source country increase the proportion of low educated migrants, while Munshi (2003) identifies the positive effects of networks at the destination on the employment probabilities and the occupational status of Mexican immigrants. Moraga (2008) finds that a combination of network effects and wealth constraints explains the selection of migrants from rural Mexico.

These studies have provided much insight into migrant self-selection at the micro-level. They stress the fact that migration costs are important and that policy barriers could be important in raising the costs e.g. of illegal migration. But they offer little insight into the observed differences in the selectivity of migration across countries of immigration. Less still do they explain why the skill-or education-content of emigration differs so much among countries of origin.

By contrast the educational content of emigration has been the central focus of the literature on the 'brain drain'. Recent advances in data collection have improved the measurement of the brain drain. By looking at the foreign born by origin country and education in the censuses or population registers of OECD countries it has been possible to assemble a much clearer picture of the migrant stock by education for a range of source countries. These datasets have been used to test the competing hypotheses of brain drain and brain gain. Following Mountford (1997) they have sought to estimate whether an increase in the prospects of emigration could increase the incentive to acquire human capital by enough to raise education levels even among those who, in the event, stay at home (the brain gain). In a series of studies Beine et al. (2001, 2003) find a positive effect of skilled migration on the share educated (migrants plus non-migrants) across a set of source countries. They estimate significant educational offsets although some countries that are small, relatively poor and have high emigration rates still suffer substantial net losses of human capital (particularly countries in the Caribbean and in Sub-Saharan Africa—see Docquier (2006), p. 38). While these studies are important in assessing key consequences of the brain drain, they are concerned with its effects rather than its causes; indeed the theoretical model of migration is one where those who attain a threshold education level are randomly chosen for emigration.

Here we focus on the factors that drive the educational selectivity of migration across both sources and destinations—something that has been neglected until recently. However in a recent paper Docquier et al. (2006) estimate models of migration to OECD countries by skill level. Their focus is on the concentration among OECD destinations of (the stock of) migrants from different source countries. For both tertiary-educated and low-educated migrants they find that the concentration in a destination decreases with distance from the source and increases with former colonial links, with linguistic and

cultural proximity, and with the size and prosperity of the destination. Interestingly they find that high-educated migration is more responsive to distance and economic incentives while unskilled migrants tend to be more sensitive to colonial ties and linguistic barriers and more responsive to the generosity of welfare programs in destination countries.

Brücker and Defoort (2006) investigate the determinants of skill selectivity using data for immigration flows by education level to 6 OECD countries over the period 1975-2000. They use the Gini coefficient as a measure of inequality and include a series of measures of geographical and cultural distances between countries. They find a positive correlation between inequality in the sending country (measured by the gini coefficient) and the immigration selectivity, which is a priori inconsistent with the Roy model. Our data show a similar pattern, as we will show in the next section. They introduce an extended version of the Roy model where they allow for a negative correlation between skill levels and individual moving costs. This extended model predicts than immigration selectivity could increase with inequality and, therefore, reconcile the theory with the evidence. However, they do not directly test this assumption.

Grogger and Hanson (2008) examine the stock of immigrants by level of education by source country and OECD destination country for 2000/1. They estimate separate equations for the educational selectivity of migration and for the sorting of migrants between sources and destinations. They focus on absolute wage gaps between countries at the low and high end of the wage distribution. In the selection model they find that the relative wage effects are consistent with the predictions of the Roy model. In addition positive selectivity is positively associated with sharing a common language and with distance and negatively with contiguity and with colonial links. Immigration policy is proxied by the share of asylum seekers, which is negative for both the educational selection of migrants and sorting across destinations.

In what follows we use a dataset similar to that analysed by Docquier et al (2006) and Grogger and Hanson (2008) which counts migrants to the OECD by destination, by source and by education level. We use the framework of the Roy model and we focus particularly more on educational selectivity from the source country perspective and on the effects if immigration policies in OECD destinations.

Educational Selectivity by Source and Destination

Our measures of the educational selectivity of migration are based on a dataset constructed at the OECD by Dumont and Lemaître (2004). This covers the stock of foreign-born in all OECD countries in 2000/01 from all source countries by three levels of education and is discussed in more detail in the data appendix. Here we focus on the share of migrants aged 15 and over that has some tertiary education, which we label as the high educated.

Table 1 looks at these migrants from the destination country perspective. The first column shows each destination country's share of the foreign born aged 15 and over in the OECD. The United States is by far the largest host country with 41.7 percent of the total, while other traditional immigration countries, Australia, Canada and New Zealand account for a further 13.0 percent. The EU-15 accounts for 37.4 percent of the OECD total with Germany the largest individual host country followed by France and the UK. Other countries in Eastern Europe and elsewhere contribute modestly to the total. The second column shows, for each country, the percentage of the population aged 15 and over that is foreign-born. As is well-known, Australia, Canada and New Zealand have immigrant shares of over 20 percent--rates that are matched only by Switzerland and Luxembourg. Less well known is the fact that seven other members of the EU-15 have immigrant shares that are over 10 percent and only little less that the United States at 14.3 percent.

The third column of Table 1 reports the percentage of the foreign-born in each host country that is tertiary educated. Among the countries with skill-selective points systems, Canada, and Australia have ratios of 37-38 percent, which are especially high when compared with European countries many of which have ratios of less than 20 percent. Notable exceptions in Europe are the UK and Ireland, while Norway and Sweden also have ratios of over 20 percent. Outside of Europe there are high ratios for some countries with very low immigration such as Japan. Korea and Mexico which have relatively few source countries (in the case of Mexico 70 percent are US-born).

Clearly, the education content of a destination country's immigration depends in part on the shares of different source countries in total migration. Column (4) shows the result of applying source country immigration weights to the high-education share of the

residents aged 15 and over in the source countries, taken from Barro and Lee (2000). Although this does not count the emigrants as part of the source country population, it gives an indication of the extent to which each destination draws migrants from relatively high-education sources. As is well known, the proportions of high-educated are much lower in the source country populations than they are for migrants, and the variation of this weighted average across destinations is also somewhat less then among migrants. However the correlation coefficient between columns (4) and (5) is only 0.47, suggesting that more than half of the variation across destination is due to factors other than source country composition. These include destination-specific factors such wage incentives and immigration policy as well as bilateral selection effects associated with cultural links and distance.

