

Reversing Brain Drain: Evidence from Malaysia's Returning Expert Program¹

Ximena V. Del Carpio
World Bank

Caglar Ozden
World Bank

Mauro Testaverde
World Bank

Mathis Wagner
Boston College

December 2015

Abstract:

This paper presents the first evidence on the efficacy of a major program designed to encourage the return migration of high-skilled individuals. The Malaysian Returning Expert Program (REP) targets high-skilled Malaysians abroad and provides them with incentives to return. We use the fact that at several thresholds the probability of acceptance to the program increases discontinuously, to identify the impact of acceptance to the REP on the probability of returning to Malaysia. Our fuzzy regression discontinuity design estimates suggest that program approval increases the return probability by 40 – 70 percent for applicants with a pre-existing job offer in Malaysia. For those who apply without a job offer in Malaysia there is no significant treatment effect. We conduct a fiscal cost-benefit analysis of the REP and find a modest net fiscal effect of the program, between minus \$6,900 and plus \$4,200 per applicant, suggesting that the program roughly pays for itself.

JEL: F22, J61, J68, O15.

Keywords: High-Skilled Migration Policy, Return Migration, Impact Evaluation, Brain Drain, Brain Circulation.

¹ We are grateful to Johan Merican and his excellent team at TalentCorp Malaysia for their support in the completion of this evaluation, and the Department of Statistics of Malaysia for making labor force data available. We thank Pablo Acosta, Laurent Bouton, Taryn Dinkelman, John Gibson, Frederico Gil Sander, David McKenzie, Hillel Rapoport and Jan Stuhler for extensive feedback and seminar participants at the Center for Global Development, SGE Annual Conference, Universidad Carlos III de Madrid, University at Buffalo SUNY, the World Bank, and the 8th Migration and Development Conference. The findings, conclusions and views expressed in this paper are entirely those of the authors and should not be attributed to the World Bank, its executive directors and the countries they represent. Contact information: xdelcarpio@worldbank.org, cozden@worldbank.org, mtestaverde@worldbank.org, mathis.wagner@bc.edu (corresponding author).

1. Introduction

Most countries around the world face large-scale emigration of their highly educated and skilled workers to other countries, especially to high-income OECD countries (see Figure 1). While the loss of relatively scarce human capital is a major concern for many developing countries, there is growing evidence that there are potential long-term benefits (Docquier and Rapoport, 2011, Gibson and McKenzie, 2011). In particular, return of these high-skilled workers after a period of employment abroad, referred to as ‘brain circulation,’ may lead to considerable economic benefits.² Thus, encouraging return migration may be one of the most effective policy tools for origin countries to ameliorate the negative effects of brain drain and benefit from global labor mobility.

In designing policies to encourage the return of high-skilled expatriates, policymakers need to answer two critical questions. First, how responsive is their high-skilled diaspora to various incentives that encourage return? Second, can such a program be cost effective? This paper breaks new ground in answering these questions using quasi-experimental evidence from the Malaysian Returning Expert Program (REP), which was designed to encourage the return of high-skilled expatriate Malaysians.

There is rapidly increasing interest in programs designed to attract a countries’ professional diaspora.³ Yet, there are very few well-designed programs to encourage ‘brain circulation’ or ‘brain return’ and very little evidence on the efficacy of potential policies (McKenzie and Yang, 2015). The most closely related academic work is a small literature, and in particular Kleven et al. (2014), that focuses on tax-based incentives to attract high-skilled foreign workers.⁴ Our

² Return migrants come back with physical and human capital earned abroad (e.g. Dustmann and Kirchkamp 2002) may transfer skills and knowledge gained abroad (e.g. Dos Santos and Postel-Vinay 2003), see also Thom (2010). Gibson and McKenzie (2012) provide micro-level evidence on the channels by which high-skilled emigration affects sending countries.

