When is "Too Much" Inequality Not Enough? The Selection of Israeli Emigrants

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June 15, 2008

Abstract

This paper examines the effect of inequality on the incentives to emigrate according to a person's observable and unobservable skills. Borjas (1987) shows that higher skilled individuals are more likely to emigrate than lower skilled individuals when the returns to skill are higher in a potential foreign destination. Building on this framework, we develop a model which shows that this prediction holds for observable skills like education which are "general" in the sense of being easily transferable to another country. However, we show that the relationship between unobservable skills and the probability of emigrating is an inverse U-shape – since unobservable skills are a mixture of "general skills" and "country-specific skills" which are not easily transferable. We examine the predictions of our model with a unique data set containing information on who emigrates from Israel between 1995 and 2004, combined with a full set of demographic and labor market variables for both movers and stayers in 1995. By exploiting differences between Israel and the United States in the returns to observable (education) and unobservable skills across different sectors (industries and occupations), we find strong evidence that a lower return to unobservable skills in Israel versus the US entices higher ability Israelis to leave the country. Also, we find that emigrants are more positively selected in terms of their education in industries with a lower relative return to education in Israel versus the US. Overall, the results strongly support our model and the importance of differentiating between general and "country-specific" skills in the analysis of immigrant selection.

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1 Introduction

There are perhaps only two issues that Israeli politicians from across the political spectrum agree upon: (1) there is too much income inequality in Israel; and (2) Israel is suffering from a "Brain Drain." It is in fact true that Israel ranks high in international comparisons of income inequality. For example, Brandolini and Smeeding (2008) examine 24 developed countries and find that only the United States has a higher ratio of income between the 90th and 10th percentiles. In addition, recent evidence is emerging that Israel suffers from a high rate of emigration of highly skilled workers (Gould and Moav (2007) and Ben-David (2008)). However, this paper analyzes the possibility that it may be a contradiction to think that both of these perceived problems can be mitigated simultaneously. Specifically, we examine the general idea that the existence of a brain drain is a sign that inequality is too low, a prospect which is well-founded in economic theory.

Building on the classic model of occupational choice by Roy (1951), a seminal paper by Borjas (1987) develops a model of an individual's decision to emigrate which is based on the comparison of his wages in his "source" country versus a potential "host" country.[1] A higher wage gap in favor of the host country increases the probability of emigrating. However, the model also predicts that higher skilled workers are more likely than less-skilled workers to leave a country with a low return to skill and move to a country with a higher return to skill. The reverse is also true – a lower skilled individual is more likely than a higher skilled worker to leave a country with a high return to skill and move to a country with a lower return to skill. These predictions are quite intuitive – higher skilled individuals benefit from higher inequality since they are at the top of the distribution, while lower skilled individuals benefit from lower inequality since they are at the bottom of the distribution. Therefore, a more compressed wage distribution encourages higher skilled individuals to leave ("positive selection"), while a more dispersed wage distribution entices lower skilled individuals to leave ("negative selection"). Thus, a "positive selection" of emigrants is a sign that inequality is low, and attempts to lower it even further may exacerbate the phenomenon.

In this paper, we extend the model by arguing that some skills are "general" in the sense that they can easily be transported to a foreign country, and some skills are "country-specific" in nature, and therefore, are not easily transferred to another country. Education is an example of a "general skill" which is likely to be rewarded in any country,

[1] Sjaastad (1962) also models the decision to emigrate based on the wage gain net of migration costs.

while examples of "country-specific" skills include personal connections, local knowledge of the product and labor markets, language-specific communication skills, legal knowledge of the local environment, licenses which are country-specific, and certain instances of luck (being at the right place at the right time). In fact, almost all forms of firm-specific human capital will also be country-specific, unless the firm has an international presence.

After distinguishing between the two types of skills, our model shows that a higher return in a foreign country to an observable skill like education (which is a general skill) will produce "positive selection" in terms of the education levels of those that choose to emigrate. This prediction is similar to Borjas (1987, 1991, 1999). However, the relationship between unobservable skills (unobservable to the econometrician) and the probability of emigration is not as straightforward – since unobservable skills are a mixture of general and country-specific skills. As a result, the relationship between emigrating and unobservable skill is shown to be an inverse u-shape. The intuition is fairly straightforward – a higher return to unobservable general skills in a foreign country implies that the benefits of emigration increase with the a person's level of unobservable general skill, but a higher level of unobserved country-specific skill raises the costs of emigration, since these skills will be rendered obsolete. Therefore, a larger ratio of unobserved general skill to country-specific skill raises the probability that a person emigrates. Furthermore, a larger proportion of individuals have a high ratio of general to country-specific skills in the middle of the distribution than in the tails. This is due to the fact that those at the bottom of the unobservable skill distribution have very little of both types of skills, while those at the top have high levels of both. In contrast, individuals located in the middle of the distribution may have a high level of general or country-specific skills, but are unlikely to have high levels of both (or else they would be at the top of the distribution). As a result, individuals are more likely to have a high level of unobservable general skills versus country-specific skills if they are in the middle of the distribution rather than the tails. Therefore, the model predicts that emigration rates increase with unobservable skill and then decrease.

The theoretical and empirical analysis of emigrant selection in terms of both observable and unobservable skills is the main contribution of the paper. Empirically analyzing observable and unobservable skills is made possible by exploiting a unique data set which includes demographic and labor force characteristics of a random sample of Israelis in 1995, combined with an indicator for whether the respondent decided to emigrate as of 2004. This data set is a rare opportunity to examine the selection of emigrants using information on

the emigrants before they move.[2] This type of information is critical, since estimating the selection of emigrants necessarily entails a comparison of the characteristics of emigrants to those that chose not to move. Without data on emigrants in their home country, the current literature has concentrated mostly on examining selection in terms of education, while assuming that education levels of emigrants in the target country can be compared to those in the source country. This may be problematic if emigrants acquire education in the target country, but a larger problem is that without seeing emigrants before they leave, it is impossible to know whether emigrants are positively or negatively selected in terms of their wages. It is well-known that education explains very little variation in actual wages, and therefore, having data on the wages of everyone before they choose to move enables us to analyze the selection of emigrants in terms of both observable skills like education, and unobservable skills which explain most of the variation in earnings. Thus, our data set offers a unique opportunity to conduct a more comprehensive analysis of selection than is possible in the existing literature.

A simple analysis of our data, combined with a comparison of the wage distribution of Israel versus the United States, supports the main predictions of our model. Specifically, we show that the probability of emigrating increases with education. This is consistent with the predictions of the model, since education is a general skill and the return to education in Israel is much lower than the United States (0.071 versus 0.100). Therefore, higher educated Israelis are more likely to move in order to benefit from the higher return to this type of general skill. Furthermore, the data shows that the probability of emigrating increases and then decreases with wages or residual wages (controlling for education, experience, etc.) This inverse u-shape is consistent with the model's predictions regarding the emigration rate of individuals according to their unobserved skills – which are composed of both general and country-specific components.

Of course, these broad patterns could be the product of other factors at work, rather than the forces emphasized in the model. Therefore, in order to test the relevance of the model, we exploit variation across different sectors (industries and occupations) in the differences between Israel and the United States in the returns to observable (education) and unobservable skills. We find strong evidence that a lower return to unobservable skills in Israel versus the US entices higher ability Israelis to leave the country. Also, we find

[2] Chiquiar and Hanson (2005) write on page 240: "Largely missing in the discussion of U.S. immigration is evidence from source countries. Surprisingly, there is little work on how the skills of immigrants compare to the skills of nonmigrating individuals in countries of origin. Such data are essential to evaluate the nature of migrant selection."

that emigrants are more positively selected in terms of their education in industries with a lower relative return to education in Israel versus the US. In other words, a higher return to skills abroad shifts the curve in a way that increases the positive selection of emigrants in terms of observable or unobservable skills, while leaving intact the general shape of the relationship. These patterns are consistent with the model's predictions.

The coefficients estimates are not only statistically significant, but also large in magnitude. For example, the estimates imply that the positive relationship between emigration and education would be completely flattened if the returns to education in each industry were equal in Israel and the United States. Although the inverse u-shape relationship between unobserved skill and emigration cannot be eliminated with changes in the returns to unobserved skill, rather small changes in the return to unobserved skill are shown to produce significant shifts in the curve towards higher or lower levels of positive selection. Overall, the results strongly support the predictions of the model and the importance of differentiating between general and "country-specific" skills in the analysis of immigrant selection.

Although no other paper has examined the selection of emigrants in terms of observable and unobservable skills to the extent that we do, there are several papers examining the main prediction by Roy (1951) and Borjas (1987) that a higher return to skill in the source country should produce negative selection, while a higher return to skill in the host country should produce positive selection. Most of this literature examines the selection of Mexican immigrants, which according to the basic model, should be negatively selected on education since the return to education is higher in Mexico than the United States. Chiquiar and Hanson (2005) find evidence against the "negative selection" hypothesis for Mexican immigrants to the United States. Orrenius and Zavodny (2005) find similar results for illegal immigrants from Mexico. However, Chiquiar and Hanson (2005) show that the model can be augmented with fixed moving costs plus migration costs which decline with education in order to accurately predict that Mexican immigrants come from the middle of the education distribution. They argue that migration costs decline with education due to the effect of education on the ability to overcome bureaucratic requirements, the lower time costs required to earn enough money to pay the fixed-costs of moving, and fewer credit constraints on educated individuals. Chiswick (1999) and McKenzie and Rapoport (2007) also argue that migration costs decline with education, with the latter showing that the selection of Mexican immigrants becomes more negative from areas in Mexico which

have lower overall migration costs (i.e. stronger migration networks).[3]

After Chiquiar and Hanson (2005) add the notion that migration costs decline with education into the model, Mexican workers at the bottom of the distribution are less likely to move due to their higher costs of moving, while those at the top of the distribution are less likely to move due to the higher returns to education in Mexico. In contrast, our results regarding selection on education are consistent with the basic model without adding the assumption that migration costs decline with education, and this additional assumption cannot help to explain the inverse u-shaped pattern we see regarding selection on unobservables. The reason for this is that the return to unobservable skill is higher in the US versus Israel, whereas it was higher in Mexico versus the US for Chiquiar and Hanson (2005). Therefore, their augmented model cannot explain the u-shaped pattern we observe in the data, thus underscoring the theoretical contribution of distinguishing between "general" and "country-specific" skills in our model.

The literature on the selection of emigrants from countries other than Mexico includes Borjas (1987), who uses data on U.S. immigrants from 41 countries in the 1970 and 1980 U.S. Censuses and finds weak evidence that the source country's income inequality is negatively related to immigrant wages. Cobb-Clark (1993) finds similar results for female immigrants. Feliciano (2005) examines 32 immigrant groups in the United States, and finds that all but one group (immigrants from Puerto Rico) are positively selected in terms of education. However, Feliciano (2005) finds an insignificant relationship between inequality and the degree of positive selection from the source country. Grogger and Hanson (2008) examine the sorting of immigrants to 15 OECD countries from 102 source countries and find that immigrants in host countries are positively selected in relation to the source country when the education gap in wages between the host and source countries increases. However, when the education wage gap is measured in logs, they find evidence in favor of negative selection when the return to education is higher in the source country. Belot and Hatton (2008) examine immigrants in 29 OECD countries from 80 source countries and find little evidence in favor of the main prediction in Borjas (1987). Only after considering the poverty constraints in poor countries do they find evidence in support of Borjas (1987).

Overall, the evidence across countries displays a general pattern where highly educated individuals leave less developed countries with high returns to education and move to developed countries with lower returns to education. This pattern is not consistent

[3]Ibarraran and Lubotsky (2005) argue that Mexican immigrants are negatively selected, and consistent with the Roy (1951) and Borjas (1987), the degree of negative selection increases from Mexican counties with a higher return to skill.

with the predictions of the basic model in Borjas (1987). There may be many confounding factors in this type of empirical analysis, since there is large variation across countries in many factors which may influence the size and direction of the selection – such as language barriers, proximity, moving costs, immigration policy, visa requirements, etc. This may be one reason why the evidence in favor of the Borjas (1987) model is stronger in studies looking at internal migration (Borjas, Bronars, and Trejo (1992) and Abramitzky (2007)). Our study is not affected by cross-country differences in factors which influence the level and selection of emigrants, since we analyze selection based on sectors within one country. Moreover, the main contribution of our study is that we examine emigrant selection based on education and unobservable skill (residual wages), and not just on education which is the dimension analyzed in all the studies mentioned above. As such, this paper is the first to examine the selection of emigrants with data on movers before they move, while exploiting variation in the returns to observable and unobservable skills between the source and host countries.

2 The Data

The analysis uses a unique data set composed of the 1995 Israeli Census merged with an indicator for whether each respondent left the country or not as of 2002 and as of 2004. (We also received an indicator for whether the person died by 2002 or 2004.) If the person is considered a "mover" (a person who has left Israel), then the data contains variables indicating the month and year when this person is considered to have left the country permanently.

Defining who is an emigrant is not straightforward. Many individuals travel abroad intending to stay for only a short period of time, but gradually their stay becomes permanent. Others may intend to leave forever but change their mind. As a result, any definition of a "mover" is somewhat arbitrary. In our analysis, we use the official definition used by the Israel Central Bureau of Statistics, which considers any individual as a "mover" if he/she left the country for at least a full year.[4] By design, the variable for being a "mover" is intended to capture a long-term absence from the country. According to the algorithm used by the Central Bureau of Statistics, a short visit back to Israel in the midst of a long-term absence does not change the status from "mover" to being a "non-mover."

[4]The Israel Central Bureau of Statistics received information from the Interior Ministry about who is leaving the country, which the Interior Ministry collects at the airports and borders according to the personal identification number.

There are a few potential weaknesses of the data worth noting. First, the data set does not indicate why a person leaves and whether the person intends to come back or not. The person may not know this information himself. Therefore, although we mainly use the given measure of a "mover" throughout our analysis, we check the robustness of our results by classifying only longer-term movers as "movers" (using the information about when the person moved). In addition, as we discuss below, there is strong evidence to believe that the measure we received is picking up moves which are indeed long term. A second weakness in the data is that it does not contain information on where the person is living if he/she resides outside of the state of Israel. However, since most Israeli emigrants live in the United States, we will treat the United States as the "host" country of interest. To the extent that the United States is not the actual destination for a particular emigrant, this should only add noise to the analysis.

Descriptive statistics for the main variables of interest from the 1995 Israeli Census are presented in Table 1. It is important to keep in mind throughout the analysis that all variables are measured in 1995, except for the information about whether the person is considered a "mover" or not. Since the focus of the paper is to determine the selection of emigrants from workers within sectors, we restrict the analysis to males with a strong attachment to the labor force, who are old enough to potentially emigrate but young enough so that they are not leaving after retirement. Specifically, we restrict the sample to male respondents between the ages of 30 and 45 who were not self-employed (so the data on earned income is reliable), worked at least 30 hours a week, and worked at least six months in the previous year.

Table 1 shows that the overall rate of emigration as of 2004 in this sample stands at 1.6 percent. The rate as of 2002 was 1.3 percent, so there appears to be an increase over time. Over 67 percent of those characterized as "movers" in 2004 emigrated by the end of 2000. In addition, only two percent of those characterized as a "mover" in 2002 returned to Israel by the end of 2004. So, our measure of a "mover" appears to be picking up longer term stays abroad. Table 1 also contains means for the other variables used throughout the analysis: education (13.0 years of education), age (37.7), native (61.4 percent were born in Israel), marital status (90 percent married), number of children (2.13), and monthly wages.