Table 2 examines migrants to the OECD from the perspective of the source region. The first column shows the percentage of OECD immigrant stock that is accounted for by different source regions. A large proportion (46 percent) of these are intra-OECD migrants, while in terms of continents, 29.5 percent come from the Americas, 35.3 percent come from Europe (including the former Soviet Union) and 24.4 percent come from Asia (including the Middle East). The second column shows for each sending region the percentage of its emigrants that are high educated. As might be expected, the ratios are relatively high (30 percent or above) for North America, Australia/New Zealand and Northwestern Europe. But the education content is also high for emigrants from most of Asia, from the former Soviet Union and from Sub-Saharan Africa. To some degree this is reflected by the (migrant weighted) percentages of high educated residing in each region's source countries (column 3). Although the correlation coefficient between columns between columns (2) and (3) is 0.5, there are substantial deviations. For countries in Asia and Africa the high-educated share among emigrants is far higher than that of the source country populations—a result that remains true even when the emigrants are added back to the source populations. In some other cases such as Central America, Southern Europe and North America the gap between emigrants and source country populations is small or even negative. These comparisons immediately raise the question of how such large differences in educational selection across countries and regions can be accounted for.

Before moving to a more formal analysis of these data, it is worth looking to see if the relationships suggested by the Roy model can be observed in crude correlations on country-level data. Migration studies often use the gini coefficient of household income as a proxy for the return to skills. However this variable is far from ideal as it measures income from all sources and it reflects the proportions at each income level. Instead we have constructed a measure of the return to skill based on wage rates for different occupations from Freeman and Oostendorp's (2001) dataset (see data appendix). Figure 2 provides scatter plots of the relationship between the share of high-educated immigrants by destination (Table 1 column 3) and the destination country skill premium. The Roy model predicts that this relationship should be upward sloping. Figure 2 shows that there is very little relationship between the education content of immigration and destination skill premium. Thus the effects of incentives on selection by education are not easily observed across OECD destinations.[1] However, as we have noted above, such effects might be masked by differences in the source country composition of immigration and/or by differences in immigration policy.

The relationship between the skill content of migration and economic incentives should be more clearly observed by comparing those who have emigrated from source countries with those who stayed. Figure 3 plots the percentage point difference between the high-educated shares of movers and stayers (the country-level equivalents to the ratio of columns (2) and (3) in Table 2) against our measure of the wage premium. According to the Roy model, this relationship should be downward sloping: the greater the source country wage premium, the lower the proportion of high-educated emigrants relative to non-emigrants. The result is even more disconcerting for the Roy model. As Figure 3 shows, the relationship is strongly upward sloping. Thus either the Roy model is not a very good characterisation of migrant selection at the global level or else the effects of economic incentives are being obscured by other influences. In order to investigate this further we first outline a model of how such influences might operate.

[1] We did a similar comparison using the gini coefficient of household income as a measure of the return to skills. This also produced little evidence of a strong positive relationship. The correlation coefficient between our measure and the gini coefficient is 0.41 and is significant at the 1% level.

Theoretical Framework

Selection by skill has been a central focus of much of the literature that employs some variant of the Roy model. Here we use a modified version of this framework. We characterise the probability that an individual migrates as depending on three components. The first is the probability that the individual finds it in his or her interest to migrate on cost-benefit grounds. The second is immigration policy through which migrants are screened. And third there is selection at the origin, arising from the fact that some individuals may be too poor to afford the costs of migration.

The incentive for individual *i* to migrate, I_i, is the difference between the utility from the economic gains and the non-economic loss or compensating differential.

$$I_i = U_{yi} - U_{xi} - z_i \qquad (1)$$

where U_y and U_x are economic utility at the destination and the origin respectively and z is the compensating differential representing the individual's non-economic preferences, all assumed to be in present value terms. In order to capture heterogeneity in individual preferences we assume that z_i is a random variable with mean $\bar{z} > 0$ reflecting a positive average preference for the origin country. Assuming logarithmic utility we can express the incentive to migrate as

$$I_i = \ln w_{yi} - \ln(w_{xi} + c) - z_i, \text{ or } I_i = \ln w_{yi} - \ln w_{xi} - \ln(1 + \frac{c}{w_{xi}}) - z_i \qquad (2)$$

where w_y and w_x are earnings in the destination and origin respectively and c is the direct cost of migration.

Earnings in origin and destination depend on education and a random unobserved productivity component, while earnings at the destination also depend on a term representing the 'cultural' distance between the origin and the destination:

$$\ln w_{xi} = \alpha_0 + \alpha_1 s_i + \varepsilon_{xi}, \text{ and } \ln w_{yi} = \beta_0 + \beta_1 s_i - u(\beta_2 - \beta_3 s_i) + \varepsilon_{yi} \qquad (3)$$

where s_i is individual *i*'s education level, which we assume is bounded by $0 \leq s \leq 1$ (later we will assign the value 1 to the high educated and 0 to the low educated). We assume that the unobserved components of the wage ε_x and ε_y have mean zero and are uncorrelated with the individual's preference for migration. The term u is a measure of 'cultural distance' between the source and the destination that affects the transferability of educational skills. The greater the cultural distance the less transferable are these skills

and therefore the lower is the wage in the destination. High education may help bridge the culture gap so that if $\beta_3 > 0$ the wage penalty is lower for the more highly educated. On the other hand cultural difference may have smaller effects on productivity in low education jobs where there is little human capital to be transferred, in which case $\beta_3 < 0$.

We characterise the direct cost of migration simply as $d(1-\gamma s_i)$, where d is a measure of the direct costs, which decline with education level. Hence the individual's incentive to migrate is:

$$I_i = \beta_0 - \alpha_0 + (\beta_1 - \alpha_1)s_i - \beta_2 u + \beta_3 u s_i + \varepsilon_{yi} - \varepsilon_{xi} - d + d\gamma_1 s_i - z_i \quad (4)$$

Immigration policy acts as a screen and it may be skill selective. We interpret immigration policy as raising the costs of migration such that the policy cost for individual i is:

$$P_i = \delta_0 - \delta_1 s_i \quad (5)$$

If policy is not skill-selective then $\delta_1 = 0$. An across-the-board toughening in policy raises the policy cost of immigration by increasing δ_0, while an increase in skill-selectivity holding overall toughness constant can be achieved increasing both δ_0 and δ_1.