³ See The Economist (June 27, 2015) <http://www.economist.com/news/international/21656176-governments-believe-their-diasporas-can-solve-all-sorts-problems-they-are-picky?frsc=dg%7Cc>. China, Ghana, Ireland, Israel and Taiwan have prominent programs. Many target academics and researchers in science and engineering fields. For example, the Millennium Science Initiative in Chile, One Thousand Talent Program in China, Presidential Fund for Retention in Mexico and the RAICES program in Argentina. All of these programs provide supplementary income and research funds. The TOKTEN program of the United Nations was implemented in over 15 countries over the last thirty years to attract high-skilled diaspora members for short durations to provide training.

⁴ Kleven et al. (2014) uses quasi-experimental variation created by a Danish preferential tax scheme for high-earning immigrants and find a very large elasticity of migration (between 1.5 and 2) with respect to the tax on foreigners.

evaluation of the REP provides the first rigorous evidence of the efficacy of a program targeting a country's own diaspora.

The REP is designed for Malaysian citizens abroad at the high end of the skill/education distribution. We obtained the detailed administrative data on applicants from TalentCorp, the government agency tasked with administering the REP. During the period 2011–2014, the program processed applications of around 4,000 expatriates, which represents a substantial fraction of the country's high-skilled diaspora. For example, we use REP administrative data, the UK Labour Force Survey and American Community Survey to identify the Malaysian diaspora in the UK and US and REP applications from those countries. We find that the annual application rate of high-skilled Malaysian expatriates is around 25 percent of the annual outflow of high-skilled Malaysians to these countries, and about 1.5 percent of the stock of eligible expatriates.

The key features of the program are a 15 percent flat income tax for five years, a tax exemption on the import of up to two cars, and permanent residency status for a foreign spouse and children. Once the basic criteria for approval to the REP have been satisfied,⁵ the key determinant of eligibility is whether the applicant has had sufficient work experience abroad. This program feature generates large discontinuities in the probability of being approved. Despite the fact that the eligibility requirements for the REP are to a large extent public knowledge, there is sufficient uncertainty in the application process to ensure that marginal applicants (around the work experience threshold) cannot be certain on which side of the threshold they will fall. We find no evidence that the observable characteristics of applicants or the number of applicants change discontinuously at the threshold, while the approval probability increases by around 50 percentage points. Thus the program's impact on return probabilities can be evaluated using a fuzzy regression discontinuity (RD) design.

A simple analytical framework for understanding expatriates' REP application and return decision incentives guides our empirical analysis. The model provides a way to interpret our fuzzy RD estimate of the Local Average Treatment Effect (LATE) and insights into the

See also Kleven, Landais and Saez (2013) on professional football players. On tax-induced mobility within a country, see Liebig et al. (2007) for Switzerland and Bakija and Slemrod (2004) and Young and Varner (2011) for the United States.

⁵ The applicant has to be currently employed abroad, is under no legal or financial obligation to return, and has been continuously abroad for the last 3 years.

effectiveness of program features that drive the self-selection of applicants and return migrants. In particular, it highlights key differences between two applicant groups: those with and without a pre-existing job offer in Malaysia at the time of their application.

Our empirical analysis yields several main results. First, the fuzzy RD estimates show that REP approval results in a large and robust increase in the return probability for applicants with a job offer in Malaysia (prior to applying to the REP). The LATE is around 40 percentage points when we use the full sample without covariates, and the impact is possibly as large as 60 or 70 percentage points.⁶ The program's impact on the expatriate return probability, not conditional on application, is of course much lower. The average annual application rate is around 1.5 percent of the total diaspora population, and, hence, the unconditional treatment effect is around 0.8 percentage points. Note also that for this group of applicants (with a job offer in Malaysia) the application to the REP appears driven by the availability of a job offer, and there is strong evidence of no sorting (on observables or unobservables) around the eligibility threshold.

Second, the impact of program approval on return is small and never statistically significant for those applicants without a pre-existing job offer. The theoretical framework provides insights to why the program is ineffective for this group. Applicants without a pre-existing job offer tend not to apply for job-related or financial reasons, but rather have strong non-pecuniary reasons for return. Consequently, this group of applicants does not contain many individuals whose decision is swayed by a (marginal) change in the financial incentives provided by the REP.