Although the overall rate of emigration appears to be rather low at 1.6 percent, there are stark differences across levels of education and wages. Figure 1 presents the rates of emigration across different levels of education. The rate for those with a high

school education or less is about 1.1 percent, but the rate increases significantly for college graduates to 1.6 percent, and then jumps dramatically for those with an MA degree or higher to 4.6 percent. The high emigration rate for the most educated Israelis has raised concerns about a significant "brain drain." Figures 2 and 3 show similar patterns for natives and non-natives, but the magnitudes are much higher for non-natives.[5]

The positive relationship between education and the rate of emigration is very consistent with the predictions of the Borjas model. Specifically, the Borjas model predicts that the propensity to emigrate should increase with education in a country with a low return to education in comparison to a potential host country. Indeed, conventional OLS estimates of the returns to education in Israel are quite low. Table 2 presents Mincer-like wage regressions using data from the US and Israel from the same period and using similar sample selection criteria. The estimated return to education is 10.0 percent for the US and only 7.1 percent for Israel. This differential is likely to be a factor which is generating the positive relationship between education and emigration in Figures 1-3. It is worth noting that this relationship is positive and significant after controlling for a host of other demographic characteristics of the individual, as shown in a regression in the third column of Table 2.

However, one potential explanation for the pattern exhibited in the figures could be that individuals with higher education levels are more likely to spend time temporarily abroad (sabbaticals, being stationed abroad by a firm or the government, etc.). However, we find no evidence to support this idea. Figure 4 shows that there is no discernible relationship between education and the propensity to return between 2002 and 2004, given that you were considered a "mover" in 2002. The last column of Table 2 confirms that there is no systematic pattern between "returning" and education levels even after controlling for other demographic characteristics and wages. Therefore, we believe that the patterns in the data are unlikely to be picking up the tendency for highly educated individuals to work for a year or two abroad.

However, the increasing likelihood of higher educated individuals to emigrate could possibly be explained by other factors, and therefore, variation in the relative returns to education is needed to truly test the predictions of the Borjas model. To do this, we estimate the returns to education within sectors in the United States using the same specification used in the first column of Table 2, and within sectors in Israel using the

[5] Gould and Moav (2007) show that the rate of emigration is very high for professors, scientists, doctors, and engineers. All of these groups are at least three times higher than teachers or workers in all the rest of the occupations.

specification in second column of Table 2. Table 3 presents the estimated returns to education in the US and Israel when the sectors are defined by industry, and Table 4 presents the estimates when the sector is defined by occupation. In our main empirical analysis, we will exploit variation in the relative returns to education (Israel versus the US) across sectors to test the predictions of Borjas model regarding the selection of Israeli emigrants from each sector.

Although most of the literature examining the Borjas model looks at whether there is a positive or negative selection of emigrants according to their education (observable skills), the model in Borjas (1987) also applies to unobservable skills. We measure the returns to unobservable skill with residual inequality. The first two columns in Table 2 show that the residual variation is higher in the US versus Israel, after controlling for a similar set of demographic characteristics. Specifically, the "Root MSE" from the Mincer-like wage regression is 0.523 for the US and 0.498 for Israel. According to the Borjas model, the higher return to unobservable skill in the US should entice individuals with higher residual wages to emigrate. However, a simple descriptive analysis is not exactly consistent with this prediction. The third column in Table 2 shows that wages are not a significant predictor of who moves, and Figure 5 shows that the propensity to emigrate increases with residual wages and then declines. That is, it is not the case that no pattern exists at all between residual wages and the propensity to leave Israel. Rather, the pattern is non-linear – characterized by an inverse U-shape. Apparently, individuals with very low residual wages and very high residual wages are less likely to emigrate than those in the middle of the distribution, which is not consistent with a simple Borjas model. As shown in Figures 6 and 7, this pattern persists even if after controlling for twelve industry categories or eight occupation groups.[6]

Chiquiar and Hanson (2005) also found that, in contrast to the predictions of the Borjas model, emigrants from Mexico come from the middle part of the education distribution rather than being concentrated in the lower tail (since the returns to education in Mexico are higher than they are in the US). The reconciled their findings by adapting the Borjas model by including a cost of emigration which declines with education. Therefore, they explain the lower rate of emigration by low educated workers in Mexico by their high costs of moving, and the lower rate of emigration of highly educated workers by the higher return to education in Mexico. Our case is obviously different, since our evidence regarding the nature of the selection on education (observable skills) is entirely consistent with the

[6] Gould and Moav (2007) show that this pattern even exists within a sample of medical doctors.

Borjas model without any adaptations. In addition, the adapted model by Chiquiar and Hanson (2005) cannot explain the inverse U-shape in our data regarding unobservable skills – since their case involved a scenario where the return to skill was higher in the country of origin (Mexico), and our case involves a lower return in Israel versus the US. A higher cost of moving for workers with low income could explain why workers with very low residual wages do not emigrate in large numbers, but a higher return to unobservable skill in the US should entice the upper tail of the residual wage distribution in Israel to emigrate at a high rate. The fact that it declines for workers in the upper tail may be due to the idea that some factors of their success are unlikely to be transported to the US.

In the next section, we formally show that incorporating the idea that some skills are "country-specific" into the model can generate the inverse U-shaped relationship between residual wages and the likelihood of emigrating. In this sense, the U-shaped pattern is consistent with our model, but it may also be the result of unobserved factors. Again, variation in the returns to unobservable skill is needed to test the implications of our model, and for this purpose, we estimate the returns to unobserved skill in each sector using the same set of regressions within each sector described above regarding the estimation of the rates of return to education in each sector. The "root mean squared error" from each regression is the estimated return to unobserved skill in each sector in the US and Israel, and Tables 3 and 4 present these estimates for the different industries and occupations. In our main empirical analysis, we will exploit variation in the relative returns to unobservable skills (Israel versus the US) across sectors to test the predictions of our model regarding the nature of the selection of emigrants with regard to unobservable skills.

3 A Model of Emigration with Country-Specific Skills

In this section, we present a model of the emigration decision which takes into consideration the idea that some skills are country-specific. A significant portion of an individual's total human capital is likely to be country-specific for several reasons. First, any skill which is "firm-specific" is likely to be country-specific as well. Second, language and cultural barriers may prevent an individual from transferring their skills to a country where they lack a commanding knowledge of the local language, cultural of business practices, consumer tastes, laws, and regulations. Third, if a person's success is at least partially due to luck (being in the right place at the right time), good luck may not be transferable abroad. Fourth, many individuals with high incomes became successful due to personal

connections with local individuals and authorities, and these connections will not be useful in a foreign country. For these and other reasons, it is very likely that some people will not be able to translate their success to a foreign country.

The model consists of individuals living in the source country (country 0) and deciding whether or not to emigrate to the host country (country 1). An individual's wage in the source country, w_0, is determined by his level of education, e, and by his unobservable (to the econometrician) skills. Unobservable skills are composed of skills which are country-specific, s, and skills which are more general, g. Education is considered a general skill which is also observable. An individual's wage, w_0,in the source country is modeled by:

$$w_0 = a_0 + e + g + s, \tag{1}$$

where a_0 is the intercept of the wage function and is constant across individuals. Without any loss of generality, the returns to each type of skill (e, g, and s) are normalized to one in country 0. The two unobservable components, s and g, are distributed independently with a uniform distribution over the unit interval,

$$s \tilde{} U[0,1];$$
$$g \tilde{} U[0,1].$$

Using the uniform distribution simplifies the analysis, but has no effect on the qualitative results.

If an individual chooses to emigrate to the host country (country 1), he will receive the following wage (net of the direct cost of moving to another country),

$$w_1 = a_1 + \beta_1 e + \gamma_1 g - f, \tag{2}$$

where a_1 is the intercept of the wage function in country 1, β_1 and γ_1 are the returns to e and g in country 1, and f is the direct cost of relocating which is considered identical across all individuals. Although several papers model the cost of moving as a decreasing function of education (Chiswick (1999), Chiquiar and Hanson (2005), and McKenzie and Rapoport (2007)), adding this element to the model will only strengthen the results for positive selection on education, but would not enable us to understand the inverse u-shaped pattern of emigration rates according to residual wages, as depicted in the preceding section.[7] The key assumption of the model is that some skills are not directly transferable to the host

[7]The other papers use the declining costs of emigration to explain why emigrants are not negatively

country, and therefore, are lost due to emigration. This is captured by setting the return to unobserved country-specific skills, s,to zero in country 1. In contrast, despite the fact that g is also unobservable to the researcher, it is rewarded in the host country since it is considered a general skill.

We restrict our analysis to the case where the returns to education and general skills are higher in the host country versus the source country, since Section II shows that this appears to be the case for Israelis who are considering a move to the United States. Formally, this assumption is represented by $\beta_1 \geq 1$ and $\gamma_1 \geq 1$.

Following the framework developed by Roy (1951) and Borjas (1987), the decision to emigrate is based on wage maximization. Therefore, individuals emigrate if and only if $w_1 > w_0$. Based on equations (1) and (2), this condition holds if and only if:

$$\beta e + \gamma g > a + s \tag{3}$$

where $a = (a_0 - a_1) + f$ is the total fixed-cost of emigration (the difference in the constant plus the direct cost of relocating), $\beta = \beta_1 - 1 \geq 0$, and $\gamma = \gamma_1 - 1 \geq 0$. The parameters β and γ are the differences in the returns between country 1 and country 0 to education and general skills respectively. Hence, the right hand side of equation (3), $a + s$, is the total emigration cost including the loss of specific skills, whereas the left hand side, $\beta e + \gamma g$, is the gain from emigration. Naturally, an individual decides to emigrate if the gain is greater than the costs.

As stated above, an individual's unobservable component of income in country 0 is represented by $s + g$. This sum is called the individual's "residual wage," and is denoted by $\tilde{w}$. Since both s and g are distributed uniformly over the unit interval, it follows that the residual wage, $\tilde{w}$, is distributed between 0 and 2. In order to focus the model on the most realistic range of results, a few restrictions on the parameters are useful. In particular, we restrict the parameters so that not everyone emigrates. Since the returns to education, e, and general skills, g, are higher in country 1, individuals with a high level of e and g are the most likely to gain from emigration. Equation (3) formally illustrates this point, as the benefits of emigration increase with both e and g. In contrast, individuals with the

selected when the return to education in the source country (Mexico) is higher than the return in the host country (United States). Since the returns to education are lower in Israel versus the United States, adding this element to the model only reinforces the positive selection of Israeli emigrants in terms of education. Formally, making the direct cost relocating, f, a function of education or general skills, is equivalent to a change in the difference in the relative returns to education or general skills between the two countries. This has no qualitative impact on the model, unless the cost is increasing with skill and/or education in a rate that can reverse the direction of the difference. However, given the literature which argues that the costs decline with skill, this possibility is not very reasonable.

lowest levels of e and g are the least likely to gain from emigration. Therefore, in order to ensure that not everyone emigates, we assume that for any individual characterized by the minimum levels of education and general skills ($g = e = 0$), the return to emigration is negative, $w_1 < w_0$. (If this holds, then it holds for any level of s as well.) Formally, we assume that:

$$a > 0, \tag{A1}$$

so that condition (3) does not hold for any individual characterized by $g = e = 0$, regardless of s. Assumption A1 implies that a positive total fixed-cost of emigrating, represented by a, causes those with the least to gain from emigration to choose not to emigrate.

Next, we focus on a different set of individuals who are very unlikely to emigrate – those with low education and high country-specific skills. The condition in equation (3) shows that the net benefits of emigration increase with e and decline with s – the latter result stemming from the high loss of country-specific skills should the individual choose to move. The only reason individuals with low e and high s would ever choose to emigrate is because the return to g is extremely high in country 1. Therefore, to preclude this unreasonable case, we restrict the return to g in country 1 to be no more than double the return to g in country 0. Formally, we assume that:

$$\gamma < 1, \tag{A2}$$

which assures that equation (3) does not hold for any individual with $e = 0$ and $s = 1$, regardless of g.

Although low educated individuals are the ones most likely to stay, we do not restrict all of them to do so. In fact, we restrict the parameters so that not everyone with the lowest education chooses to stay. In particular, for an individual with the lowest education ($e = 0$), equation (3) holds if $g\gamma > a + s$, which is most likely to be satisfied if g is high and s is low. Therefore, we assume that the return to g is sufficiently high so that:

$$\gamma > a, \tag{A3}$$

assuring that condition (3) holds for an individual with $g = 1$ and $s = 0$, regardless of e (as long as $\beta \geq 0$).

We now derive the probability of emigration for any individual with a given level of education e and a given residual wage, $\tilde{w}$. We condition on these two variables since these are observable to the econometrician, while the individual components of the residual

wage, g and s, are not observable. Since the distributions of g and s are uniform and independent, it follows that for any given $\tilde{w}$, g is uniformly distributed in its feasible range.[8] In particular, the conditional distribution of g given $\tilde{w}$ is given by:

$$\begin{array}{cc} g \tilde{} U[0, \tilde{w}] & for \quad \tilde{w} \leq 1; \\ g \tilde{} U[\tilde{w} - 1, 1] & for \quad \tilde{w} \geq 1, \end{array}$$

These properties allow for a straightforward calculation of the probability that an individual with any given $\tilde{w}$ and e will emigrate, which we denote by $p(\tilde{w}; e)$. As follows from equation (3), and noting that $s = \tilde{w} - g$, $p(\tilde{w}; e)$ is given by:

$$\begin{aligned} p(\tilde{w}, e) &\equiv p(\gamma g + \beta e > a + s | \, \tilde{w}) \\ &= p\left(g > \frac{a - \beta e + \tilde{w}}{1 + \gamma} \middle| \, \tilde{w} \right). \end{aligned} \tag{4}$$

We further suppose that a is sufficiently large relative to β, so that the distribution of e is bounded from above by a/β. This implies that the return to education in country 1 versus country 0 is not so large that majority of highly educated people decide to emigrate. (This coincides with the case of Israel – the highest emigration rates are for those with MA degrees, but the rate is still only 4.6% over the seven-year period we study). This assumption implies that the residual wage, and not just the level of education, plays an influential role in the decision to emigrate. Our assumption that e is bounded from above by a/β, implies that $a - \beta e > 0$.[9] All proofs are in the appendix.

Proposition 1 *(The properties of $p(\tilde{w}, e)$). Under Assumptions A1-A3 and as long as $a - \beta e > 0$,*

1. *The probability that an individual decides to emigrate is:*

$$p(\tilde{w}, e) = \begin{cases} 0 & for \quad \tilde{w} \leq \frac{a - \beta e}{\gamma} \\ \frac{\gamma}{\gamma + 1} - \frac{a - \beta e}{(1 + \gamma)\tilde{w}} & for \quad \tilde{w} \in \left(\frac{a - \beta e}{\gamma}, 1 \right) \\ \frac{1 + \gamma - (a - \beta e) - \tilde{w}}{(2 - \tilde{w})(1 + \gamma)} & for \quad \tilde{w} \in [1, 1 + \gamma - (a - \beta e)) \\ 0 & for \quad \tilde{w} \geq 1 + \gamma - (a - \beta e) \end{cases} \tag{5}$$

   where,

2. *$p(\tilde{w}, e)$ is continuous*
3. *$\frac{a - \beta e}{\gamma} \in (0, 1)$*

[8] Note that the probability that $s + g \in (w - \varepsilon, w + \varepsilon)$, for $\varepsilon \to 0$, for any given g, such that $\tilde{w} - g < 1$ is independent of g,and therefore the conditional probability of s and g for any given $\tilde{w}$ are uniform in the feasible range.

[9] We briefly discuss below the case where $a - \beta e < 0$.

4. $1+\gamma-(a-\beta e)\in(1,2)$

5. $p(1,e)\in(0,1/2)$

6. $p(\tilde{w},e)$ *is increasing and concave with respect to* $\tilde{w}$ *for* $\tilde{w}\in\left(\frac{a-\beta e}{\gamma},1\right)$

7. $p(\tilde{w},e)$ *is decreasing and concave with respect to* $\tilde{w}$ *for* $\tilde{w}\in(1,1+\gamma-(a-\beta e))$.