An important feature of our model is the poverty constraint; people living close to subsistence find it much more difficult to migrate. While it might seem possible to borrow, it will be difficult to provide collateral based on future earnings when the purpose of the loan is to leave the country. Thus, the greater are the migration costs, the higher is the general incidence of poverty in the origin country, and the more likely a given individual is to be poor, the less likely that he/she will be able to migrate. We express the poverty constraint effect as the product of these three factors:

$$R_i = C_i r(1 - s_i) \quad (6)$$

where r is the general poverty rate and C_i represents the total cost of migration including both the direct cost and the policy cost. These costs could be prohibitive for a low educated individual in a poor country facing sufficiently high migration costs. Substituting direct and policy costs as defined above, the poverty cost can be expressed as:

$$R_i = (d + \delta_0 - (d\gamma_1 + \delta_1)s_i) r(1 - s_i) \quad (7)$$

Provided that the sum of migration costs is positive, the poverty cost R_i is increasing in the poverty rate and decreasing in s up to $s = 1$. Putting together the incentive to migrate, the policy cost and the poverty cost, the probability that individual i will migrate is:

$$\Pr(m_i = 1) = \Pr(\beta_0 - \alpha_0 - d - \delta_0 - \beta_2 u + (\beta_1 - \alpha_1 + \beta_3 u + d\gamma + \delta_1)s_i \\ -(d + \delta_0 + (d\gamma + \delta_1)s_i)r(1 - s_i) > z_i + \varepsilon_{xi} - \varepsilon_{yi}) \quad (8)$$

We characterise the total migration rate as depending on these variables such that:

$$\frac{M_T}{N_T} = \beta_0 - \alpha_0 - d - \delta_0 - \beta_2 u + (\beta_1 - \alpha_1 + \beta_3 u + d\gamma + \delta_1)s \\ -(d + \delta_0 + (d\gamma + \delta_1)s)r(1 - s) - \bar{z} \quad (9)$$

where s is the mean of s_i . We assume two education levels, high educated, $s_i = 1$, and low educated, $s_i = 0$, and thus s is the share of high-educated in the population. The migration rate for high-educated individuals is:

$$\frac{M_H}{N_H} = \beta_0 - \alpha_0 - d - \delta_0 - \beta_2 u + \beta_1 - \alpha_1 + \beta_3 u + d\gamma + \delta_1 - \bar{z} \quad (10)$$

And the migration rate for low-educated individuals is

$$\frac{M_L}{N_L} = \beta_0 - \alpha_0 - d - \delta_0 - \beta_2 u - (d + \delta_0)r - \bar{z} \quad (11)$$

Thus the difference between the migration rates of the high- and the low-educated is:

$$\frac{M_H}{N_H} - \frac{M_L}{N_L} = \beta_1 - \alpha_1 + \beta_3 u + d\gamma_1 + \delta_1 + (d + \delta_0)r \quad (12)$$

As in the Roy model, an increase in the return to skills in the destination relative to the origin increases positive selection. In this specific case, an increase in $\beta_1 - \alpha_1$ increases migration among the high educated but not among the low educated. Cultural distance affects selection through β_3, which could be positive or negative. Positive selection is also related to direct migration costs through $d\gamma_1$ and through the policy selectivity term δ_1. Finally, the degree of poverty, r, reduces unskilled migration and therefore increases positive selection, both directly and through the interaction with migration costs.

Estimating framework and data

We use the theoretical approach above to motivate an empirical model of migrant selectivity from country *x* to country *y* by specifying the following estimating equation:

$$\ln\left(\frac{M_{Hyx}/M_{Tyx}}{N_{Hx}/N_{Tx}}\right) = a_0 + a_1(\ln\frac{w_{Hy}}{w_{Ly}} - \ln\frac{w_{Hx}}{w_{Lx}}) + a_2 Cult_{yx} + a_3 Dist_{yx} + a_4 Pov_x \qquad (13)$$
$$+ a_5(Dist_{yx} \times Pov_x) + a_6 Pol_y + \eta_{yx}$$

The dependent variable is the log of the share of high educated in the total migration from *x* to *y* divided by the share of high educated in the population of origin country *x*. This measures the educational selectivity of migration from *x* to *y*. The first of the explanatory variables is the difference in the wage premium for high over low educated workers between the destination and source countries. The basic test of the Roy model is that $a_1 > 0$. Because of the restriction imposed on the two wage ratios this variable varies by origin and by destination. The second term is cultural distance which is specific to each country pair and which could be positive or negative in sign. The distance between *x* and *y*, which varies across bilateral pairs, is a proxy for direct migration costs. Since these are less of a deterrent to the high educated we expect that $a_3 > 0$.

The fourth and fifth terms capture the poverty constraint that affects the low educated in poor countries. The effect of poverty is to increase high education selectivity, the more so the higher are the costs of migration. Hence we expect $a_4 > 0$ and $a_5 > 0$. The interacted term varies by source and destination but the poverty rate varies only by the origin country. Selective immigration policy, Pol_y, is destination specific and it may be skill selective. We first capture this with a dummy for each destination country, which will also absorb any other destination-specific effects. But further below we investigate some direct measures of skill selective immigration policy.[2]

The data that we use for the numerator of our dependent variable is the share of migrants aged over 15 from a source country to an OECD destination country that have some tertiary education. As noted earlier, this stock data for the year 2000 comes from

[2] The theory set out in the previous section considers only one destination but in our empirical model we estimate migration from a given source country to a number of different destinations. Third country effects could potentially matter but, if cross-destination effects are symmetric, the alternatives to any given destination are constant across sources and can be absorbed by the destination dummy.