Third, we conduct a cost-benefit analysis of the fiscal impact of the program. The main fiscal costs of the REP arises from the foregone tax receipts of approved applicants who would have returned to Malaysia even in the absence of the program, but still take advantage of the available tax breaks. The fiscal benefits arise from the fact that some additional people return to Malaysia due to the REP and pay income and consumption tax. Several different scenarios are considered and the net fiscal benefit estimates of the REP program are modest and centered around zero. The two-stage least square estimates suggest a net cost of around \$6,900 per applicant at the

⁶ With the help of the theoretical framework we can also infer the fraction of compliers (those applicants who return only if they are accepted to the program) and hence the marginal treatment effect (MTE) of program approval for approval probabilities away from the threshold. At the discontinuity the implied MTE is 64 percentage points, very similar to the LATE estimates. At lower approval probabilities, further away from the discontinuity, the fraction of the compliers is smaller. For example it is only 9 percentage points at an approval probability of 10 percent. The average impact (ATE) of the REP on the return probability, the weighted sum of the marginal effects, is 57 percentage points.

lower-end, while we find net benefits of about \$4,200 at the upper-end. The model-based estimates show small net benefits of around \$1,700 per applicant. It is likely that the program roughly pays for itself, even without accounting for possible economy-wide positive externalities generated by the return of high-skilled expatriates.

Section 2 provides background on the REP and descriptive statistics. Our conceptual framework is outlined in Section 3. Section 4 provides preliminary evidence based on our model predictions. Section 5 discusses the fuzzy RD design and presents results. Section 6 describes the cost-benefit analysis of the fiscal impact of the REP. Section 7 concludes.

2. Institutional Background and Data

2.1. The Returning Expert Program (REP)

The Returning Expert Program (REP) was introduced on January 1, 2011, and is administered by TalentCorp Malaysia, a government agency. Those who are admitted to the program and are employed upon their return can take advantage of four benefits provided by the REP. First, they can use an optional 15 percent flat tax rate, instead of the standard progressive tax schedule, on employment income for the next five years. Second, they enjoy a tax exemption on the import or purchase of two locally assembled or manufactured completely knocked-down (CKD) vehicles.⁷ Third, foreign spouses and children automatically receive permanent residency status. Fourth, there is a tax exemption for all personal effects brought back to Malaysia.

The value of these benefits depends on the characteristics of the recipient. The top marginal income tax rate in Malaysia is currently 25 percent. In order to benefit from the 15 percent flat tax, an applicant would have to earn more than RM 135,000 annually, which was about US\$45,000 in 2012. The tax exemption on the import of personal effects is unlikely to have substantial monetary benefits but considerably reduces the bureaucracy faced at customs. The tax exemption on cars is potentially very valuable since Malaysia has one of the highest import taxes on foreign cars in the world (in an attempt to support local car manufacturing). Finally, Malaysia has restrictive citizenship laws as Malaysian citizenship is normally only acquired by birth while

⁷ The exact parameters of the tax exemption on vehicles have changed over time. We describe the system in place for nearly all of the main period of analysis (2011-12).

permanent residency is granted mainly to very high-skilled individuals. Thus, the permanent residency for foreign spouses or for children born abroad is potentially an important benefit of the program.

The basic eligibility for the REP requires that an individual (i) is a Malaysian citizen, (ii) has been residing and employed continuously for the past three years and at the time of the application, (iii) is under no financial or legal obligation to a company or government agency to return, and (iv) has no outstanding scholarship bonds or loans from the Malaysian government. The application has to be submitted while the applicant is still residing and employed abroad. There is no application fee, but application requires extensive documentation and is time intensive.