According to Proposition 1, the probability to emigrate is an inverse u-shaped function of the residual wage, $\tilde{w}$, if β and γ are not too high and a is sufficiently high. The intuition is rather straightforward. Generally speaking, individuals with a low residual income have low levels of both general and country-specific skills (g and s). A low g implies that the individual has a limited incentive to emigrate in order to enjoy the higher return to g in country 1, while a low s means that he will suffer a small loss in terms of losing his country-specific capital if he moves. These effects offset each other, so that the net gain to emigration for this individual is modest, and therefore, he will tend not to emigrate due to the significant fixed-costs of emigration, a. On the other end of the spectrum, individuals with very high residual wages will tend to have high levels of general and country-specific skills. For these individuals, a high level of g implies a larger benefit to emigrating, while a large level of s means that he will suffer a severe loss of country-specific skills. That is, similar to the individual with a low residual wage, the ratio of g to s is close to one, and therefore, the costs and benefits of emigration roughly cancel each other out. As a result, a significant level of fixed emigration costs will prevent individuals with a high residual wage from leaving the country in large numbers.

Now, consider those in the middle of the residual wage distribution. In this range, individuals have varying levels of s and g. Those with high levels of s versus g will behave similar to those at the tails of the distribution since the loss of country-specific skills and the fixed-costs will prevent them from leaving at a large rate. However, in the middle of the distribution, there is a significant group of people with high levels of g relative to s, and for those individuals, the return to emigration is high enough to produce the largest rate of emigration within the population. As a result, the rate of emigration tends to be larger in the middle of the residual wage distribution than in the tails.[10]

[10] It should be noted that the inverse u-shaped relationship between the residual wage and the probability of emigration does not depend on our assumption that the two components of the residual, s and g, are uncorrelated. The u-shape patterns persists for any type of correlation except for the case where they are perfectly, positively correlated (which would produce positive selection). However, the u-shaped pattern becomes flatter when the correlations becomes more positive. Interestingly, a negative correlation will strengthen the inverse u-shape pattern, since a more negative correlation would increase the variance in the distribution of s and g in the middle of the distribution of their sum, and hence a higher probability of g exceeding its threshold level for triggering emigration.

It is important to note how our results differ from the existing framework developed by Roy (1951) and Borjas (1987). In their models, the selection of immigrants in terms of "unobservable skill" is significantly influenced by the correlation of unobservable skills in the source and host countries. Our model is different since the correlation between an individual's unobservable skill in both countries is different across people, rather than being a single parameter. In particular, due to the variation in the level of country-specific skills across people, some individuals stand to lose a large portion of their total unobservable skill and some would lose virtually nothing. That is, our model produces a different rate of transferability of unobservable skill across people according to the relative size of each component of unobservable skill. By showing that a larger proportion of individuals with a higher transferability rate of unobservable skills (i.e. those with a high g relative to s) exists in the middle of the distribution of total unobservable skill (i.e. the residual wage), our model is able to explain the inverse u-shaped pattern of emigration in relation to unobservable skill.

We now examine the effect of education on the shape of the probability function of emigrating, $p(\tilde{w}, e)$.

Proposition 2 *(The effect of e on $p(\tilde{w}, e)$). Under Assumptions A1-A3 and as long as $a - \beta e > 0$,*

1.
$$\frac{dp(\tilde{w}, e)}{de} > 0 \quad for \quad p(\tilde{w}, e) > 0$$

2.
$$\frac{d^2 p(\tilde{w}, e)}{de d\tilde{w}} < 0 \quad for \quad \tilde{w} \in \left(\frac{a - \beta e}{\gamma}, 1 \right)$$

3.
$$\frac{d^2 p(\tilde{w}, e)}{de d\tilde{w}} > 0 \quad for \quad \tilde{w} \in (1, 1 + \gamma - (a - \beta e))$$

Part 1 of Proposition 2 implies that the probability of emigrating increases with the level of education. In other words, emigrants are positively selected in terms of their education, which follows from the higher return to education in country 1 versus country 0, $\beta > 0$. This result and its mechanism is similar to the prediction in Borjas (1987). However, Proposition 2 demonstrates that the marginal effect of e on p is decreasing with $\tilde{w}$ for $\tilde{w} < 1$ (part 2),and increasing with $\tilde{w}$ for $\tilde{w} > 1$ (part 3). That is, the inverse u-shaped pattern of $p(\tilde{w}, e)$, with respect to $\tilde{w}$ is shifting up and flattening out as e increases.

For the case where $a - \beta e < 0$, the results are generally in the opposite direction: $p(\tilde{w}, e) = 1$ for both high and low levels of $\tilde{w}$, and the lowest value of $p(\tilde{w}, e)$ is in the middle of the distribution of $\tilde{w}$ ($\tilde{w} = 1$). Since this pattern is not observed in the data, we focus our analysis on the case where $a - \beta e > 0$.

We now examine how the pattern of emigration across different levels of $\tilde{w}$ changes as the return to g increases in country 1.

Proposition 3 *("mean preserving spread") A rise in the return to unobservable general skills in the host country versus the source country, γ, and in the fixed cost of emigrating, a, such that $p(1, e)$ is held constant, generates a decline in $p(\tilde{w}, e)$ for $\tilde{w} < 1$,and a rise in $p(\tilde{w}, e)$ for $\tilde{w} > 1$.*

It follows from Proposition 3 that a rise in γ, while holding $p(1; e)$ constant, generates a shift to the right in $p(\tilde{w}; e)$ around the point $p(1; e)$. In other words, a higher relative return to unobservable general skills in country 1, while holding $p(1; e)$ constant, maintains the overall u-shaped pattern of emigration according to residual wages, but shifts the whole curve to the right (raising emigration rates for those with high residuals and lowering the rate for low residual wages).

The intuition for this result is as follows. For a given e, the decision to emigrate depends on both g and s.The benefits of emigration increase with g, while the costs increase with s. Therefore, as $\tilde{w}$ increases, the sum of s and g increases, which implies that the threshold level of g, above which individuals choose to emigrate, increases with $\tilde{w}$. To derive this formally, the condition for a person with any given $\tilde{w}$ to decide to emigrate, given by equation (3), can be re-written as,

$$\beta e + \gamma g > a + \tilde{w} - g,$$

where $\tilde{w} - g = s$. Re-arranging implies: $\beta e + (1 + \gamma) g > a + \tilde{w}$,and therefore, for any $\tilde{w}$ and e, there exists a threshold level of g, denoted $\hat{g}(\tilde{w}, e)$,such that equation (3) holds with equality:

$$\hat{g}(\tilde{w}, e) = \frac{a - \beta e + \tilde{w}}{1 + \gamma}.$$

Hence, the threshold level of g is increasing with $\tilde{w}$,and therefore a rise in the difference in the return to general skills, γ, has a stronger impact on individuals with larger residual wages, $\tilde{w}$. This can also be seen from equation (3), where the marginal benefit of emigrating with respect to γ is equal to g. Therefore, those with higher g are more sensitive to changes

in γ. This general result is independent of the specific "mean preserving spread" exercise performed in the proposition.[11]

We now examine how the positive selection of emigrants, as shown in Proposition 2, is affected by changes in the relative returns to education between the two countries. To do this, we derive the probability of emigrating as a function only of education, and discuss its properties.

Proposition 4 *(the effect of education on the emigration probability) Under A1-A3, for* $\beta > 0$*:*

1. The probability of emigrating as a function of education is:

$$p(e) = \frac{(\gamma - a + \beta e)^2}{2\gamma} > 0.$$

2. The probability of emigrating is an increasing and convex function of education:

$$\frac{\partial p(e)}{\partial e} = \frac{\beta}{\gamma}(\gamma - a + \beta e) > 0,$$

$$\frac{\partial^2 p(e)}{\partial e^2} = \frac{\beta^2}{\gamma} > 0.$$

3. The probability of emigrating as a function of education increases and becomes steeper with an increase in the return to education in country 1 relative to country 0:

$$\frac{\partial p(e)}{\partial \beta} = \left(1 - \frac{a}{\gamma} + \frac{\beta e}{\gamma}\right) e > 0,$$

$$\frac{\partial^2 p(e)}{\partial e \partial \beta} = 1 - \frac{a}{\gamma} + \frac{2\beta e}{\gamma} > 0.$$

Proposition 4 states once again that emigrants are positively selected in terms of education (part 1), and that the shape of the relationship between education and the probability of emigrating is convex (part 2). Part 3 of the proposition indicates that an increase in the return to education in the host country makes the curve shift up and become steeper. In other words, an increase in the return to education in country 1 increases the overall level of emigration from country 0, and intensifies the positive selection of those that choose to emigrate in terms of education levels.

[11] A rise in the fixed cost, a, has a negative effect on the emigration probability. However, this effect declines (in absolute value) with $\tilde{w}$ for $\tilde{w} < 1$, in particular, for $\tilde{w} \in \left(\frac{a-\beta e}{\gamma}, 1\right)$, $\frac{d^2 p(\tilde{w},e)}{da d\tilde{w}} = \frac{1}{\tilde{w}^2(\gamma+1)} > 0$.For $\tilde{w} > 1$ the opposite is true. For $\tilde{w} \in (1, 1+\gamma-(a-\beta e))$, $\frac{d^2 p(\tilde{w},e)}{da d\tilde{w}} = -\frac{1}{(\gamma+1)(w-2)^2} < 0$.

Although g is not observable to the econometrician, we now describe the patterns of emigration in relation to different levels of this general skill. As follows from the emigration condition (3), for any level of g and e, there is a threshold level of specific skills s,below which the individual decides to emigrate:

$$\hat{s} = \gamma g - (a - \beta e).$$

Noting that under the restriction that $a-\beta e > 0$ there is a threshold level of $g = (a-\beta e)/\gamma$ below which there is no emigration, the probability to emigrate as a function of g is given by:

$$p(g) = \begin{cases} 0 & g < (a - \beta e)/\gamma; \\ \gamma g - (a - \beta e) & g \in [(a - \beta e)/\gamma, 1], \end{cases}$$

where it follows from our restrictions ($g \leq 1$ and $\gamma < 1$) that the probability of emigration is strictly smaller than 1 for any g as long as $a - \beta e > 0$. Hence, above the threshold level, the emigration rate is a linear increasing function with a slope equal to γ. Similar to the results regarding the observable general skill, e, a higher return to g in country 1 versus country 0 generally produces positive selection in terms of g.

Overall, the theory presented in this section shows that a higher return to observable and unobservable general skills in the host country versus the source country, combined with the presence of country-specific skills in the source country, can generate the patterns in the data seen in Section II. In particular, the model shows that emigrants are positively selected in terms of their education, and that the relationship is convex (as shown in Figures 1 and 2). However, the relationship between emigration rates and residual wages exhibits an inverse u-shaped pattern (as shown in Figures 4, 5, and 6). Increases in the returns to either type of skill in country 1 increase the positive selection of emigrants in terms of either skill, but keep the overall shape of the curve intact. In the next section, we examine the relevance of these forces of emigrant selection.

4 Selection on Observables (Education)

The goal of this section is to test whether a higher relative return to education in Israel versus the US intensifies the positive relationship between education and the propensity to leave Israel (Proposition 2). With information on each individual in Israel before he makes the decision to leave the country or not, the basic regression specification explains the

probability that person i who works in sector j (before leaving Israel) decides to emigrate from Israel by the following equation:

$$\begin{aligned}\Pr(Mover_{ij}) &= \gamma_0 + \gamma_1 x_i + \gamma_2 educ_i + \gamma_3 (residual\ wage)_{ij} + \gamma_4 (residual\ wage)_{ij}^2 \\ &\quad + \gamma_5 (Israel\ ROR\ Educ)_j + \gamma_6 (US\ ROR\ Educ)_j \\ &\quad + \beta_1 (Israel\ ROR\ Educ)_j \cdot educ_i + \beta_2 (US\ ROR\ Educ)_j \cdot educ_i \\ &\quad + \alpha_j + \varepsilon_i\end{aligned}$$

where:

$Mover_{ij}$ is an indicator equal to one if the person emigrates from Israel and is zero otherwise;

x_i is a vector of personal characteristics (age, marital status, number of children in the household, an indicator for being a native Israeli or not, age that the person moved to Israel (if he is not a native)), and dummy variables for ethnicity (European descent or Middle Eastern descent);

$educ_i$ is the number of completed years of schooling by person i;

$residual\ wage_{ij}$ is the individual's residual from a standard Mincer-like wage regression from the 1995 Israel Census using observations of workers in sector j (regressing wages on education, age, age squared, marital status, and indicators for ethnic status and immigrant status);

$Israel\ ROR\ Educ_j$ is the estimated return to education from the 1995 Israel Census in sector j in the regression described above for estimating the residual wage for each person in sector j;

$US\ ROR\ Educ_j$ is the estimated return to education from the US CPS (combining 1994, 1995, and 1996) within workers in sector j using the specification in the first column of Table 2;

α_j is a fixed-effect for sector j; and ε_i is the error term.

The coefficient γ_2 will determine whether there is a general relationship between schooling and the probability to leave Israel, while γ_3 and γ_4 will indicate whether higher residual wages within a given individual's sector increase or decrease the probability of emigrating (and whether the relationship is linear or non-linear). The analysis uses "residual wages" as a proxy for the return to unobservable skill, so that we can explicitly separate the effect of observable skill (education) from unobservable skill on the probability of leaving

Israel. For both Israel and the US, we use estimates for the return to education in sector j as a proxy for the return to observable skill (education) in sector j in each country.

In the context of the model, the main coefficients of interest are β_1 and β_2. The model has no clear predictions on whether a higher relative return to observable skill will increase or decrease the overall rate of emigration from the source country. In fact, with the inclusion of fixed-effects for each sector, the parameters on these variables (γ_5 and γ_6) are not even identified. The model does predict, however, that a lower (higher) relative return to skill in Israel versus the US will entice higher (lower) skilled workers to leave Israel. Formally, this prediction is represented by $\beta_1 < 0$ and $\beta_2 > 0$. These parameters are identified by exploiting variation across sectors in the difference between Israel and the US in the returns to education within each sector, and testing for whether the probability of emigration increases (decreases) with education in sectors with a lower (higher) return to education in Israel versus the United States.

In terms of defining the sectors, we use either the twelve industrial sectors depicted in Table 3 or the nine occupations in Table 4. Sectors have to be defined rather broadly so that we can obtain reasonable estimates of the returns to education and residual variation (used in the next section) within each sector. Also, we need a reasonable number of emigrants within each sector in order to test for selection. Tables 3 and 4 present the returns to education within each sector in Israel and the US. Differences in these estimates across sectors are the source of the "treatment variation" that is exploited in the empirical analysis.

Although there is a large literature which examines the bias in the estimated returns to schooling using a standard Mincer-like regression, this issue should only affect our results if the biases across sectors and between the US and Israel are somehow systematically related to the selection of workers within a sector. To be more precise, the main identifying assumption throughout the paper is that the difference between the US and Israel in the estimated return to skill (either the return to education or the residual variation) within a sector is not systematically correlated with an increasing or decreasing likelihood for higher skilled individuals to emigrate. Therefore, even if the estimated returns to schooling are biased, this should only add noise to the regression. It is difficult to imagine why differential biases between the US and Israel across sectors would somehow be correlated with the relationship between skill and the propensity to emigrate.

Table 5 presents the main analysis for selection on observable skill when sectors are defined by the twelve industries displayed in Table 3. The coefficients presented in all of

the regression tables represent the estimated marginal effect of each explanatory variable (evaluated at the means of all the explanatory variables). The first column of Table 5 shows the estimates of the regression equation using fixed-effects for each industry, but using only the returns to education in Israel (excluding the return to education in the United States). The results show that education is positively and significantly related to the probability of emigrating, and the quadratic on an individual's residual wage is also very significant. However, the main parameter of interest is not significant – the interaction of education with the return to education in Israel. In the second column, we include only the return to education in the US, thus omitting the return to education in Israel. In this specification, the interaction between education and the return to education in the US is positive and significant, and indicates that higher educated Israelis tend to leave Israel more if they work in a sector which has a high return to education in the United States. The direction of this effect is consistent with the predictions of the model – positive selection in a sector with a higher return to general skills abroad.