Dumont and Lemaître (2004). The denominator is the share of the source country population aged 15 and over with some tertiary education in 2000, based on the Barro and Lee (2000) database. In order to obtain the population at risk, we add back the emigrants to the OECD to the source country numbers of high-educated and total emigrants to the Barro-Lee estimates for each source country.

As noted earlier we measure the skill premium using wage rates rather than relying on the gini coefficient of household income, which has often been used as a measure of the return to skills. Our measure of the skill premium is the ratio of the wage in a set of occupations that normally require some tertiary education to the wage in a set of unskilled occupations. These are calculated from Freeman and Oostendorp and cover the years 1983 to 2003. The percentage in poverty is the World Bank's estimate of the proportion of population living with incomes of less than $2 per day for the available year nearest to 2000. Because this is only available for a recent year and because of missing data we develop an alternative measure of poverty using the share of agriculture in GDP. Across the source countries in our data for which the World Bank poverty share is non-zero the correlation between poverty and the agricultural share in 2000 is 0.85. For our alternative poverty measure we apply the prediction from a regression of the $2 per day poverty rate on the agricultural share to the average agricultural share over the years 1950 to 2000. One advantage is that this reflects average poverty levels for the period over which almost all of the migration took place.

The costs of migration are reflected in the distance between the capitals of the source and destination countries. Variables that are intended capture the cultural distance between the source and the destination include dummies for having a common official or primary language and having a post-colonial relationship. We also include a measure of linguistic proximity, which is based on the number of nodes between one language and another on the linguistic tree. Further details of the definition and sources of the variables can be found in the data appendix.

Results for Educational Selection

Our estimates of different variants of the model appear in Table 3. Column (1) shows the results for a baseline specification that includes the wage premium differential

and the variables that reflect geographical and cultural distance between the source and destination countries, but excluding the destination country dummies. This produces a negative coefficient on the wage premium differential, which is the opposite of what the Roy model would predict, although it is not significant. When the destination dummies are included in column (2) we find that the coefficient becomes positive although it remains small and insignificant. One reason is that, across source countries, the wage premium is positively correlated with poverty. Thus the source country wage ratio would be capturing a mixture of the 'true' negative effect on selection through the wage premium and the positive selection effect operating through the poverty constraint.

The third column of the table adds controls for the World Bank's $2 per day poverty rate and the interaction between distance and poverty. Our model predicts that the effect of poverty should matter more the further away the source country is from the destination country and so both the main effect and the interaction should take positive coefficients. The results strongly support the hypothesis that poverty matters. We find that the estimates of a_4 and a_5 are both positive and significant, that is, poor countries are associated with more positive selection and the further away they are the stronger is this effect. Introducing these poverty variables has a dramatic effect on the coefficient of the wage premium differential, which now has the predicted sign and is strongly significant. That is, controlling for poverty, we find that source countries with a higher wage premium are associated with more negative selection. More precisely, the estimated elasticity of skill selection with respect to the wage premium differential is around 0.37. Column (4) uses instead our measure of poverty imputed from the agricultural share. This expands the number of available observations and it produces results that are similar to those in column (3) using the direct measure of poverty.

As noted earlier we have no clear prediction for the effects of cultural distance. On the one hand high education may make it easier to bridge the cultural gap, in which case cultural distance should lead to positive skill selection. On the other hand for the lower educated with fewer skills to transfer, cultural distance may be less of a barrier, in which case it may lead to negative selection. The results in columns (3) and (4) of Table 3 suggest that the transferability of human capital may be highly sensitive to the sharing of a common language; and that cultural proximity does not necessarily enhance the

transferability of human capital but reduces the costs of migration for low-skilled workers more than for high-skilled workers. The negative effect of colonial history may reflect the long-term effects of the initially low barriers to immigration from post-independence colonies that generated persistent streams of low-skilled migrants. Finally, distance has a positive coefficient, as we would expect, even in the presence of the interaction with poverty. Thus migration costs increase positive selection, but more so for poor source countries.

The results so far suggest a strong role for poverty in explaining the patterns of skill selection, and we explore this further by looking at poor and rich countries separately. We label source countries as "poor" if their poverty rate is higher than 10% and as "rich" if their poverty rate is smaller than 5%.[3] We then estimate the model separately for each of these two groups. For the poor countries, we estimate a model with and without the poverty variables, to identify precisely the role played by poverty in skill selection. The results are reported in Table 4. These results confirm our previous findings. The elasticity of skill selection with respect to the wage premium differential is twice as large in rich countries as in poor countries, when we do not control for poverty rates. Once we do (column (3)), we find a coefficient for the wage premium differential that is comparable to the one for rich countries and we find that poverty itself also increases positive selection. The results with the imputed poverty rates (column (4)) are very similar to those with the poverty variables, as we found earlier.

The Effects of Policy in Destination Countries

As noted above, selective immigration policies can be viewed as a screening mechanism that imposes differential costs on potential immigrants by skill and education. Unfortunately we have no comprehensive indicator of the degree of selection across destination countries. While policies with a bias towards employment rather than family reunification are widely believed to increase positive selection, there are no cross country measures of such policies. Also, the degree to which foreign qualifications and skills are recognised in the host country must also be considered as part of selective policy.

[3] We experimented with alternative classifications of countries and found very similar results.

We use three indicators of skill-selective policy. The first is based on data from the *World Competitiveness Yearbook,* which reports the responses of business executives to a question on how far immigration policies permit the hiring of foreign employees. We interpret greater flexibility as representing more-employment friendly policy. The second relates to the restrictiveness of the country's policy towards professional workers (Nguyen Hong, 2000). We convert some of the components relating to migrants not a measure of the ease with which professionals can be employed. The third indicator is the share of foreign citizens among students in the country's tertiary education sector in the late 1990s. This is intended to capture the conversion of foreign students into highly educated immigrants. Each of these measures was converted to an index with zero mean and unit standard deviation (across destination countries). The three indices are added to produce a combined index of skill-selective policy.

A further measure that is sometimes used is the share of asylum seekers in total immigration. If asylum seekers have lower education than the average immigrant, more permissive asylum policies should reduce educational selectivity. We construct an index of the share of migrants who were not refugees over the period 1990 to 1999 as an additional measure of skill selective policy. This also is adjusted to have a cross-country mean of zero and a standard deviation of one. Further details of the sources used in constructing these indices are provided in the data appendix. Unfortunately our measures of policy are incomplete for Mexico and the Eastern European countries and so we lose these destinations from our sample.