Beyond the basic, non-negotiable requirements listed above, the key element of the eligibility criteria is that the individual needs to have completed education beyond high school and a sufficient number of years of work experience abroad. The required years abroad vary by the degree obtained by the individual. For the sample used in this analysis, the applicants in 2011 and 2012, the minimum experience thresholds were two years for those with a PhD, four years for those with a masters or professional qualification, six years for people with a Bachelor (or first) degree, and ten years for people with a technical diploma. In practice, TalentCorp typically grants the applicants about 6 months leeway on these requirements in anticipation of them continuing to work until they return.

There are several other dimensions considered during the evaluation of the application, which TalentCorp currently refers to as ‘holistic assessment criteria’. Applicants can also be approved if their skills are considered vital to the Malaysian economy, such that they are designated as an expert in a high-value sector or profession. This designation depends on the applicant’s industry, profession, income, and any other criteria TalentCorp chooses to take into consideration during the evaluation process. Hence, the education-specific work experience abroad thresholds are important, but not deterministic for eligibility (conditional on meeting the basic criteria). After approval, applicants have a two-year window during which to find a job, return to Malaysia and claim the REP benefits.

2.2. Administrative Data

Administrative data on the applicants to the REP have been provided by TalentCorp Malaysia. The data contain applicant characteristics that are relevant to the admission process as well as the application status, and return status (only for approved applicants). Available personal information on applicants includes their work experience abroad in months, education levels, income while abroad, industry, profession, job title, marital status, nationality of spouse, number of children, whether the applicant has an existing job offer in Malaysia, and salary in Malaysia (for approved applicants who eventually return).

Administrative data on the applicants for the years 2011–2014 are available. However, there is a sharp fall in the observed return rate of applicants (approved and not approved) in 2013 and especially in 2014. This and the data on the 2011-12 applicants suggest that many people approved in these two later years have not fully completed their return process yet. Hence, the focus of this analysis is on the applications that were processed in 2011 and 2012.

A crucial issue for our analysis is determining whether those who were not approved by the REP returned to Malaysia or not. Unfortunately, TalentCorp does not officially keep track of the return status of rejected applicants. We obtained this information by calling every applicant who was not approved at his or her contact numbers in Malaysia and abroad (provided at the time of application) up to three times to inquire about their return status. For the remaining applicants who could not be contacted by telephone, we searched for them on LinkedIn (which is much more popular in South East Asia when compared to the United States or European countries). If their account appeared active, we verified whether they were currently in Malaysia or not. In this manner, return status information for 96.2 percent of the entire sample of applicants and for 85.6 percent of rejected applicants was obtained.⁸

The final sample of 1654 individuals includes all 2011 and 2012 applicants (i) who meet the basic eligibility criteria,⁹ (ii) for whom we know their return status, and (iii) the administrative data on their level of education, months of experience abroad and other personal

⁸ The observed characteristics of those whose return status was not determinable are near identical to the overall sample, suggesting that a representative sample was obtained.

⁹ TalentCorp checks whether an applicant has received income in Malaysia in the past 3 years and whether they are under an obligation to return, thereby excluding 1.8 percent of the sample.

characteristics.¹⁰

2.3. Summary Statistics

Table 1 presents summary statistics. REP applicants predominantly apply from Southeast and East Asian countries (39 percent), English-speaking countries (37 percent), and the Arabian Peninsula (16 percent). The United Kingdom is the single largest source country (17 percent of applicants), followed by Singapore (15 percent), China (11 percent), Australia and the USA (8 percent each).

The REP applicants are highly educated; they typically have a Bachelors (48 percent) or Masters degree (42 percent), and 7 percent have a PhD. They are predominantly male (77 percent), middle-aged (38 years on average), and married (68 percent), primarily to other Malaysians (24 percent of the married have a foreign spouse). Applicants have on average 7.3 years of work experience abroad. They describe their job title as technical experts (51 percent), middle management (36 percent) or top management (12 percent). Over one-third of the applicants are employed in business services, and around one-tenth in each manufacturing, ICT, healthcare, electronics and oil, gas and energy.