The third column of Table 5 includes the returns to education in the US and Israel. Interestingly, both of the main parameters of interest are now significant, and the magnitudes are much larger than in the first two columns. For example, the interaction between education and the return to education in Israel increases in size from -0.015 to -0.093, while the interaction of education with the return to education in the US increases from 0.020 to 0.051. The fact that the coefficients of interest are much bigger and significant when we include the interaction terms for the US and Israel together in the same regression is an important result in the context of the model. When we exclude the returns to skill in the US in column (1), the non-significant results for the interaction of education with the Israeli return to education indicate that high skilled workers are not generally more likely to leave Israel if they work in an industry with a low return to education. This is mostly true because of the returns to education are positively correlated across the two countries. Therefore, a sector that has a high return to skill in Israel most likely has a high return as well in the US, and since the effect of the former is negative and the latter is positive, the coefficients are biased towards zero when we exclude the returns to skills in either country. This pattern of results highlight the importance of using variation in the relative returns to skill between the source and potential host country, and not just relying on the returns to skill in the source country in order to identify the parameters of the model.

Our finding that the relative returns between Israel and the US, and not the absolute returns in Israel, are what matters is strong evidence in favor of the implications of the

model. In addition, the fact that the results are highly sensitive to the inclusion of the US measures of the returns to skill indicate that our measured returns to skill in the US and Israel are not simply measures of noise which are fraught with biases and measurement error. If this were the case, they should not be significant determinants of the probability to emigrate, and they should not be influencing the other coefficients to such a high degree.

The last column of Table 5 uses a specification which explicitly assumes that the relative returns to skill between Israel and the US are the main determinants of emigration – by interacting a person's education level with the difference in the returns to education between Israel and the US in his sector. Using this specification, the main parameter of interest is highly significant: the probability of emigrating for Israelis with higher levels of education declines in sectors with a higher relative return to education in Israel versus the US. This result is consistent with the predictions of our model regarding the selection of workers according to observable general skills.

Table 6 presents the main results for selection on education after defining sectors according to occupations. It is important to note that the "wage residual" for each individual is not the same one used in the analysis using industries as sectors. The "wage residual" is now taken from regressions within the individual's occupation, rather than each individual's industry. Also, the returns to education in the US and Israel are now computed for occupations rather than industries.

Overall, the results using occupations as sectors are similar to those using industries in one respect, but differ in a few important ways. They are similar in the sense that higher educated Israelis tend to leave occupations with a low return to education in Israel. However, higher educated Israelis also tend not to leave Israel if the return to education in their occupation in the US is higher. The former result is consistent with the model but the later one is not. In the last column of Table 6, the interaction of education with the difference in the returns to education between Israel and the US yields an insignificant coefficient, since the individual coefficients (in the first three columns) are of a similar magnitude and have the same sign. That is, the last column masks the two individual effects. However, even though one of the coefficients has an unexpected sign, it is worth noting that the size of the coefficients in the occupation level analysis are considerably smaller than the ones obtained in the industry-level analysis – less than half the magnitude of the coefficients in Table 5. Also, the difference in the results could be due to the idea that occupational status is already somewhat of a proxy for education, so testing for selection within occupations is really a test of selection within very small ranges of education. In

contrast, the larger selection effects obtained in the industry-level analysis is most likely a product of exploiting a broader range of education levels within each industry.

We now examine the sensitivity of the results to different sample selection criteria and to different ways of defining a "mover." For the sake of parsimony, we present only the coefficient on the interaction between a person's education level with the difference in the return to education between Israel and the US in his sector (industry or occupation). We present results for both the industry and occupation level analysis, but restrict most of our discussion to the industry analysis since using occupations as sectors yields a consistently non-significant coefficient.

Table 7 presents the results for three different sample selection criteria. The first column replicates the last column of Tables 5 and 6, while the next two columns compare the results obtained for natives versus non-natives (those not born in Israel). Figures 1 and 2 show that non-natives have a higher rate of emigration, and that the positive relationship between education and the probability of emigrating is steeper as well. However, Table 7 shows that the results are more significant for natives rather than non-natives, although the sign of the coefficients for both groups are consistent with the model in the industry analysis. One possible explanation for the non-significant results for non-natives could be that many of those who choose to leave Israel are moving back to Russia, and therefore, measures of the returns to skill in the US may be less relevant for them. In the last column of Table 7, we delete industries with a small sample size from the regression (less than 1,000 observations), and the results are very similar to the results obtained from the entire sample. Therefore, the results are not coming from small sectors with influential outliers.

Table 8 presents results for different ways of defining a "mover." The first two columns compare the results obtained using "mover" status as of 2004 (the measure we have been using up to now) to "mover" status as of 2002. The results are a little weaker and less significant, but are generally similar using both definitions. The third column defines a "mover" as someone who is defined as a "mover" in both 2002 and 2004, and the results are still very similar. The last column defines a mover as someone who is categorized as a "mover" in 2004, but also has been out of the country since the end of 2000. Again, the results are significant but smaller in magnitude. Overall, the results appear to be robust to confining the status of "mover' only to those who have been out of the country for several years. We will discuss the magnitude of the results later, but first we present a similar analysis for the selection of emigrants on unobservable skill.

5 Selection on Unobservables (Residual Wages)

The section analyzes the prediction of Proposition 1 that the rate of emigration should be an increasing and then decreasing function of the residual wage, and Proposition 3's prediction that a higher relative return to unobservable in Israel versus the US increases the probability that individuals with higher unobserved skill will emigration (i.e. shift the inverse U-shaped relationship between emigration and residual wages to the right). The basic regression specification explains the probability that person i who works in sector j (before leaving Israel) decides to emigrate from Israel by the following equation:

$$\begin{aligned}\Pr(Mover_{ijk}) &= \gamma_0 + \gamma_1 x_i + \gamma_2 educ_i + \gamma_3 (residual\ wage)_{ij} + \gamma_4 (residual\ wage)_{ij}^2 \\ &\quad + \beta_3 (Israel\ residual\ SD)_{jk} \cdot (residual\ wage)_{ij} \\ &\quad + \beta_4 (US\ residual\ SD)_{jk} \cdot (residual\ wage)_{ij} \\ &\quad + \alpha_{jk} + \varepsilon_i\end{aligned}$$

where each variable is defined as before except:

$Israel\ residual\ SD_{jk}$ is the standard deviation of the residuals within sector j and education group k (k=1 if person i is a high school dropout, k=2 if person i completed only high school, and k=3 if person i completed college) from the wage regression described above for estimating the residual wage for each person in sector j in the 1995 Israel Census;

$US\ residual\ SD_{jk}$ is the standard deviation of residuals within sector j and education group k from the wage regression described above using the specification in the first column of Table 2 with workers in sector j in the US CPS data;

α_{jk} is a fixed-effect for education group k in sector j; and ε_i is the error term.

The analysis uses a person's residual wage within a sector as a measure of his unobservable skill, and the residual variation in sector j for education group k as a proxy for the return to unobservable skill in sector j and education group k.[12] With the inclusion of fixed-effects for each sector and education group, the direct effect of the residual variance in each sector and education group is not identified. Therefore, the main coefficients of

[12] There are likely to be differences across education groups within a given sector in the returns to unobservable skills, so the regression explicitly considers this possibility.

interest are β_3, and β_3. According to the model, a lower (higher) relative return to skill in Israel versus the US will entice workers with higher (lower) residual wages to leave Israel.[13] Formally, this prediction is represented by $\beta_3 < 0$ and $\beta_4 > 0$. These parameters are identified by exploiting variation across sectors in the difference between Israel and the US in the returns to unobservable skill within each cell (sector and education group). The main identifying assumption is that the differences between Israel and the US in the residual variation across cells is not correlated with an unobservable factor which can generate positive or negative selection within each cell.

Table 9 presents the main analysis for selection on unobservable skill when sectors are defined by the twelve industries displayed in Table 3. The first column of Table 9 includes the interaction of each person's residual wage with the residual variation in his sector in Israel (excluding the interaction with the residual variation in the United States). The results show that the direct effect of a person's residual wage is positive (although not significant) while the quadratic term is very significant and negative. This pattern forms a non-linear relationship between residual wages and the probability of emigrating, as seen in Figure 4. According to our model, this pattern is indicative of the idea that residual wage is composed of two types of unobservable skills – those that are "general" and can be transferable to the target country and those that are "country-specific" to Israel, and therefore, cannot be transferred to another country.

However, the main parameter of interest in Table 9 is the coefficient on the interaction between a person's residual wage and the residual variation in the person's sector and education cell. This coefficient is negative, but not significant in the first column of Table 9. Similarly, when we include the interaction term for the residual variation in the US, the main parameter is not significant. However, when we include the residual variation in both Israel and the US together in the specification, the interaction terms are much larger in magnitude and marginally significant. Moreover, the signs of the coefficients are consistent with the model – a higher return to unobservable skill in Israel induces individuals with high levels of unobservable skill to stay, while higher returns to unobservable skill in the US increase the chances for individuals with higher levels of unobservable skill to leave Israel.

The fact that the coefficients of interest are smaller in magnitude and significance when one of the interactions is deleted is indicative that individuals compare the relative

[13] Implicitly, we are assuming that the residual variance in each country reflects the return to unobserved general skills rather than country-specific skills. However, if this were not the case, then we should only be adding noise to the regressions.

returns to skill across countries, rather than just looking at the return to skill in their own country. This idea is explicitly modeled in the last column of Table 9 which interacts a person's residual wage with the difference in the returns to unobservable skill between Israel and the US. The interaction term in this specification is highly significant and negative: the probability of emigrating for Israelis with higher levels of unobservable skill declines in sectors with a higher relative return to unobservable skill in Israel versus the US. This result is consistent with Proposition 3.

Table 10 presents the main results for selection on unobservable skill after defining sectors according to occupations. Overall, the pattern of results for the main parameters of interest (the interaction terms) is very similar to the industry-level analysis in Table 9. In fact, the magnitudes and significance levels are higher than Table 9, and the sign of the coefficients once again are consistent with Proposition 3.

Therefore, in contrast the results regarding the selection of emigrants in terms of education levels, the results are very similar in terms of selection on unobservable skill in the industry and occupation level analyses. Again, one possible explanation for this could be that occupation is already a proxy for education, so this is likely to affect the results for selection on education levels in a way that does not affect selection on unobservables (since residuals are computed after controlling for occupation and education).

We now examine the sensitivity of the results to different sample selection criteria and to different ways of defining a "mover." Table 11 presents the results for three different sample selection criteria. Although the magnitudes are similar for natives and non-natives (actually a little bigger for the non-natives), the results are statistically significant only for the natives. In the last column of Table 11, we show that the results are similar even after deleting sectors with a small sample size from the regression (less than 1,000 observations). Therefore, the results are not coming from small sectors with influential outliers.

Table 12 presents results for different ways of defining a "mover." The first two columns compare the results obtained using "mover" status as of 2004 to "mover" status as of 2002. The results are a little weaker and less significant, but are generally similar using both definitions. The third column defines a "mover" as someone who is defined as a "mover" in both 2002 and 2004, and the results are still very similar. The last column defines a mover as someone who is categorized as a "mover" in 2004, but also has been out of the country since the end of 2000. Again, the parameters of interest are significant, and indicate that the results are robust to confining the status of "mover' only to those who have been out of the country for several years.

In Table 13, we specify a regression which tests for selection on observable skill (education) and unobservable skill (residual wages) in the same regression. Up to now, we estimated them separately in different regressions, since the analysis for observables required using a fixed-effect for sector only, while the analysis for unobservables requires a fixed-effect for each sector and education cell. Therefore, it is not appropriate to estimate them together with fixed-effects for cells defined by sector or sector-education cells.[14] However, despite these concerns, we now estimate the selection on observable and unobservable skills in the same regression – using fixed-effects for the sector only and then using fixed-effects for the sector-education cell. Table 13 presents these results for both the industry and occupation level analysis. Overall, the results are very similar to all of the previous estimates – a lower relative return to skill increases the level of positive selection in unobservable skill for both the industry and occupation level analyses, while the results for observable skill are significant only for the industry level analysis. Essentially, the coefficient estimates are unchanged from the analysis that estimates each type of selection separately, and they are robust to whether the fixed-effect is at the sector level or whether they are defined by sector-education cells. In the next section, we discuss the magnitude of the coefficients.

6 The Magnitude of the Coefficients

So far, we found statistically significant evidence in favor of positive selection on observable and unobservable skill in sectors with a low relative return to skill in Israel versus the US. However, the magnitudes of the coefficients are not easy to interpret from the results presented in the tables. Therefore, we now use our estimates to present the relationship between levels of skill and the propensity to emigrate under several scenarios. Specifically, we compute the predicted values of the regression after substituting different relative returns to skill between Israel and the US, and show how the relationship between skill and the probability of emigration changes under each scenario.

For example, Figure 7 analyzes the magnitude of selection on education in the industry analysis, by showing the predicted levels of emigration (according to the estimated parameters in the last column of Table 5) under various relative differences in the returns to

[14] Using a fixed-effect for each sector and education cell when we test for selection on education means we would be testing for selection on education within very small ranges of education, and therefore, we believe this is not the appropriate specification. Furthermore, including a fixed-effect for sector only in the analysis on unobservable skill is not entirely appropriate since the person's residual wage is interacted with the return to skill within cells defined by sector and education group, not just sector.

education between Israel and the US. To be precise, the line for "relative return = -0.04" is computed by predicting the probability of emigrating for each person using the coefficients in Table 5, after we substitute -0.04 into the equation in place of the actual relative return to education in Israel versus the US. Then, the predicted probabilities are graphed as a smoothed quadratic function of education in the figure. Figure 7 computes similar lines for other magnitudes for the relative return to education (-0.02, 0.0, and 0.02). We chose these numbers in order to examine the sensitivity of the relationship between education and emigration using various levels of returns to skill that are similar to the actual levels – Table 2 showed that the aggregate relative return to education in Israel versus the US is roughly -0.03 (0.071 for Israel and 0.10 for the US).

The simulations in Figure 7 show that the relationship between education and the probability of emigrating is very sensitive to the relative return to education. The probability that a person with a college degree (15 years of schooling) emigrates doubles when the relative return decreases in Israel from -0.02 to -0.04. In the other direction, when the relative return moves in the positive direction (i.e. higher returns in Israel), the relationship between education and emigration becomes negative (which is easier to see in Figure 8). In Figure 9, we compare the predicted emigration rates using the actual relative return to education with the predicted rates after decreasing the actual relative return by 0.02. Again, this change in the relative return exacerbates the positive selection significantly. In Figure 10, we compare the actual rates with what happens when the relative return to education in Israel is increased by 0.03 (which roughly makes the average return equal in Israel and the US). Overall, Figure 10 shows that the entire relationship between education and emigration can be eliminated if the relative returns to skill were similar to those in the US. These simulations suggest that the estimated selection parameters are not only significant statistically, but are considerably large in magnitude. (We do not do simulations for the occupation-level analysis of selection on education, since these coefficients were not significant, and therefore, the magnitudes should be considered close to zero.)

In order to demonstrate the magnitude of selection on unobservable skill, Figure 11 shows the predicted emigration rates from the industry level analysis for various levels of the relative return to unobserved skill between Israel and the US. For example, the line for "relative residual SD = -0.05" is computed by predicting the probability of emigrating for each person using the coefficients in Table 9, after we substitute -0.05 into the equation in place of the actual difference in residual variation between Israel and the US. We do the same for other values of the relative difference in residual variation, and the predicted

probabilities are graphed as a smoothed quadratic function of the residual wage decile in the figure.