The regressions presented in Table 5 include policy indices in place of the destination country dummies, but are otherwise equivalent to column (4) of Table 3.
Note that the coefficients on the non-policy variables are little changed by the exclusion of the destination dummies. In the first column the combined policy index is positive as expected but significant only at the 10 percent level. In the second column the refugee share is added to the equation and this takes the opposite sign to what would be expected. When the three components of the selective policy index are included separately those representing employment flexibility and low restrictions on professionals are significantly positive while the foreign student index is positive but insignificant. Finally,

when the share of non-refugees is added in column (4), it remains negative and it weakens the coefficient on employment flexibility.

The results reported here are the first to investigate the influence of direct measures of skill-selective policy. While there is some evidence that such policy matters the effects are not particularly robust. Among the different components, the ease with which professionals can transfer their skills appear to be the most important—an effect that probably reflects more widely the transferability of specific skills. By contrast the effect of a smaller refugee share is perverse. Given that, in part, this reflects the number who choose to apply for asylum, a higher share of refugees may reflect employment prospects in the chosen country.

Conclusion

In this paper we have examined, and attempted to explain, the selection by education of immigrants from a wide variety of source countries into the countries of the OECD. Since the labour market quality of immigrants is of increasing concern to developed-country governments, it is important to know what are the key forces determining the educational selectivity of immigration. Although considerable research has been devoted to differences in selection and outcomes for immigrants to a given destination (usually the US) there have been few attempts to analyse this selection across source and destination countries. As a result it has not been possible to fully explore the predictions of standard migration theory.

Broadly speaking our results contain four main findings. The first relates to the Roy model, which predicts that the greater the return to skills in the destination as compared to the source country, the stronger will be the positive selection of immigrants by skill-level. This effect is not observed in the simplest model but it reappears once we allow for the fact that many potential immigrants in poor counties are constrained from migrating by poverty. This explains the paradox that migrants from poor countries, where the returns to education and skills are large, are strongly positively selected from among the source country populations.

Following from this, the second finding is that the costs and constraints are important in shaping the selectivity of migration. Distance, which reflects the costs of

migration, and poverty, which reflects liquidity constraints, are both associated with more highly educated migration streams. A further implication suggested by theory is that the poverty constraint should bite harder where migration costs are higher. Our results strongly support the hypothesis that the interaction between poverty and distance further increases skill selectivity from a given source country.

The third main finding is that cultural differences are important but that their effects on skill selection are ambiguous. On hand sharing a common official language with a destination country increases the educational selectivity of migration. This may be because professional skills and qualifications can more easily be translated into the host country environment. On the other hand linguistic proximity has a negative effect. This may be because low-skill migrants are more able to function effectively where the linguistic distance is not too great. It is important to note also that colonial ties remain important even after accounting for linguistic similarities. This may reflect 'second language effects' or it may be the persistent results of postcolonial policies that gave preferential access to unskilled migrants from former colonies.

Finally we have investigated the effects of skill selective immigration policies in destination countries. Although our measures of selective policy are imperfect they do attempt to capture elements of post-immigration policy that affect the transferability of skills. While these policies work in the expected direction, their effects are not particularly robust. And in addition the share of non-refugees, which has been used in some other studies, fails to give the expected sign once the other determinants of skill selection are taken into account. Thus, more definitive conclusions about the effects of policy on skill selection must await the development of more comprehensive indicators of policy.

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Table 1: Immigration to the OECD

Host Country	Code	(1) Percent of OECD Migrant Stock	(2) Percent Foreign-born	(3) Percent of Foreign-born Hi-Educated	(4) Weighted Source Country Hi-Educated
Australia	AUS	5.1	26.9	37.9	16.4
Austria	AUT	1.2	13.8	11.3	11.6
Belgium	BEL	1.3	12.0	17.4	12.7
Canada	CAN	7.0	22.4	38.0	13.5
Switzerland	CHE	2.0	24.7	18.6	13.7
Czech Republic	CZE	0.6	5.2	12.5	11.5
Germany	DEU	10.4	13.4	14.9	11.4
Denmark	DNK	0.4	7.5	19.4	13.2
Spain	ESP	2.4	5.9	21.8	12.8
Finland	FIN	0.1	2.7	18.9	15.9
France	FRA	7.4	11.7	18.1	9.2
United Kingdom	GBR	5.9	9.5	30.5	12.3
Greece	GRC	1.3	10.8	15.3	13.9
Hungary	HUN	0.4	3.2	19.8	10.1
Ireland	IRL	0.4	11.0	38.7	18.8
Italy	ITA	2.7	4.1	12.2	13.0
Japan	JPN	1.5	1.1	24.2	17.6
South Korea	KOR	0.2	0.4	32.2	11.7
Luxembourg	LUX	0.2	36.6	18.3	15.3
Mexico	MEX	0.3	0.4	37.1	29.3
Netherlands	NLD	1.6	9.6	17.6	9.9
Norway	NOR	0.4	8.1	22.3	14.2
New Zealand	NZL	0.8	22.5	27.3	15.4
Poland	POL	1.0	2.4	11.7	15.8
Portugal	PRT	0.8	6.7	19.3	7.8
Slovak Republic	SVK	0.2	2.7	14.7	11.6
Sweden	SWE	1.2	14.4	22.3	13.9
Turkey	TUR	1.5	2.4	14.3	15.9
United States	USA	41.7	14.3	25.9	12.6

Notes: Cols 1-4 based on data underlying Dumont and Lemaître (2004); Col 5 calculated from Barro and Lee (2000). The high education share of countries missing in the Barro and Lee data are imputed as the (population weighted) average of the other countries in the region.