Labor income abroad is in the dataset for all applicants, while income in Malaysia is available only for those who were approved and returned. Applicants with an existing job offer report the income associated with that offer.¹¹ We report income in 2012 US dollars using purchasing power parity conversion rates.¹² The average income abroad of applicants is around \$120,000; the median is considerably lower at about \$84,000. Average incomes in Malaysia, for those who returned, are actually higher with the average and median around \$137,000 and \$107,000

¹⁰ The electronic administrative records are missing information for 18 percent of our sample. Note that the electronic records are not used to determine whether an application is accepted, rather TalentCorp prepares a paper file on each applicant. The characteristics of those missing, including their return status, are near identical to the overall sample, suggesting they are missing at random.

¹¹ For 21 percent of the sample income abroad is missing. In addition, to deal with measurement error we exclude outlying income observations. Most importantly, the income abroad question on the REP application is ambiguous in whether annual or monthly income should be reported. The large majority of respondents seem to have reported annual income, but we exclude reported incomes of less than \$24,000 (14 percent of observations) since these could plausibly be monthly wages. Our results are robust to varying this cutoff income. We also exclude the top 1 percent of income observations. The characteristics of individuals with income information missing or below the cutoffs are near identical to those of the remainder of the sample, including their return probability.

¹² PPP conversion rates are from the World Bank Development Indicators. 2011 numbers are inflated by the change in the US Consumer Price Index.

respectively.¹³ Applicants with an existing job offer declared (offered) incomes are even somewhat higher. Those applicants who were approved by the REP and returned experienced average (and median) wage gains of about 11 percent. The interquartile range on these wage gains is 0.79 log points, and 42 percent of people who returned experienced wage losses (in terms of PPP).

2.4. Diaspora and Applicants from the UK and the US

We compare the characteristics of applicants from the United Kingdom and the United States with the stock of Malaysians in those countries, so as to assess whether the REP applicants are representative the high-skilled Malaysian diaspora. We use information from the American Community Survey (ACS) 2008-12 and the UK Labour Force Survey (LFS) 2009-12 for this purpose.¹⁴

The stock of REP eligible Malaysians in UK and US is 9,142 and 10,033 respectively in this period.¹⁵ The average annual inflow of REP eligible Malaysians is 611 for the UK and 490 for the US. In comparison, the average annual number of REP applicants is 185 from the UK and 95 from the US. REP attracts a large number of applicants when compared to the flow of REP eligible Malaysians to the UK and US. Specifically, applicants represent 30 and 19 percent of the inflow to the UK and US respectively. When compared to the *stock* of REP eligible Malaysians abroad, the number of applicants is also substantial: 2 percent for the UK and 0.9 percent for the US. Clearly, REP is large enough to potentially have a significant impact on the extent of Malaysian “brain circulation.”

Table 2 presents sample statistics for the Malaysian diaspora and applicants from the UK and US. The characteristics of applicants from the UK and US are quite different. Applicants from the UK are most likely to have a Masters degree (51 percent), while those from the US most likely a completed Bachelors (47 percent), from both countries a large number of applicants

¹³ Note that at market exchange rates incomes in Malaysia are considerably lower than abroad. Over this period at market exchange rates one Malaysian Ringgit was worth 0.32 US dollars, at the PPP conversion rate it was worth 0.69 US dollars.

¹⁴ The UK and US account for 24 percent of all applicants. They are the only two countries with a substantial number of Malaysian immigrants for who we were able to obtain information by nationality of the respondent.

¹⁵ We consider an individual to be REP eligible if they are between 25-64 years old, have completed at least a Bachelor’s degree, are employed, in the country for at least three years, and are a Malaysian citizen (or in the case of the US, a non-US citizen, since Malaysia does not allow dual citizenship). We report averages over the sample period.

apply with a PhD (13 percent). Also, UK applicants are considerably more likely to be female and married than their US counterparts. The mean age of applicants from the two countries is very similar (about 35 years), as is the time they have spent in the country (around 7.5 years). Incomes abroad are considerably lower for UK applicants, on average \$80,000 compared to \$106,000 for the US.