Figure 11 demonstrates that the inverse U-shaped pattern between residual wages and emigration rates shifts to the right as the relative return to skill in Israel versus the US decreases. Consistent with Proposition 3, the tendency for individual's with higher levels of unobserved skill to leave the country increases as the return to unobserved ability declines in Israel. When the relative return declines from 0.05 to -0.05, the emigration rate of those at the second lowest decile declines from about 1.70 percent to 1.40 percent, while the rate for those at the second highest decile increases from 1.35 percent to 1.55 percent. This shift in the propensity to emigrate is consistent with the idea that country-specific skills keep the overall pattern of the relationship in the form of an inverse U-shape, while the increase in the return to general unobservable skills induces a shift rightward in the entire curve.

Figure 12 compares the actual rates of emigration to those predicted by the model when the relative level of residual variation is decreased by 0.04. Again, we see the shift rightward of the entire curve: the emigration rate of those at the second lowest decile decreases from 1.55 to 1.45 percent, while the rate at the second highest decile increases from 1.40 to 1.50 percent. These are reasonably large shifts in terms of the magnitudes, but Figure 13 shows that if we essentially equalize the residual variation between Israel and the US displayed in Table 2 (by increasing the relative difference by 0.025), the shift in the curve is not very large. Therefore, we draw two conclusions from these figures. First, the coefficient for the selection on unobservables in the industry-level analysis is quite significant in magnitude. However, the relative difference in residual variation between the US and Israel is not very large.

A similar set of figures is now presented for the selection of unobservable skill using the occupation level analysis. Figure 14 shows the familiar shift to the right of the U-shaped curve when the relative return to unobservable skill decreases in Israel versus the US, thus increasing positive selection on unobservable skill. However, the magnitudes are larger than those depicted in Figure 11 for industry level analysis, which follows from the larger coefficient for the interaction parameter in Table 10 (-0.055) versus -0.031 in Table 9. The larger magnitudes are displayed again in Figure 15 which shows a large shift towards greater positive selection when the relative return in Israel is decreased by 0.04, and in Figure 16 which shows a significant decrease in positive selection when the relative return in Israel increases by 0.025 (essentially equalizing the residual variation across the two

countries). Overall, these figures show that the parameters governing the selection process on unobservable skill are significant statistically and also in magnitude.

Furthermore, the simulations in this section confirm the main predictions of the model: a decrease in the relative return to education in Israel increases the positive relationship between education and the propensity to emigrate, while the U-shaped relationship between unobservable skill and emigration shifts to the right when the relative return to unobserved skill in Israel declines.

7 Conclusion

Using a unique data set containing information on the labor market outcomes of individuals before they decide to move or not, this paper is the first to analyze the selection of emigrants based on their observable and unobservable skills. Building on the theoretical framework of Roy (1951) and Borjas (1987, 1991, 1999), we develop a model which predicts that the relationship between education and emigration should be positive if the relative return to education is lower in the source country versus a potential host country, while the relationship between moving and unobservable skills should be characterized by an inverse U-shaped pattern. The first prediction is similar to Borjas (1987), since education is considered a general skill in our analysis. However, unobservable skills are composed of both general and country-specific skills, and since those at the top of the income distribution are the most likely to have both types of skill in abundance, they are less likely to risk losing their country-specific skills by moving than those towards the middle of the unobservable skill distribution. Thus, the pattern for unobservable skills exhibits an inverse U-shape.

These predictions are supported by the general patterns in our data. Furthermore, we exploit differences across sectors in the relative returns to observable and unobservable skills between Israel and the United States to identify the causal effect of inequality in each country on the propensity to emigrate. We find strong evidence that a lower return to unobservable skills in Israel versus the United States entices higher ability Israelis to leave the country. Also, we find that the positive relationship between education and the probability of moving intensifies in industries with a lower relative return to education in Israel versus the United States. The estimates suggest that the positive relationship between education and emigration could be eliminated entirely if the returns to skill were similar across the two countries. Overall, the results strongly support our model and the importance of differentiating between general and "country-specific" skills in the analysis

of immigrant selection.

Our findings have important implications regarding the desired level of inequality in a country. Although the high level of inequality in the United States is commonly regarded in a negative light, it does play an important role in making the United States a magnet for the most talented workers in the world. Therefore, to a large degree, a country's level of inequality represents how well it will be able to compete with the US for its smartest people. So, even if a country has a high level of inequality, like Israel, it should be careful about reducing it in ways that will lead to a significant brain drain.

8 APPENDIX

We now present the proofs to the proposition in the main text.

PROOF OF PROPOSITION 1:

1. For $a-\beta e>0$, if $\tilde{w}<1$, then $g\tilde{}U[0,\tilde{w})$. Since $g\leq\tilde{w}$, for $\tilde{w}\leq\frac{a-\beta e+\tilde{w}}{1+\gamma}\longleftrightarrow\tilde{w}\leq\frac{a-\beta e}{\gamma}$, then $p(\tilde{w},e)=0$. For $\tilde{w}\in\left(\frac{a-\beta e}{\gamma},1\right)$, as follows from equation (4), $p(\tilde{w},e)=\frac{\tilde{w}-\frac{a-\beta e+\tilde{w}}{1+\gamma}}{\tilde{w}}=\frac{\gamma}{1+\gamma}-\frac{a-\beta e}{(1+\gamma)\tilde{w}}$. If $\tilde{w}\geq 1$, then $g\tilde{}U[\tilde{w}-1,1]$. For $\frac{a-\beta e+\tilde{w}}{1+\gamma}\geq 1\longleftrightarrow\tilde{w}\geq 1+\gamma-(a-\beta e)$, $p(\tilde{w},e)=0$. For $\tilde{w}\in(1,1+\gamma-(a-\beta e))$, as follows from (4), noting that since $\gamma<1$ and $\tilde{w}\leq 2$, $\frac{a-\beta e+\tilde{w}}{1+\gamma}>\tilde{w}-1$, $p(\tilde{w},e)=\frac{1-\frac{a-\beta e+\tilde{w}}{1+\gamma}}{1-(\tilde{w}-1)}=\frac{1+\gamma-(a-\beta e)-\tilde{w}}{(2-\tilde{w})(1+\gamma)}$.

Parts 2-7 follow from the properties of (5). □

PROOF OF PROPOSITION 2:

The proposition follows directly from the properties of (5), noting that $\beta>0$. □

PROOF OF PROPOSITION 3:

For any given $\tilde{w}$ and e, there exists a threshold level of g above which individuals decide to emigrate. In particular, for $\tilde{w}=1$, it follows that $g\tilde{}U[0,1]$, and hence this threshold level of g is represented by $\hat{g}(1;e)=1-p(1;e)=1-\frac{\gamma-(a-\beta e)}{\gamma+1}=\frac{1+(a-\beta e)}{\gamma+1}$. Since $s+g=\tilde{w}$, it follows that an individual at the threshold level of g, given that $\tilde{w}=1$, will have specific skills equal to $s=1-\hat{g}=\frac{\gamma-(a-\beta e)}{\gamma+1}$. For this individual, by definition of being at the threshold, $w_0=w_1$, and hence $\beta e+\gamma g=a+s$. Suppose there is a rise in γ and a such that this individual remains indifferent, and hence, $p(1,e)$ is unchanged. In this case, the rise in a is given by $da=gd\gamma=\frac{1+(a-\beta e)}{\gamma+1}d\gamma$, where $d\gamma$ is the change in γ.

For $\tilde{w}\in\left(\frac{a-\beta e}{\gamma},1\right)$, $p(\tilde{w},e)=\frac{\gamma}{\gamma+1}-\frac{a-\beta e}{(1+\gamma)\tilde{w}}$. Therefore, the change in $p(\tilde{w},e)$, $dp(\tilde{w},e)$, holding $p(1,e)$ constant, is

$$dp(\tilde{w},e)=\left(\frac{\gamma+d\gamma}{\gamma+d\gamma+1}-\frac{a+da-\beta e}{(1+\gamma+d\gamma)\,\tilde{w}}\right)-\left(\frac{\gamma}{\gamma+1}-\frac{a-\beta e}{(1+\gamma)\,\tilde{w}}\right).$$

Replacing da by $\frac{1+(a-\beta e)}{\gamma+1}d\gamma$,

$$dp(\tilde{w},e)=\left(\frac{\gamma+d\gamma}{\gamma+d\gamma+1}-\frac{a+\frac{1+(a-\beta e)}{\gamma+1}d\gamma-\beta e}{(1+\gamma+d\gamma)\,\tilde{w}}\right)-\left(\frac{\gamma}{\gamma+1}-\frac{a-\beta e}{(1+\gamma)\,\tilde{w}}\right),$$

and re-arranging:

$$dp(\tilde{w},e)=\frac{1}{\tilde{w}}\frac{d\gamma}{\gamma+1}\frac{\tilde{w}-1}{\gamma+d\gamma+1}.$$

Hence, for $d\gamma>0$ and $\tilde{w}<1$, $dp(\tilde{w},e)<0$.

Similarly, for $\tilde{w} \in (1, 1+\gamma-(a-\beta e))$, $p(\tilde{w}, e) = \frac{1+\gamma-(a-\beta e)-\tilde{w}}{(2-\tilde{w})(1+\gamma)}$, and the change in $p(\tilde{w}, e)$, $dp(\tilde{w}, e)$,holding $p(1, e)$ constant is,

$$dp(\tilde{w}, e) = \frac{1+\gamma+d\gamma-(a+da-\beta e)-\tilde{w}}{(2-\tilde{w})(1+\gamma+d\gamma)} - \frac{1+\gamma-(a-\beta e)-\tilde{w}}{(2-\tilde{w})(1+\gamma)},$$

replacing da by $\frac{1+(a-\beta e)}{\gamma+1}d\gamma$,

$$dp(\tilde{w}, e) = \frac{1+\gamma+d\gamma-\left(a+\frac{1+(a-\beta e)}{\gamma+1}d\gamma-\beta e\right)-\tilde{w}}{(2-\tilde{w})(1+\gamma+d\gamma)} - \frac{1+\gamma-(a-\beta e)-\tilde{w}}{(2-\tilde{w})(1+\gamma)},$$

and re-arranging:

$$dp(\tilde{w}, e) = \frac{d\gamma}{\gamma+1}\frac{1-\tilde{w}}{(\tilde{w}-2)(\gamma+d\gamma+1)}.$$

Hence, for $d\gamma > 0$ and $\tilde{w} > 1$, $dp(\tilde{w}, e) > 0$. □

PROOF OF PROPOSITION 4**:**

First note that the density function derived from the distribution of $\tilde{w}$, which is the sum of two independent uniform distributions on the unit interval, is:

$$f(\tilde{w}) = \begin{cases} \tilde{w} & for \quad \tilde{w} \leq 1 \\ 2-\tilde{w} & for \quad \tilde{w} > 1 \end{cases}$$

Hence, it follows from Proposition 1 that

$$\begin{aligned}
p(e) &= \int_0^2 p(\tilde{w}, e) f(\tilde{w}) d\tilde{w} \\
&= \int_{\frac{a-\beta e}{\gamma}}^{1} \left(\frac{\gamma}{\gamma+1} - \frac{a-\beta e}{(1+\gamma)\tilde{w}}\right) f(\tilde{w}) d\tilde{w} + \int_1^{1+\gamma-(a-\beta e)} \left(\frac{1+\gamma-(a-\beta e)-\tilde{w}}{(2-\tilde{w})(1+\gamma)}\right) f(\tilde{w}) d\tilde{w} \\
&= \frac{1}{2\gamma(\gamma+1)}(\gamma-a+\beta e)^2 + \frac{1}{2(\gamma+1)}(\gamma-a+\beta e)^2 \\
&= (\gamma-a+\beta e)^2 \left(\frac{1}{2\gamma(\gamma+1)} + \frac{1}{2(\gamma+1)}\right) \\
&= \frac{(\gamma-a+\beta e)^2}{2\gamma}
\end{aligned}$$

the derivatives appearing in the proposition are straightforward noting that $\gamma > a$.

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Table 1: Descriptive Statistics for Male Workers from the 1995 Israel Census

	Mean	Standard Deviation
Mover 2004	0.016	0.126
Mover 2002	0.013	0.114
Returned 2002-2004 (for Movers 2002)	0.020	0.141
Left by end of 2000 (for Movers 2004)	0.672	0.470
Education	13.011	3.187
Age	37.773	4.613
Married	0.898	0.303
Native	0.614	0.487
Age Arrived in Israel (non-natives only)	20.344	13.274
Asia-Africa Origin	0.466	0.499
European Origin	0.480	0.500
Israeli Origin	0.054	0.227
Number of Children	2.130	1.366
Log Wage (monthly)	8.605	0.593
Observations	40713	

The core sample used throughout the paper and in this table includes all male respondents between the ages of 30 and 45 in the 1995 Israel Census who were not self-employed, worked at least 30 hours a week, and worked at least six months in the previous 12 months. Wages are monthly wages in Israeli Shekels using 1995 prices.

Table 2: Descriptive OLS Regressions for Male Workers in Israel and the US

	Log Wage		Mover (from Israel) 2004	Returned (to Israel) 2002-2004
	US (CPS Data)	Israel (1995 Census)		
Education	0.100***	0.071***	0.002***	-0.002
	(0.001)	(0.001)	(0.000)	(0.002)
Age	0.108***	0.080***	-0.003	0.002
	(0.012)	(0.010)	(0.002)	(0.025)
Age-squared	-0.001***	-0.001***	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Married	0.223***	0.186***	-0.003	-0.009
	(0.006)	(0.008)	(0.002)	(0.019)
Year 1994	-0.008			
	(0.007)			
Year 1996	0.002			
	(0.007)			
Native		-0.099***	0.005***	-0.016
		(0.008)	(0.002)	(0.026)
Age Arrived in Israel		-0.019***	0.001***	-0.001
		(0.000)	(0.000)	(0.001)
Asia-Africa Origin		-0.161	-0.000	0.005
		(0.011)	(0.003)	(0.034)
European Origin		-0.016	0.001	0.039
		(0.012)	(0.003)	(0.033)
Log Wage			-0.001	0.003
			(0.003)	(0.014)
Intercept	5.271***	5.921***	0.070	-0.024
	(0.214)	(0.184)	(0.047)	(0.459)
Root MSE	0.523	0.498		
Observations	33,302	40,713	40,713	538

* indicates significance at the 10% level, ** at the 5% level, and *** at the 1% level. The Israel sample is described in Table 1. The sample for the United States comes from the 1994, 1995, and 1996 March CPS files (dummy variables are included in the specifications for each sample year). The US sample includes all white, male respondents between the ages of 30 and 45 in the three CPS files who were not self-employed, worked at least 30 hours a week, and worked at least six months in the previous 12 months. Wages are monthly wages and are adjusted to 1995 price levels using the CPI-U index.

Table 3: Industry Descriptive Statistics of the Israeli Sample with US CPS Variables

	N	Mean Mover 2004	Mean Log Wage	Mean Educa-tion	ROR to Educ in Israel	ROR to Educ in US	Residual SD in Israel	Residual SD in US
Agriculture, Forestry, Fishing	663	0.015	8.199	11.157	0.039	0.070	0.488	0.525
Mfg	13493	0.017	8.561	12.723	0.078	0.113	0.451	0.500
Electric, Water	1038	0.014	8.821	13.163	0.058	0.079	0.418	0.407
Construction	2939	0.020	8.463	11.939	0.064	0.091	0.479	0.543
Wholesale and Retail	6270	0.014	8.533	12.341	0.072	0.094	0.513	0.535
Trans., Storage, Comm.	3331	0.011	8.610	12.036	0.072	0.088	0.510	0.531
Bank, Finance, Insurance	1627	0.010	8.996	14.286	0.068	0.108	0.467	0.496
Real Estate, Business	3776	0.022	8.784	14.871	0.069	0.124	0.533	0.535
Public Admin.	3216	0.008	8.685	12.801	0.067	0.067	0.417	0.439
Education	1488	0.018	8.578	15.545	0.052	0.073	0.484	0.440
Health, Welfare, Social Work	1693	0.028	8.674	15.282	0.073	0.122	0.605	0.543
Social Service	1179	0.015	8.467	12.602	0.061	0.066	0.531	0.567

Industry categories were matched across the Israeli 1995 Census and the CPS files from the US. The rate of return to education in each sector in Israel comes from a regression specified in the second column of Table 2, but run on a sample of workers within each sector. The "Residual SD" for each sector in Israel comes from the same set of regressions and is computed by calculating the standard deviation of residuals within each education group (high school dropouts, high school graduates, and college graduates) within each sector, and then computing the mean by sector. Similarly, the returns to education and "Residual SD" for the US comes from similar regressions as specified in the first column in Table 1 for each sector.