Table 2: Migrants to the OECD by Region

World Region	(1) Percent of Migrants to OECD	(2) Percent High Educated Migrants	(3) Source Region Percent Hi-Educated
North America	2.7	43.1	51.5
Central America	14.8	6.9	10.2
Caribbean	7.0	19.8	7.8
South America	5.0	25.9	12.9
Scandinavia	1.1	31.9	21.4
UK and Ireland	5.7	36.0	19.9
Western Europe	8.5	29.5	17.1
Southern Europe	7.4	12.6	14.4
Eastern Europe	9.5	17.7	10.6
Former Soviet Union	3.1	32.5	16.3
East Asia	7.0	41.0	14.6
Southeast Asia	6.9	34.3	12.0
South Asia	4.9	41.8	3.4
Middle East	5.6	21.2	9.7
North Africa	5.1	18.1	4.7
Sub-Saharan Africa	4.2	32.7	2.4
Pacific Islands	0.5	18.7	4.6
Australia and New Zealand	1.0	41.4	37.7

Notes: Cols 1-2 based on data underlying Dumont and Lemaitre (2004); data classified only by regions that are broader than those in the table or are classified as Other are excluded. Col 3 calculated from Barro and Lee (2000); the high education share of countries missing in the Barro and Lee data are imputed as the (population weighted) average of the other countries in the region.

Table 3: Determinants of skill selection
Dependent variable: Log (share of high skilled migrants / share of high skilled)

	(1)	(2)	(3)	(4) (poverty imputed)
Log wage premium differential (destination – source)	-0.003 (0.055)	0.062 (0.054)	0.369 (0.052)**	0.334 (0.048)**
Common official or primary language	0.670 (0.089)**	0.802 (0.087)**	0.647 (0.076)**	0.665 (0.071)**
Linguistic proximity	-0.087 (0.016)**	-0.128 (0.016)**	-0.128 (0.014)**	-0.117 (0.013)**
Colonial relationship post 1945	0.284 (0.098)**	-0.030 (0.105)	-0.512 (0.095)**	-0.432 (0.086)**
Distance (most populated cities, 1,000 km)	0.102 (0.005)**	0.124 (0.006)**	0.053 (0.007)**	0.054 (0.006)**
Share of poverty			0.006 (0.002)*	0.008 (0.002)*
Distance × share in poverty			0.002 (0.000)**	0.002 (0.000)**
Constant	-0.173 (0.043)**	-0.824 (0.130)**	0.102 (0.130)	0.093 (0.119)
Observations	1438	1438	1438	1719
R-squared	0.30	0.39	0.55	0.54
Country of destination dummies	NO	YES	YES	YES

Note: Standard errors in parentheses. * significant at 5%; ** significant at 1%. In column (4) the poverty rate is imputed from the share of the labour force in agriculture. The dependent variable is weighted by the corresponding total number of migrants from the source country to the destination country.

Table 4: Determinants of skill selection – Poor versus rich countries
Dependent variable: Log (share of high skilled migrants / share of high skilled)

	(1) Rich countries (poverty rate < 5%)	(2) Poor countries (poverty rate >10%)	(3) Poor countries (poverty rate >10%)	(4) Poor countries (poverty rate >10%)
Log wage premium differential	0.373	0.226	0.389	0.386
(destination – source)	(0.104)**	(0.072)**	(0.058)**	(0.052)**
Common official or primary	0.589	1.326	0.831	0.953
language	(0.088)**	(0.184)**	(0.161)**	(0.137)**
Linguistic proximity	-0.186	-0.104	-0.175	-0.149
	(0.020)**	(0.034)**	(0.028)**	(0.024)**
Colonial relationship post 1945	-	-1.346	-0.953	-0.973
		(0.157)**	(0.129)**	(0.107)**
Distance (most populated cities,	0.029	0.176	0.094	0.105
1,000 km)	(0.007)**	(0.011)**	(0.018)**	(0.016)**
Share of poverty			0.034	0.036
			(0.004)**	(0.003)**
Distance × share in poverty			0.0002	-0.0003
			(0.0005)	(0.0004)
Constant	0.671	0.099	-0.478	-0.387
	(0.134)**	(0.232)	(0.220)*	(0.186)*
Observations	563	738	768	977
R-squared	0.46	0.61	0.75	0.73
Country of destination dummies	YES	YES	YES	YES

Note: Standard errors in parentheses. * significant at 5%; ** significant at 1%. In column (4) the poverty rate is imputed from the share of the labour force in agriculture. The dependent variable is weighted by the corresponding total number of migrants from the source country to the destination country.

Table 5: The effects of selective immigration policy on skill selection
Dependent variable: Log (share of high skilled migrants / share of high skilled)

	(1)	(2)	(3)	(4)
Log wage premium differential	0.190	0.248	0.211	0.252
(destination – source)	(0.052)**	(0.051)**	(0.051)**	(0.051)**
Common official or primary	0.621	0.619	0.614	0.611
language	(0.072)**	(0.075)**	(0.076)**	(0.075)**
Linguistic proximity	-0.082	-0.084	-0.083	-0.083
	(0.014)**	(0.014)**	(0.014)**	(0.014)**
Colonial relationship post 1945	-0.186	-0.285	-0.233	-0.291
	(0.086)*	(0.086)**	(0.084)*	(0.086)**
Distance (most populated cities,	0.055	0.065	0.056	0.064
1,000 km)	(0.005)**	(0.005)**	(0.005)**	(0.005)**
Share of poverty	0.006	0.009	0.006	0.009
	(0.002)**	(0.002)**	(0.002)**	(0.002)**
Distance × share in poverty	0.002	0.001	0.002	0.001
	(0.000)**	(0.000)**	(0.000)**	(0.000) **
Selective policy	0.037	0.015		
	(0.015)*	(0.015)		
Flexibility			0.118	0.044
			(0.038)**	(0.040)
Low restrictions on			0.158	0.100
professionals			(0.036)**	(0.036)**
Foreign student share			0.068	0.024
			(0.038)	(0.039)
Non-refugee share		-0.240		-0.211
		(0.033)**		(0.035)**
Constant	-0.137	-0.149	-0.149	-0.158
	(0.044)	(0.043)**	(0.046)	(0.047)
Observations	1520	1520	1520	1520
R-squared	0.46	0.48	0.47	0.48

Note: Standard errors in parentheses. * significant at 5%; ** significant at 1%. In these regressions the poverty rate is imputed from the share of the labour force in agriculture. The dependent variable is weighted by the corresponding total number of migrants from the source country to the destination country.