3. Analytical Framework

In this section, we outline a simple framework for understanding application and returns decisions of expatriates. We focus on two types of expatriates – those with and without a pre-existing job offer in Malaysia at the time of their application to the REP. We assume that whether an expatriate has a current job offer in Malaysia is due to reasons that are unrelated to the key other determinants of the application and return decisions. Sections 4 and 5 provide empirical evidence supporting that assumption.

The analytical model generates several contrasting and testable predictions for these two types of applicants. The model also helps us with the interpretation of the estimates of our fuzzy RD design (see Section 5 below) and provides a way to estimate the MTE for all observed approval probabilities.

3.1. Setup

3.1.1. The Return Migration Decision

An expatriate's return migration decision is determined by several key variables. First, the value of the job in Malaysia (w_m) and the value of the current job abroad (w_a). The tax benefit of the REP program, sw_m , which we assume is proportional to income. Hence, for those expatriates who are accepted to the REP program the value of an existing job offer in Malaysia is $w_m(1 + s)$. Finally, there is the utility of living in Malaysia as compared to abroad, denoted by v . Then, an expatriate's utility from returning home is given by $w_m(1 + s) + v$ if he is admitted to REP and $w_m + v$, otherwise.

We distinguish between three groups of expatriates. First, those who have a very high wage offer in Malaysia or a high utility from returning relative to their wages abroad, i.e $w_m + v > w_a$ (or

$w_m/w_a + v/w_a > 1$ when expressed relative to income abroad). These people will return irrespective of the approval decision of REP. We refer to this group as *always-returners*. Second, there are the expatriates with intermediate values of wages and non-pecuniary return valuations such that $w_m(1 + s)/w_a + v/w_a > 1 > w_m/w_a + v/w_a$. This group will return *only if* they are accepted to the REP and we refer to them as the *compliers*. Third, there are those expatriates who will not return to Malaysia even if they are admitted to the REP since their relative wages in Malaysia are too low: $1 > w_m(1 + s)/w_a + v/w_a$. This is the group of *never-returners*.

We represent these three groups in Figure 2a. On the y-axis is the relative wage in Malaysia (w_m/w_a) and on the x-axis is the relative non-pecuniary return utility (v/w_a). The 45-degree line $\frac{w_m}{w_a} + \frac{v}{w_a} = 1$ separates always-returners from the compliers and the line $w_m(1 + s)/w_a + v/w_a = 1$ separates the compliers from the never-returners.

3.1.2. The Application Decision With an Existing Job Offer

The decision to apply to the REP requires individuals to weigh the cost of application against the probability of acceptance and the size of benefits provided. REP application does not involve a fee but it is time intensive. Hence, we assume the application cost is proportional to an applicant's wage abroad and is given by cw_a . The probability of acceptance to the REP is denoted by p ($0 < p \leq 1$) and is assumed to be independent of a person's type (given by w_a, w_m, v). For the purpose of exposition in the model we assume that applicants know their exact acceptance probability, even though the qualitative predictions of the model are unaffected by a moderate amount of uncertainty.¹⁶

For those expatriates with an existing job offer, REP admission is the only substantial source of uncertainty. The *never-returners*, even if they have an offer, never pay to apply to the REP since the application cost cw_a is a waste for them. The *compliers* will apply only if the expected benefits of acceptance exceed the costs. This trade-off is expressed as:

$$p[w_m(1 + s)/w_a + v/w_a - 1] > c \quad (1)$$

The benefits of REP for this group, expression on the left in equation (1), are given by the

¹⁶ In the previous section, we discussed how applicants face significant residual uncertainty in their acceptance probability. This uncertainty is essential in providing the exogenous variation in acceptance probabilities we use for identification in Section 5 below, but does not impact the qualitative results of the model.

(probability weighted) difference in utility from returning versus remaining abroad. For the final group, *the always-returners*, the trade-off is given by:

$$psw_m/w_a > c \quad (2)$$

In this case, the marginal benefit is psw_m since this group will return regardless of the REP outcome.