Table 4: Occupation Descriptive Statistics of the Israeli Sample with US CPS Variables

	N	Mean Mover 2004	Mean Log Wage	Mean Educa-tion	ROR to Educ in Israel	ROR to Educ in US	Residual SD in Israel	Residual SD in US
Academic Professionals	5624	0.027	8.945	16.842	0.016	0.067	0.516	0.489
Associate Professionals and Technicians	3867	0.018	8.723	14.044	0.041	0.070	0.467	0.475
Managers	4452	0.012	9.139	14.371	0.047	0.098	0.511	0.507
Clerical	4395	0.008	8.610	12.764	0.063	0.054	0.452	0.521
Agents, Sales, and Service	4429	0.012	8.496	12.183	0.054	0.113	0.489	0.571
Skilled Agricultural	516	0.016	8.152	11.258	0.036	0.060	0.462	0.529
Skilled Workers	13835	0.017	8.379	11.472	0.045	0.070	0.438	0.509
Unskilled Workers	3595	0.014	8.348	11.717	0.063	0.054	0.473	0.532

Occupation categories were matched across the Israeli 1995 Census and the CPS files from the US. The rate of return to education in each sector in Israel comes from a regression specified in the second column of Table 2, but run on a sample of workers within each sector. The "Residual SD" for each sector in Israel comes from the same set of regressions and is computed by calculating the standard deviation of residuals within each education group (high school dropouts, high school graduates, and college graduates) within each sector, and then computing the mean by sector. Similarly, the returns to education and "Residual SD" for the US comes from similar regressions as specified in the first column in Table 1 for each sector.

Table 5: Selection on Education – Main Results for the Industry Level Analysis

	Probit for being a Mover in 2004			
Education* Israel ROR Educ in Industry i	-0.0146		-0.0930***	
	(0.018)		(0.027)	
Education* US ROR Educ in Industry i		0.0202**	0.0511***	
		(0.0083)	(0.012)	
Education* Diff between Israel and US in ROR Educ in Industry i				-0.0427***
				(0.011)
Industry Wage Residual	0.000155	0.000144	0.000119	0.000130
	(0.0010)	(0.0010)	(0.0010)	(0.0010)
Industry Wage Residual^2	-0.00481***	-0.00481***	-0.00482***	-0.00482***
	(0.0015)	(0.0015)	(0.0015)	(0.0015)
Education	0.00217*	-0.000903	0.00254*	-0.000170
	(0.0013)	(0.00085)	(0.0014)	(0.00038)
Married	0.00132	0.00128	0.00126	0.00126
	(0.0014)	(0.0014)	(0.0014)	(0.0014)
Number of Children	-0.00199***	-0.00199***	-0.00201***	-0.00200***
	(0.00045)	(0.00045)	(0.00045)	(0.00045)
Native	0.00249	0.00244	0.00242	0.00242
	(0.0017)	(0.0017)	(0.0017)	(0.0017)
Age Arrived in Israel	0.000634***	0.00063***	0.000631***	0.000632***
	(0.000062)	(0.00006)	(0.000061)	(0.000061)
Industry Fixed Effects	Yes	Yes	Yes	Yes
Observations	40,713	40,713	40,713	40,713

* indicates significance at the 10% level, ** at the 5% level, and *** at the 1% level. All specifications include controls for age, age-squared, and ethnic dummies.. Coefficients are the marginal effects calculated at the sample means of the explanatory variables.

Table 6: Selection on Education – Main Results for the Occupation Level Analysis

	Probit for being a Mover in 2004			
Education* Israel ROR Educ in Occup i	-0.0297** (0.012)		-0.0298** (0.012)	
Education* US ROR Educ in Occup i		-0.0221** (0.010)	-0.0219** (0.0099)	
Education* Diff between Israel and US in ROR Educ in Occupation i				0.00157 (0.0079)
Occupation Wage Residual	-0.000909 (0.0011)	-0.000868 (0.0011)	-0.000871 (0.0011)	-0.000895 (0.0011)
Occupation Wage Residual^2	-0.00482*** (0.0015)	-0.00480*** (0.0015)	-0.00484*** (0.0015)	-0.00478*** (0.0015)
Education	0.00240*** (0.00058)	0.00269*** (0.00075)	0.00400*** (0.00093)	0.00113*** (0.00029)
Married	0.00115 (0.0014)	0.00110 (0.0014)	0.00117 (0.0014)	0.00109 (0.0015)
Number of Children	-0.00200*** (0.00045)	-0.00197*** (0.00045)	-0.00201*** (0.00045)	-0.00196*** (0.00045)
Native	0.00262 (0.0017)	0.00255 (0.0017)	0.00262 (0.0017)	0.00255 (0.0017)
Age Arrived in Israel	0.000646*** (0.000062)	0.000635*** (0.000062)	0.000644*** (0.000062)	0.000637*** (0.000062)
Occupation Fixed Effects	Yes	Yes	Yes	Yes
Observations	40,713	40,713	40,713	40,713

* indicates significance at the 10% level, ** at the 5% level, and *** at the 1% level. All specifications include controls for age, age-squared, and ethnic dummies.. Coefficients are the marginal effects calculated at the sample means of the explanatory variables.

Table 7: Selection on Education – Sensitivity to Sample Selection

	Probit for being a Mover in 2004			
Industry Level Analysis				
Education* Diff between Israel and US in ROR Educ in Industry i	-0.0427*** (0.011)	-0.0484*** (0.012)	-0.0321 (0.024)	-0.0426*** (0.011)
Sample Restriction	None	Natives	Non-Natives	Industries with Sample Size > 1000
Industry Fixed Effects	Yes	Yes	Yes	Yes
Observations	40,713	25,011	15,702	40,050
Occupation Level Analysis				
Education* Diff between Israel and US in ROR Educ in Occupation i	0.00157 (0.0079)	0.00509 (0.0096)	-0.00612 (0.016)	0.00147 (0.0079)
Sample Restriction	None	Natives	Non-Natives	Occupations with Sample Size > 1000
Occupation Fixed Effects	Yes	Yes	Yes	Yes
Observations	40,713	25,011	15,702	40,197

* indicates significance at the 10% level, ** at the 5% level, and *** at the 1% level. All specifications include controls for education, age, age-squared, ethnic dummies, marital status, native status, and age arrived in Israel (if non-native). The industry analysis also controls for the individual's residual wage within his industry and its square, while the occupation analysis controls for the individual's residual wage within his occupation and its square. Coefficients are the marginal effects calculated at the sample means of the explanatory variables.

Table 8: Selection on Education – Sensitivity to Various Definitions of a "Mover"

	Mover 2004	Mover 2002	Mover 2002 and 2004	Mover 2004 since 2000
Industry Level Analysis				
Education* Diff between Israel and US in ROR Educ in Industry i	-0.0427*** (0.011)	-0.0321*** (0.010)	-0.0315*** (0.010)	-0.0269*** (0.0090)
Industry Fixed Effects	Yes	Yes	Yes	Yes
Observations	40,713	40,713	40,713	40,713
Occupation Level Analysis				
Education* Diff between Israel and US in ROR Educ in Occupation i	0.00157 (0.0079)	0.00136 (0.0074)	0.00151 (0.0073)	-0.00103 (0.0064)
Occupation Fixed Effects	Yes	Yes	Yes	Yes
Observations	40,713	40,713	40,713	40,713

* indicates significance at the 10% level, ** at the 5% level, and *** at the 1% level. All specifications include controls for education, age, age-squared, ethnic dummies, marital status, native status, and age arrived in Israel (if non-native). The industry analysis also controls for the individual's residual wage within his industry and its square, while the occupation analysis controls for the individual's residual wage within his occupation and its square. Coefficients are the marginal effects calculated at the sample means of the explanatory variables.

Table 9: Selection on Unobservables – Main Industry Level Analysis

	Probit for being a Mover in 2004			
Industry Wage Residual* Israel Residual SD in Industry-Education Group i	-0.0212 (0.015)		-0.0295* (0.016)	
Industry Wage Residual* US Residual SD in Industry-Education Group i		0.0219 (0.021)	0.0357 (0.022)	
Industry Wage Residual * Difference between Israel and US in Residual SD in Industry-Education Group i				-0.0311** (0.015)
Industry Wage Residual	0.0106 (0.0077)	-0.0113 (0.011)	-0.00328 (0.012)	-0.000146 (0.0010)
Industry Wage Residual^2	-0.00524*** (0.0015)	-0.00494*** (0.0015)	-0.00549*** (0.0015)	-0.00550*** (0.0015)
Education	0.000862*** (0.00025)	0.00085*** (0.0003)	0.000864*** (0.00025)	0.000865*** (0.00025)
Married	0.00114 (0.0014)	0.00113 (0.0014)	0.00112 (0.0014)	0.00113 (0.0014)
Number of Children	-0.00191*** (0.00045)	-0.00191*** (0.00045)	-0.00190*** (0.00045)	-0.00190*** (0.00045)
Native	0.00218 (0.0017)	0.00215 (0.0017)	0.00213 (0.0017)	0.00214 (0.0017)
Age Arrived in Israel	0.000609*** (0.000062)	0.00061*** (0.00006)	0.000606*** (0.000062)	0.000606*** (0.000062)
Industry-Education Group Fixed Effects	Yes	Yes	Yes	Yes
Observations	40,412	40,412	40,412	40,412

* indicates significance at the 10% level, ** at the 5% level, and *** at the 1% level. All specifications include controls for age, age-squared, and ethnic dummies.. Coefficients are the marginal effects calculated at the sample means of the explanatory variables.

Table 10: Selection on Unobservables – Main Occupation Level Analysis

	Probit for being a Mover in 2004			
Occupation Wage Residual* Israel Residual SD in Occup-Education Group i	-0.0764*** (0.028)		-0.0785*** (0.028)	
Occupation Wage Residual* US Residual SD in Occup-Education Group i		0.0245 (0.029)	0.0303 (0.029)	
Occupation Wage Residual * Difference between Israel and US in Residual SD in Occup-Education Group i				-0.0552*** (0.021)
Occupation Wage Residual	0.0357*** (0.014)	-0.0135 (0.015)	0.0213 (0.019)	-0.00257** (0.0012)
Occupation Wage Residual^2	-0.00569*** (0.0015)	-0.00493*** (0.0015)	-0.00584*** (0.0015)	-0.00569*** (0.0015)
Education	0.000897*** (0.00024)	0.00088*** (0.0003)	0.000896*** (0.00024)	0.000892*** (0.00024)
Married	0.000969 (0.0014)	0.000999 (0.0014)	0.000956 (0.0014)	0.000958 (0.0014)
Number of Children	-0.00187*** (0.00044)	-0.00190*** (0.00044)	-0.00186*** (0.00044)	-0.00187*** (0.00044)
Native	0.00224 (0.0017)	0.00225 (0.0017)	0.00222 (0.0017)	0.00221 (0.0017)
Age Arrived in Israel	0.000596*** (0.000063)	0.00060*** (0.00006)	0.000596*** (0.000063)	0.000596*** (0.000063)
Occupation-Education Group Fixed Effects	Yes	Yes	Yes	Yes
Observations	40,621	40,621	40,621	40,621

* indicates significance at the 10% level, ** at the 5% level, and *** at the 1% level. All specifications include controls for age, age-squared, and ethnic dummies.. Coefficients are the marginal effects calculated at the sample means of the explanatory variables.

Table 11: Selection on Unobservables – Sensitivity to Sample Selection

	Probit for being a Mover in 2004			
Industry Level Analysis				
Industry Wage Residual * Difference between Israel and US in Residual SD in Industry-Education Group i	-0.0311** (0.015)	-0.0244* (0.014)	-0.0340 (0.033)	-0.0331** (0.015)
Sample Restriction	None	Natives	Non-Natives	Industries with Sample Size > 1000
Industry-Education Group Fixed Effects	Yes	Yes	Yes	Yes
Observations	40,412	24,674	15,602	39,749
Occupation Level Analysis				
Occupation Wage Residual * Difference between Israel and US in Residual SD in Occup-Education Group i	-0.0552*** (0.021)	-0.0515** (0.023)	-0.0636 (0.044)	-0.0621*** (0.021)
Sample Restriction	None	Natives	Non-Natives	Occupations with Sample Size > 1000
Occupation-Education Group Fixed Effects	Yes	Yes	Yes	Yes
Observations	40,621	24,573	15,673	40,105

* indicates significance at the 10% level, ** at the 5% level, and *** at the 1% level. All specifications include controls for education, age, age-squared, ethnic dummies, marital status, native status, and age arrived in Israel (if non-native). The industry analysis also controls for the individual's residual wage within his industry and its square, while the occupation analysis controls for the individual's residual wage within his occupation and its square. Coefficients are the marginal effects calculated at the sample means of the explanatory variables.

Table 12: Selection on Unobservables – Sensitivity to Definitions of a "Mover"

	Mover 2004	Mover 2002	Mover 2002 and 2004	Mover 2004 since 2000
Industry Level Analysis				
Industry Wage Residual * Difference between Israel and US in Residual SD in Industry-Education Group i	-0.0311** (0.015)	-0.0223 (0.014)	-0.0236* (0.014)	-0.0226* (0.012)
Industry-Education Group Fixed Effects	Yes	Yes	Yes	Yes
Observations	40,412	40,412	40,412	40,412
Occupation Level Analysis				
Occupation Wage Residual * Difference between Israel and US in Residual SD in Occup-Education Group i	-0.0552*** (0.021)	-0.0449** (0.019)	-0.0442** (0.019)	-0.0406** (0.017)
Occupation-Education Group Fixed Effects	Yes	Yes	Yes	Yes
Observations	40,621	40,621	40,621	40,621

* indicates significance at the 10% level, ** at the 5% level, and *** at the 1% level. All specifications include controls for education, age, age-squared, ethnic dummies, marital status, native status, and age arrived in Israel (if non-native). The industry analysis also controls for the individual's residual wage within his industry and its square, while the occupation analysis controls for the individual's residual wage within his occupation and its square. Coefficients are the marginal effects calculated at the sample means of the explanatory variables.

Table 13: Estimating Selection on Education and Unobservables Together

	Probit for being a Mover in 2004			
	Industry Analysis		Occupation Analysis	
Education* Diff between Israel and US in ROR Educ in Industry i	-0.0418*** (0.011)	-0.0306* (0.017)		
Industry Wage Residual * Difference between Israel and US in Residual SD in Industry-Education Group i	-0.0308** (0.015)	-0.0303** (0.015)		
Education* Diff between Israel and US in ROR Educ in Occupation i			0.00184 (0.0078)	-0.0123 (0.011)
Occupation Wage Residual * Difference between Israel and US in Residual SD in Occup-Education Group i			-0.0568*** (0.021)	-0.0546*** (0.021)
Industry Fixed Effects	Yes	No		
Industry-Education Group Fixed Effects	No	Yes		
Occupation Fixed Effects			Yes	No
Occupation-Education Group Fixed Effects			No	Yes
Observations	40,713	40,412	40,713	40,621

* indicates significance at the 10% level, ** at the 5% level, and *** at the 1% level. All specifications include controls for education, age, age-squared, ethnic dummies, marital status, native status, and age arrived in Israel (if non-native). The industry analysis also controls for the individual's residual wage within his industry and its square, while the occupation analysis controls for the individual's residual wage within his occupation and its square. Coefficients are the marginal effects calculated at the sample means of the explanatory variables.