Data Appendix

Migrant skills. The data that we use for immigrants is that constructed at the OECD by Dumont and Lemaître (2004), as noted in the text. Our measure of migrant skills is the share of the foreign born aged 15 and above having some tertiary education. Education is classified into four levels: high, medium, low and unknown. We take the high educated as a share of the total, assuming that those for whom education is unknown would be either low or medium educated. Taking the high educated as a share of those for whom the education level is known makes very little difference to the results reported above. This share is available by source country for each OECD destination although in a few cases some of the source countries are aggregated together by region. In the regression analysis we use only the observations for individual source countries.

Source country skills. In order to calculate the share of high educated in each source country we take the number aged 15 and over with some post-secondary education in the year 2000 from Barro and Lee (2000), available at: http://www.cid.harvard.edu/ciddata/ciddata.html. For those source countries that are represented in the data on migrants but not in the Barro and Lee data, we have imputed the number of high educated by applying the average ratio of high educated in other countries in the same region, using the regions listed in Table 2. The countries omitted in Barro and Lee are generally very small and are not likely to affect our results. In order to obtain the population at risk we add back the emigrants by skill level so that the base population for each source country includes those who have emigrated. This assumes that emigration of the highly educated does not generate more education among those who did not emigrate. If there is an educational response, as some of the recent literature suggests, then our calculation will overestimate the counterfactual no-migration skill ratio in the base population. If on the other hand we assume complete offset then the appropriate ratio would be the same as in the unadjusted Barro and Lee data (although the absolute numbers would differ).

Skill premium. We use data from the Occupation Wages around the World database, constructed by Freeman and Oostendorp (2000), available at http://www.nber.org/oww/. The data include standardized wage information for 161 occupations in over 150 countries from 1983 to 2003 and is based on the ILO October Inquiry that asks governments to yearly report wages for a wide range of occupations. The ILO dataset is not directly usable because of the lack of comparability in reported wage formats across countries and over time. Freeman and Oostendorp corrected the data in such a way that wages could be made comparable across occupations, countries and over time.

Given that occupations may differ in their skill requirements across countries, we choose to construct a skill premium measure based on occupations that are either highly-skilled (and do require at least some tertiary education) and unskilled occupations, which according to the ILO description "require a minimum of training or no previous experience". We calculated a premium for each country and year, based on the average wages in all available occupations in each skill level. We use the country average over the period 1983-2003 as a measure of the skill premium. While this goes some way towards capturing the skill premium over the longer run, it must be noted that there are missing values for certain country/years. For Belgium, the Czech Republic, France, Japan, Switzerland and the Slovak Republic, where insufficient observations are available

we used the predicted value of the premium based on a regression of the premium on the gini coefficient in 20 OECD destination countries.
Poverty. The proportion of the source country population living on less than $2 per day comes from the World Bank's *World Development Indicators, 2006* at: http://devdata.worldbank.org/wdi2006/contents/Section2.htm. These measures are for a single year between 1995 and 2003. The imputed poverty measure corresponds to the predicted value of poverty from a linear regression of poverty on the average share of agriculture in GDP over 1950-2000. Share of Agriculture in GDP from World Bank, average share for the years 1950-2000.
Distance. Distance in kilometres between capital cities, taken from Centre d'Etudes Prospectives et d'Informations Internationales, at: http://www.cepii.fr/anglaisgraph/bdd/distances.htm.
Common language dummy. Dummy equal to 1 for pairs of countries sharing a common official language. Source: Centre d'Etudes Prospectives et d'Informations Internationales
Language proximity. Values from 1 to 5 calculated from the number of common nodes in the linguistic tree between the closest official languages of pairs of countries (based on the language classification tree of the Ethnologue).
Colonial links. Dummy equal to 1 for pairs sharing a colonial link after 1945. Source : Centre d'Etudes Prospectives et d'Informations Internationales.
Employment flexibility. Based on survey responses of business executives where 0 corresponds to the statement "immigration laws prevent the company from hiring foreign employees" and 10 corresponds to the statement "immigration laws do not prevent the company from hiring foreign employees." This is taken from the International Institute of for Management Development, *World Competitiveness Yearbook* (Lausanne: IMD) for the years 1992, 1994, and 1997-2000 and adjusted to zero mean and unit standard deviation.
Low restrictions on professionals. Data from worksheets underlying the study by Nguyen Hong (2000) of restrictions on trade in professional services, covering professionals in engineering, architecture, accountancy and law. The subset of indicators used here are those on policy rules in each sector related to nationality or citizenship requirements, permanent residence, quotas on foreign professionals, accreditation, licensing and business ownership. Numerical indices for each profession (higher numbers reflecting more permissive policy) were then averaged over the four professions to give a single value for each country.
Foreign student share. Taken from the OECD, *Education at a Glance* (Paris: OECD) for the years 1995, 1998 and 2000. The share of foreign citizens among those in tertiary education is averaged over these years and converted to mean zero and unit standard deviation.
Non-refugee share. The number admitted as refugees (the number accepted, not the number of applicants) in 1990-1999 is taken from various issues of the United Nations Commissioner for Refugees, *UNHCR Statistical Yearbook* (Geneva: UNHCR). The total number of immigrants admitted in 1990-1999 is taken from various issues of OECD, *International Migration Outlook* (Paris OECD). The average share of non-refugees in total migration was converted to mean zero and unit standard deviation.