Figure 2b presents the application and return decision of the expatriates with existing job offers. The never-returners are in region R3 and they do not apply or return. The compliers (middle group) are split into two sub-groups where the dashed line separating them is given by equation (1) above. Region A2 include those compliers who will apply and return if approved; they have higher wage offers in Malaysia (w_m) and/or high utility of return (v). The compliers with low wage offers or return utility (region R2) do not find it worthwhile to apply and do not return. Finally, the always-returners are also split into two groups where the dashed line is given by equation (2). Those in region A1 apply to REP but return regardless of its outcome. For those in R1, the relative cost of application is too high so they do not apply but they also return. By changing the program parameters (s , p and c), the government can move the cutoffs (given by equations (1) and (2), and the dashed lines in Figure 2b) and therefore, the applicant pool and returning expatriate numbers. Higher benefits (s), higher acceptance probability (p) and lower application costs (c) move the lines down, increasing the applicant pool, acceptance numbers and returning expatriates.

The trade-offs faced by the designers of the incentive program are easily seen in Figure 2b. The goal of the program is to attract expatriates at a minimum cost. The benefits should ideally be granted only to those who would not return without them (compliers), but exclude those expatriates who will return even without the tax incentives (always-returners). However, it is impossible for the policymakers to perfectly know the individual types of the applicants (especially their v). Making the program more attractive region causes region A2 to grow and R2 to shrink (which is desirable), but it also results in region A1 growing (which increases the cost of the program as more people who would return anyhow receive the tax breaks).

3.1.3. The Application Decision Without an Existing Job Offer

Applicants without a pre-existing job offer in Malaysia are assumed to receive the wage offer

(w_m) only after their application decision is made. So these expatriates need to base their application decision on an expected wage, rather an actual wage, and this distinction leads to significant differences in how they self-select into the program. For simplicity, we assume that the expected relative wage in Malaysia, $E[w_m/w_a]$, is independent of REP approval.

Figure 2c presents the application and return decision for expatriates without a pre-existing wage, and a common probability p of acceptance into the REP program. The return decision is made exactly in the same way as it was the case with expatriates with a pre-existing wage offer (see section above) since the wage in Malaysia and the REP decision are fully known at that point. Again, there are *always-returners*, *compliers* and *never-returners* depending on the expatriate's type (w_a, w_m, v) and whether they have been accepted to the REP. In contrast, the application decision is now based on the applicant's wage abroad, w_a , the relative utility v derived from living in Malaysia and the *expected* wage in Malaysia. Since w_m is not perfectly known at the application stage, the expatriates only know the probability of being a complier or an always-returner, which we denote by q_c and q_a , respectively. The application decision, therefore, depends on the *ex ante* probabilities of being an always-returner, $q_a = Prob(w_m/w_a + v/w_a > 1)$, or a complier, $q_c = Prob\left(\frac{w_m(1+s)}{w_a} + \frac{v}{w_a} > 1 > \frac{w_m}{w_a} + \frac{v}{w_a}\right)$. This allows us to define the application cutoff:

$$p \left[q_a E \left[\frac{w_m}{w_a} \mid \frac{w_m+v}{w_a} > 1 \right] s + q_c \left(E \left[\frac{w_m}{w_a} \mid \frac{w_m(1+s) + v}{w_a} > 1 > \frac{w_m+v}{w_a} \right] (1+s) + \frac{v - w_a}{w_a} \right) \right] > c \quad (3)$$

In this expression, the (probability weighted) expected benefits of applying, which depend on the probability of being approved and the probability that the applicant is *ex post* an always-returner or complier, should be larger than the application cost.

In Figure 2c, the application cutoff is represented by the dashed vertical line and is identical for everybody since people do not know their type at that point. The location of the dashed line is determined by the acceptance probability p , the tax benefit s , the expected wage $E[w_m/w_a]$, and is implicitly defined by equation (3). At a very low acceptance probability, only those who know they will return to Malaysia, due to a very high v , will apply. As the acceptance probability increases, the dashed line moves to the left and the number of applicants increases.