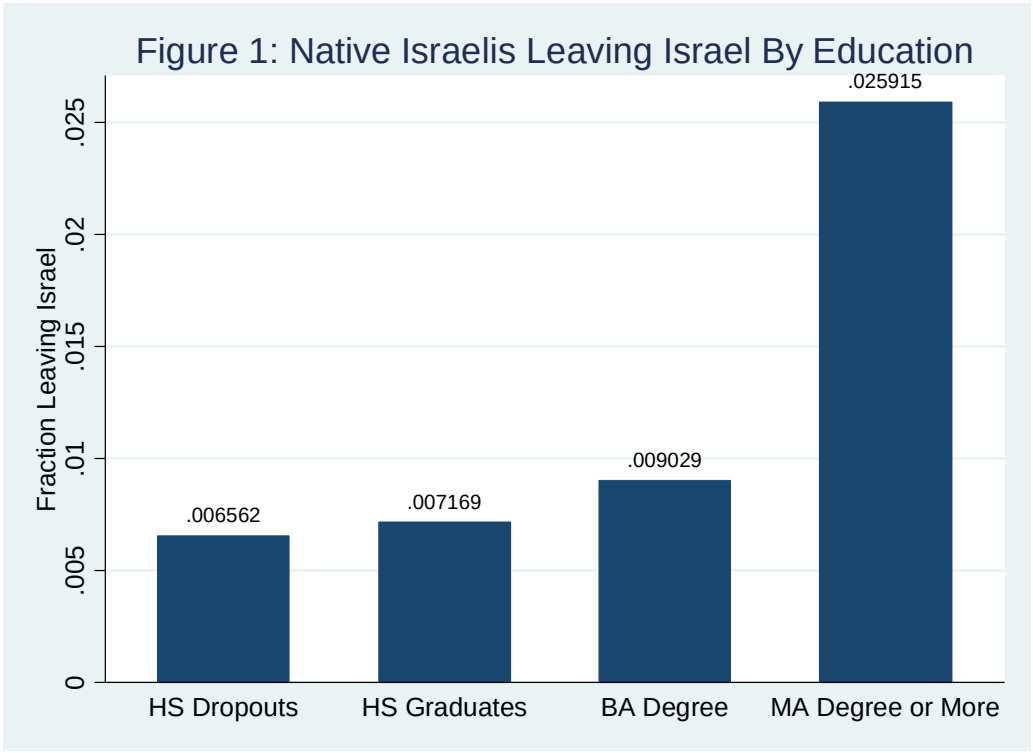
Figure 1: Native Israelis Leaving Israel By Education
Fraction Leaving Israel
0
.005
.01
.015
.02
.025
.006562
.007169
.009029
.025915
HS Dropouts
HS Graduates
BA Degree
MA Degree or More

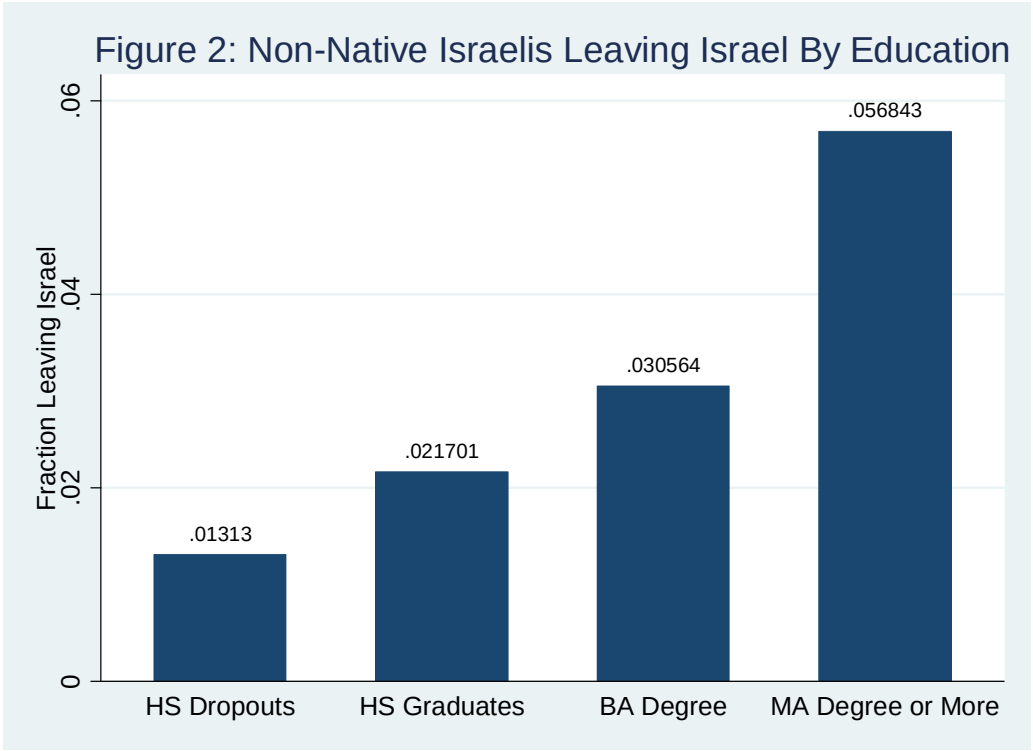
Figure 2: Non-Native Israelis Leaving Israel By Education
Fraction Leaving Israel
0
.02
.04
.06
.01313
.021701
.030564
.056843
HS Dropouts
HS Graduates
BA Degree
MA Degree or More