Figure 1

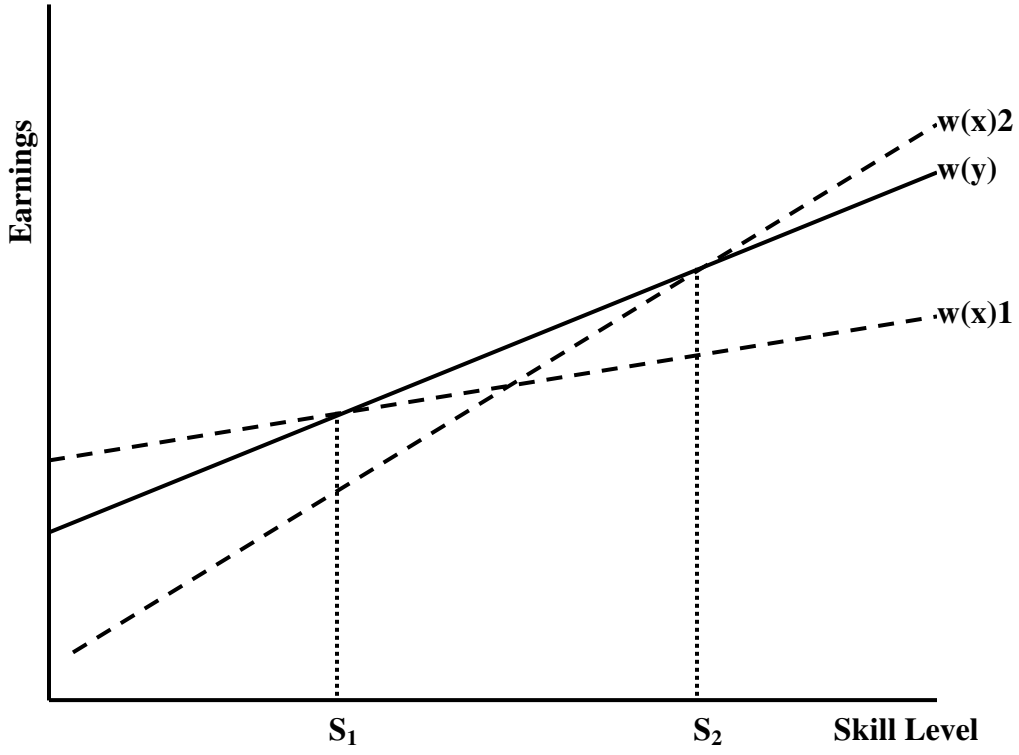
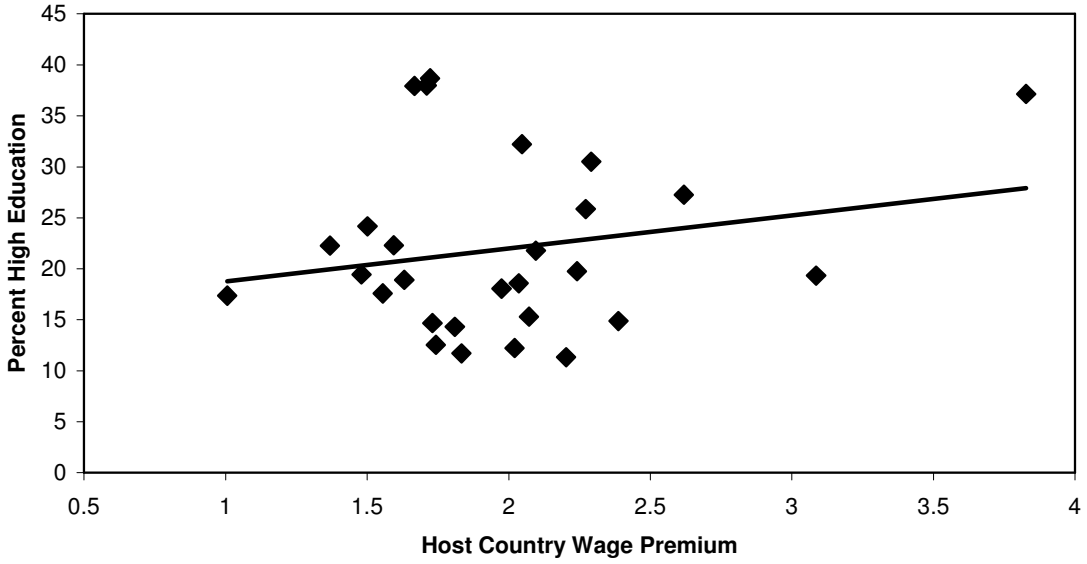
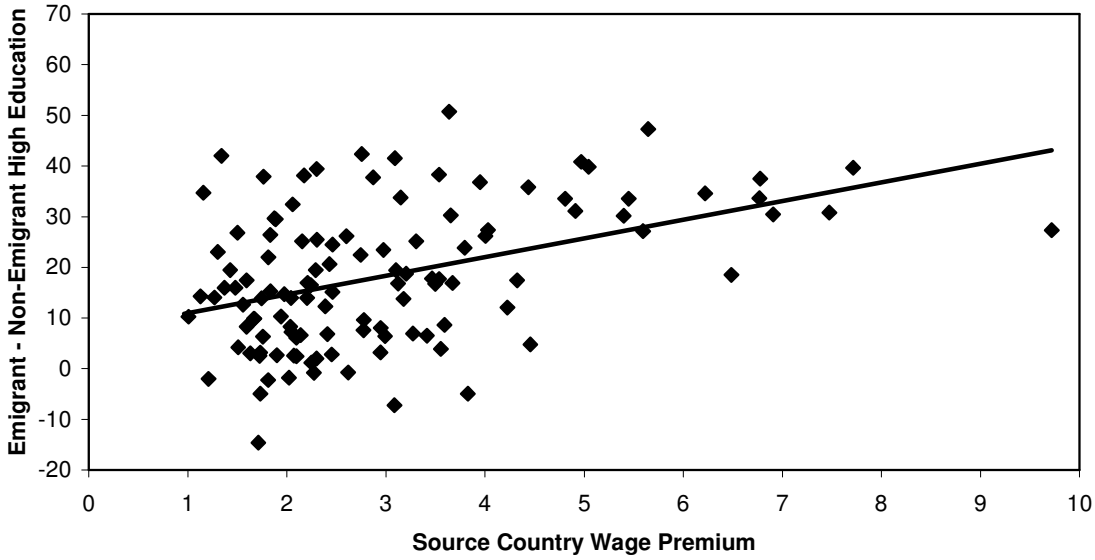


Fig 2: Percent of Immigrants High Educated and Wage Premium, OECD Countries 2001



Source: See text.

Figure 3: Difference between High Education Percent for Emigrants and Non-Emigrants and Wage Premium, Source Countries 2001



Source: See text