Figure 3: Returning to Israel from 2002-2004 by Education

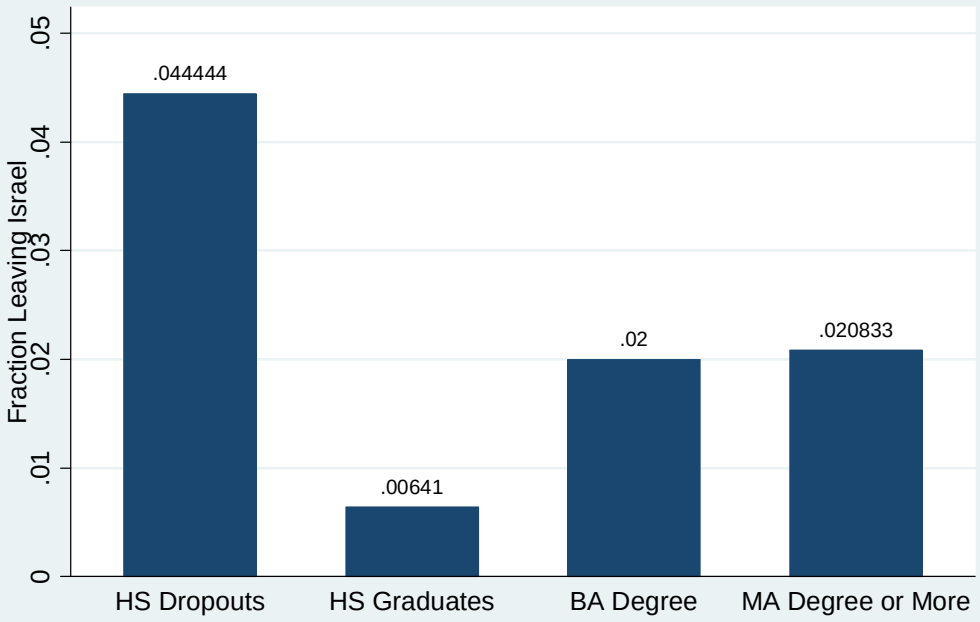

Figure 4: Fraction Leaving Israel by Residual Wages

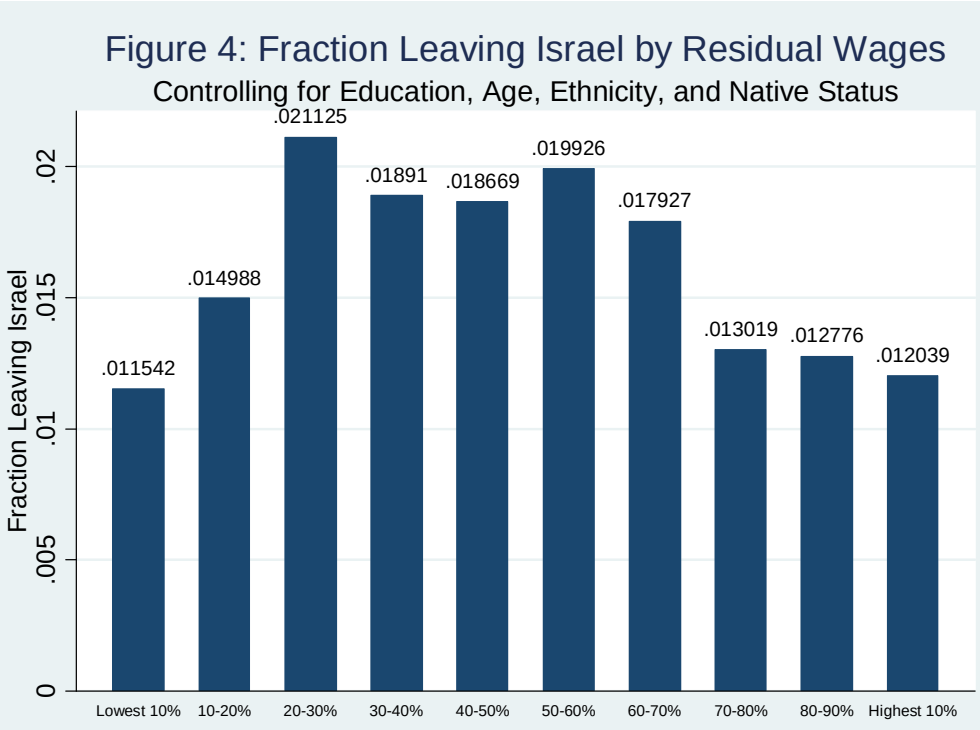

Figure 5: Fraction Leaving Israel by Residual Wages

Controlling for Industry, Education, Age, Ethnicity, and Native Status

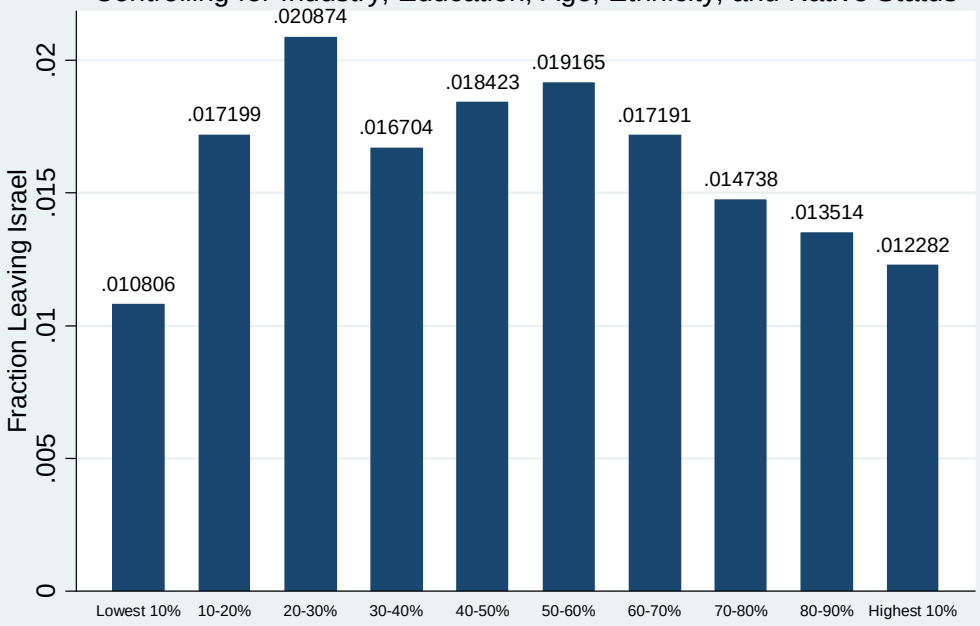

Figure 6: Fraction Leaving Israel by Residual Wages

Controlling for Occupation, Education, Age, Ethnicity, and Native Status

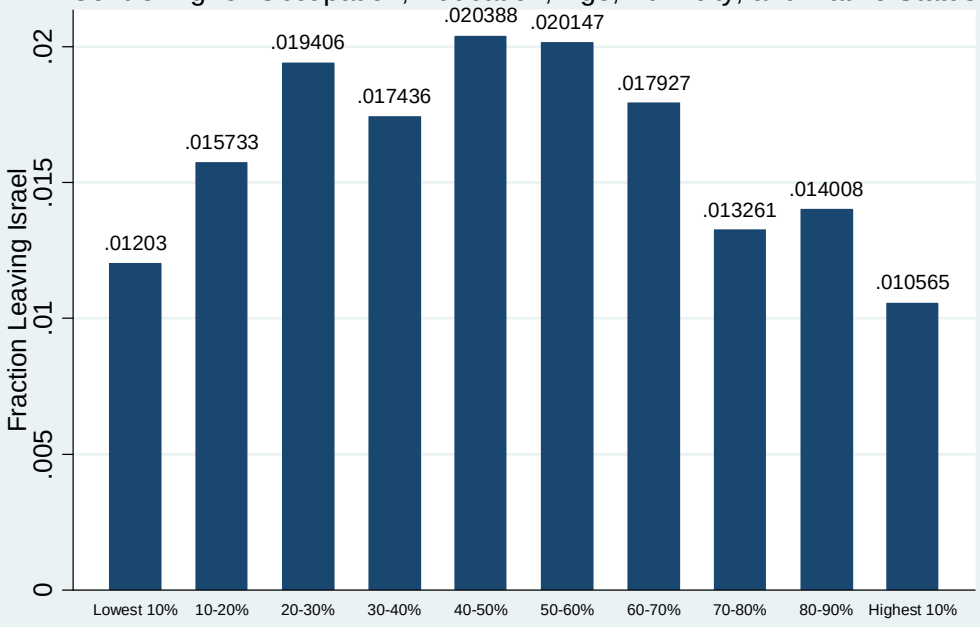

Figure 7: Industry Analysis - Predicted Movers by Education

Under Various Returns to Schooling in all Industries in Israel versus US

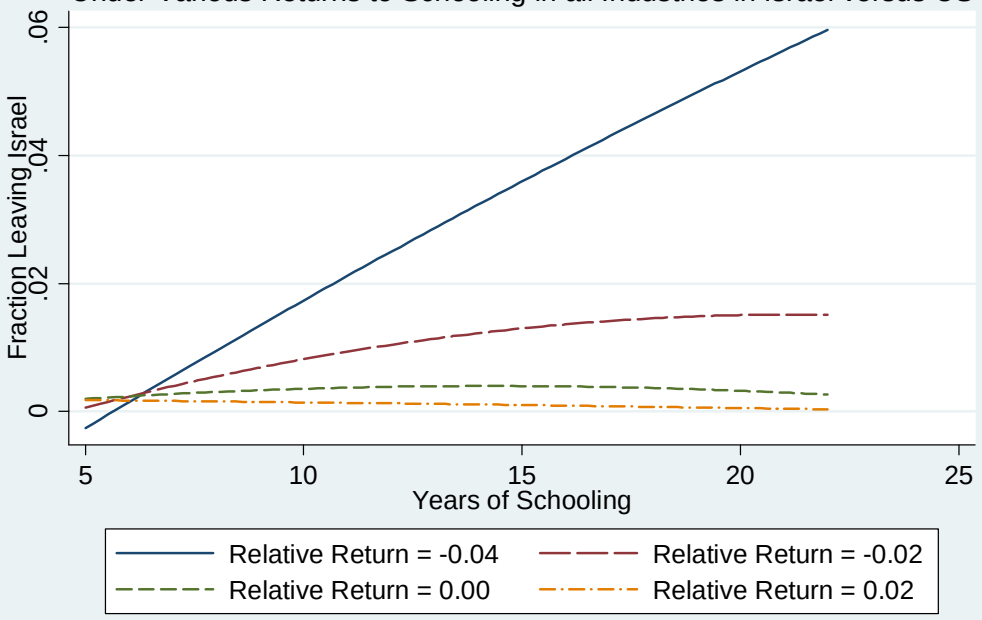

Figure 8: Industry Analysis - Predicted Movers by Education

Under Various Returns to Schooling in all Industries in Israel versus US

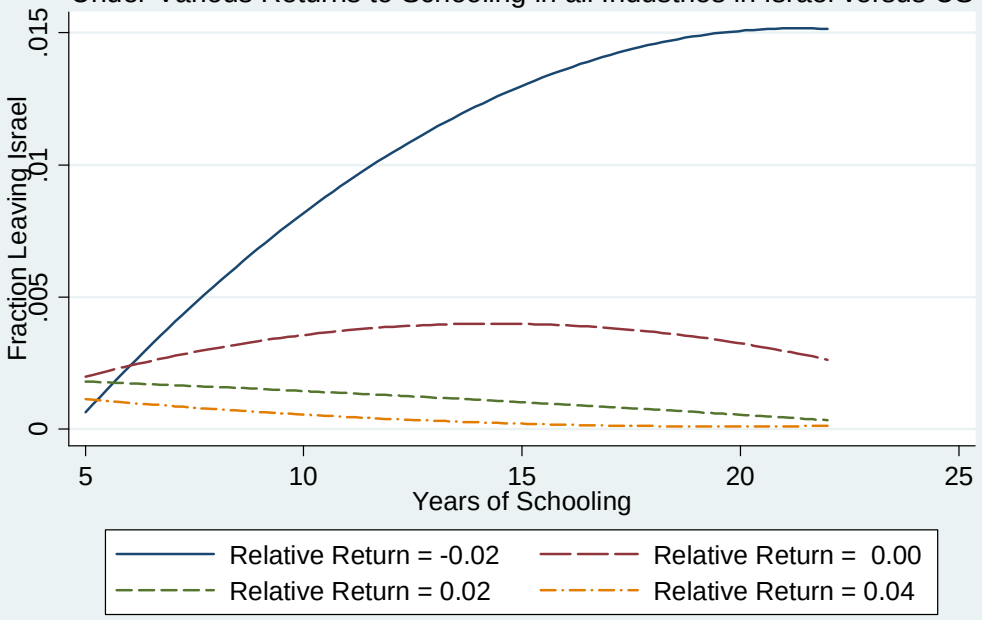

Figure 9: Industry Analysis - Predicted Movers by Education

Actual versus Decrease in Relative Return to School in All Industries by 0.02

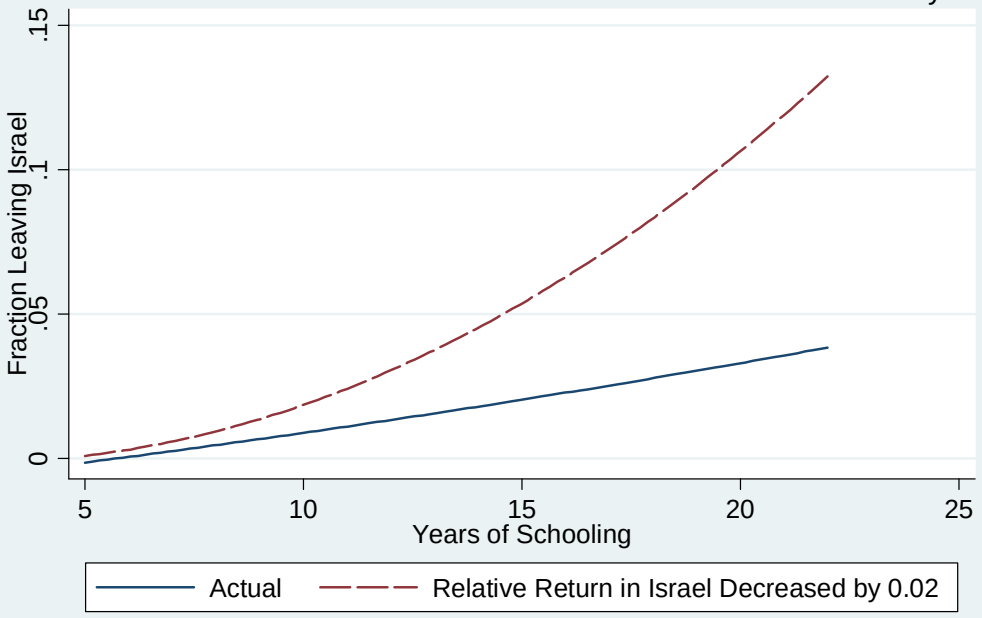

Figure 10: Industry Analysis - Predicted Movers by Education

Actual versus Increase in Relative Return to School in All Industries by 0.03

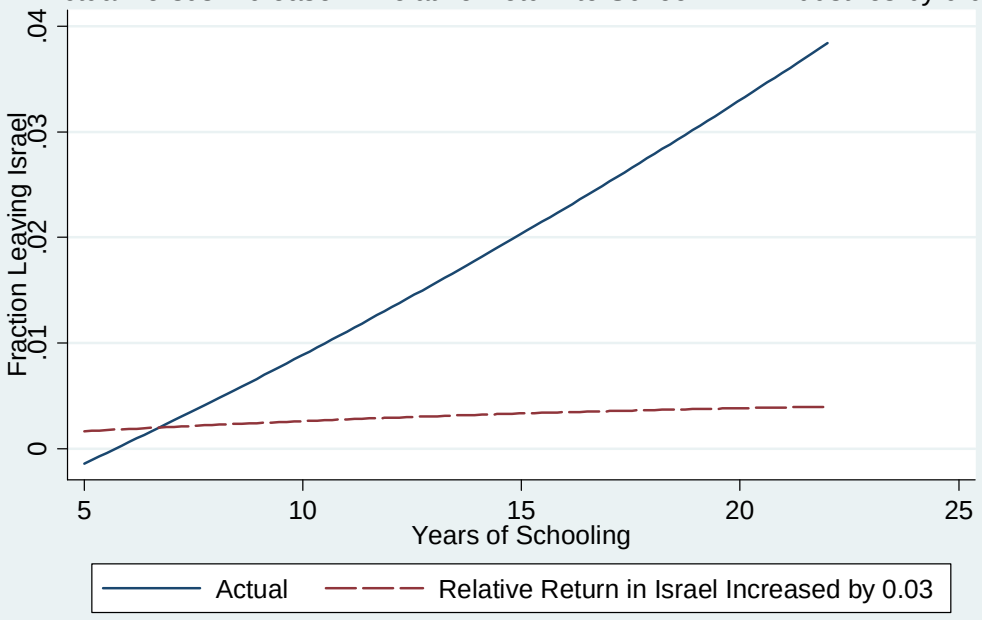

Figure 11: Predicted Movers by Industry Residual Wages

Under Various Levels of Relative Industry Inequality in Israel versus US

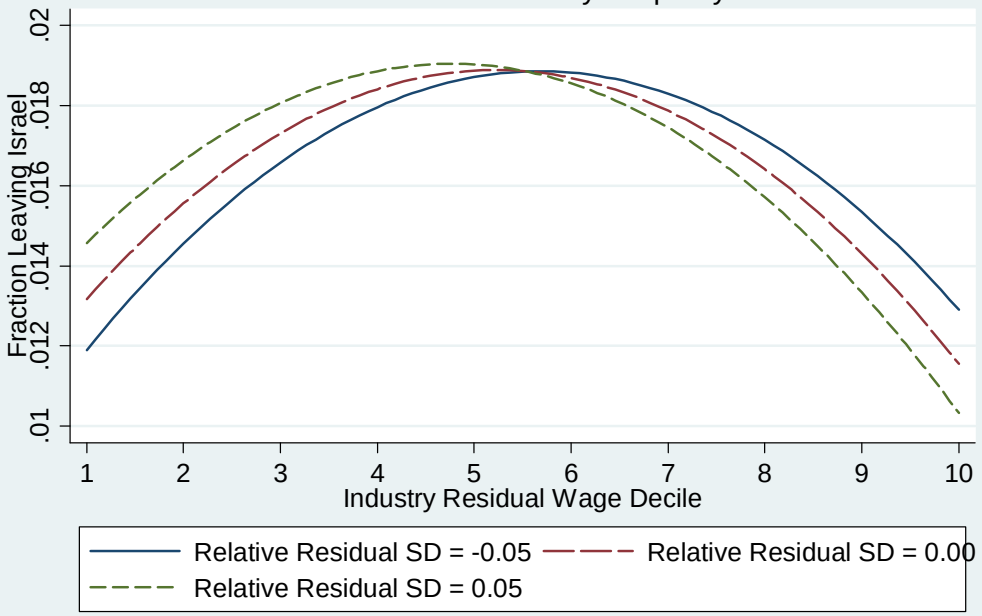

Figure 12: Predicted Movers by Industry Residual Wages

Actual versus Decreasing Relative Inequality in all Industries in Israel by 0.04

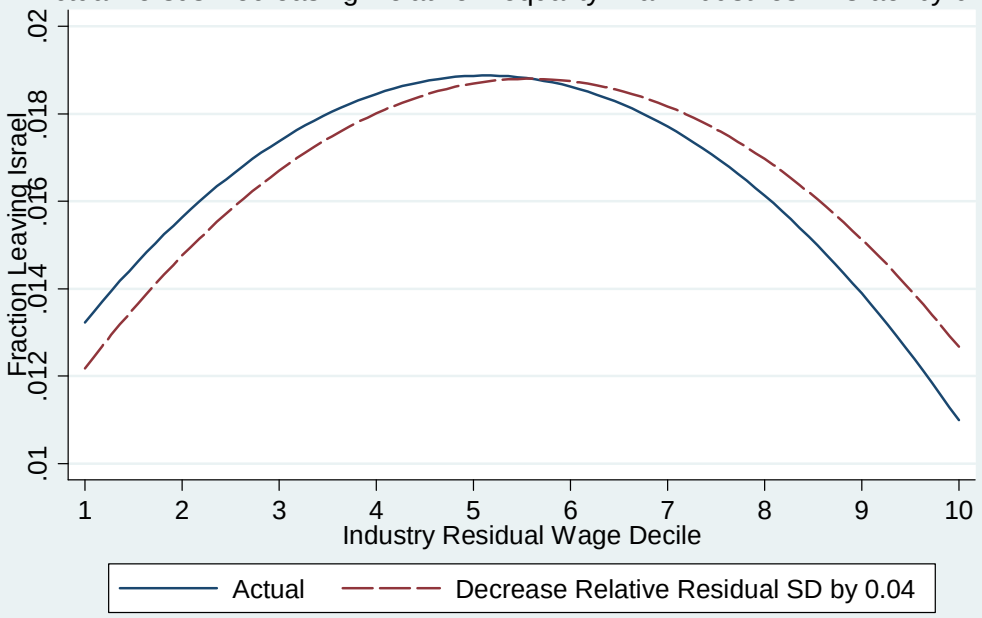

Figure 13: Predicted Movers by Industry Residual Wages

Actual versus Increase in Relative Inequality in all Industries in Israel by 0.025

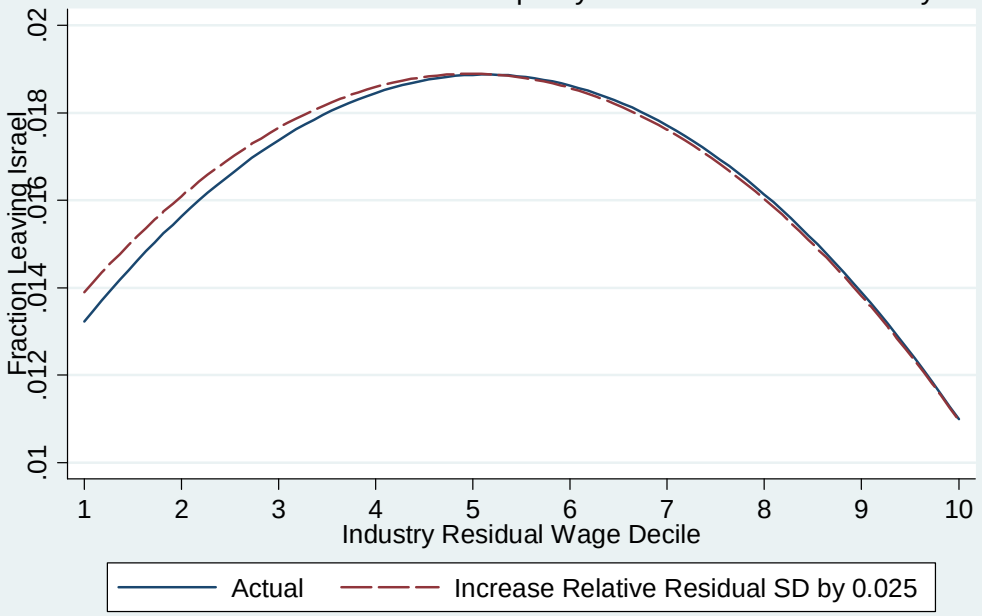

Figure 14: Predicted Movers by Occupation Residual Wages

Under Various Levels of Relative Occupation Inequality in Israel versus US

Figure 15: Predicted Movers by Occupation Residual Wages

Actual versus Decreasing Relative Inequality in all Occupations in Israel by 0.04

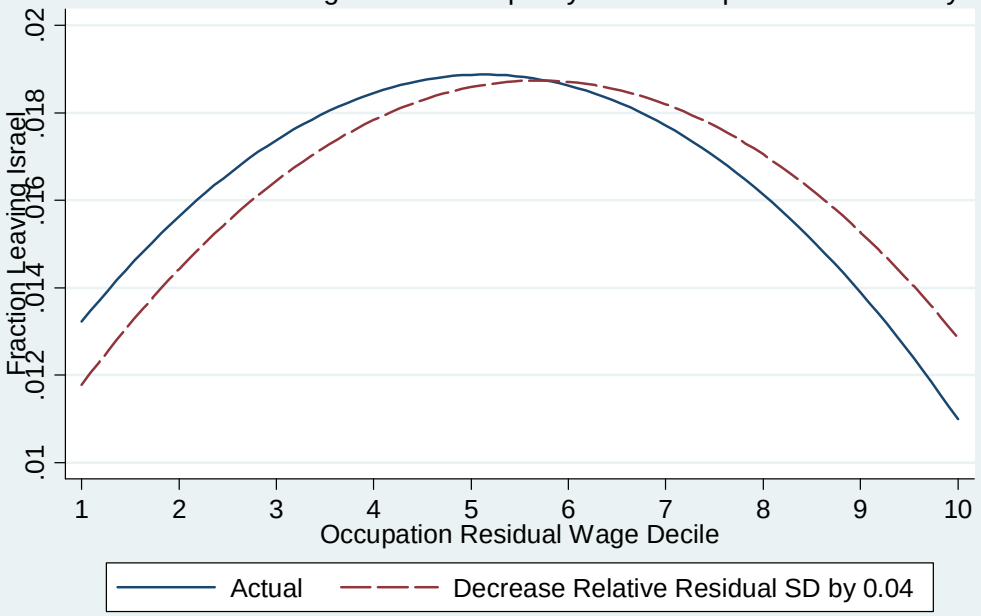

Figure 16: Predicted Movers by Occupation Residual Wages

Actual versus Increase in Relative Inequality in all Occupations in Israel by 0.025