People in regions A1, A2 and A3 (i.e. high v) apply to REP whereas those in R1, R2 and R3 (with low v) do not. Once all the uncertainty is resolved, i.e. w_m is revealed and the application decision is made, those in R1 and A1 will return since they have high w_m . Those in R2, R3 and A3 will not return (even if admitted to REP). Finally, those who find themselves in A2 will return only if approved by the REP. The policy trade-off again is between those individuals in regions A2 and R1; the tax benefits will be “wasted” for those in R1 in order to induce those in A2 to apply and return.

3.2. Model Predictions

The analytical framework provides several testable predictions.¹⁷

For the expatriates with pre-existing job offers, the only uncertainty is whether TalentCorp will approve them for tax benefits. Only always-returners and compliers will apply to the program. Hence, all of the approved people will return. Among the rejected, the always-returners return anyway but the compliers do not (see Figure 2b). In short, the return ratio among the approved is 100 percent, while the ratio is less than one among the rejected.

Expatriates without an existing job offer face an additional source of uncertainty: they do not know their wage offer in Malaysia at the time of their REP application. So only high v expatriates apply but some of the approved will not return (region A3 in Figure 2c) as they will receive very low wage offers. For rejected applicants, only those in R1 will return.

The model does not yield a clear prediction about whether the return rate among rejected applicants should be higher for those with and without pre-existing job offers. Among those with a job offer, only rejected compliers stay abroad. For those without pre-existing offers, both rejected compliers and non-returners stay abroad (regions R2 and R3 in Figure 2c). However, even if the underlying distribution of expatriates in $\left(\frac{v}{w_a}, \frac{w_m}{w_a}\right)$ -space is the same for the two groups, the incentives to apply to the program and the applicant pools are entirely different. Hence, we cannot theoretically predict which rejected group has a higher return rate.

¹⁷ In this section we provide intuitive explanations for the empirical predictions provided by the theoretical framework. More formal proofs of these predictions require an assumption about the distributions of expatriates characteristics in $\left(\frac{v}{w_a}, \frac{w_m}{w_a}\right)$ -space. In particular, individuals have to be reasonably smoothly distributed, for example uniformly distributed (within some bounds).

The first set of testable predictions can be summarized as:

Prediction 1:

- (i) *Accepted applicants are more likely to return than rejected applicants whether they have an existing job offer or not.*
- (ii) *The return probability for approved applicants will be higher for those with job offers compared to those without an offer.*
- (iii) *For rejected applicants the model does not predict whether those with or without pre-existing job offers are more likely to return.*

Our next predictions are about the relationship between approval and return probabilities. First, we introduce some additional notation. Let N_a , N_c and N_n denote the number of expatriates who are always-returners, compliers, and never-returners, respectively. Their application rates are given by $\theta_a(p)$, $\theta_c(p)$ and $\theta_n(p)$, respectively. Then the total number of applicants is given by $N_p = \theta_a(p)N_a + \theta_c(p)N_c + \theta_n(p)N_n$.

The observed return probability of *all* applicants, π^{obs} is:

$$\pi(p)^{obs} = \frac{\theta_a(p)N_a + p\theta_c(p)N_c}{N_p} \quad (4)$$

The critical question is how changes in REP approval probability impact application decisions and return rates. At very low yet positive approval probabilities (p), the dashed lines will move up in Figure 2b and to the right in Figure 2c. This means only always-returners apply to the REP at low p and $\theta_c, \theta_n \approx 0$. Since only always-returners apply, the return probability is close to one for both approved and rejected applicants. As p increases the number of applicants increase (as the dashed lines move down in Figure 2b and left in Figure 2c). But some of the applicants are now compliers (for both groups) and never-returners (for those without an existing job offer). As a result, the return probability among the applicants start to decline for both groups. As p increases and approaches 1, the implications are slightly different. In the case of the people with offers, (nearly) all applicants return since only compliers and always-returners apply and approval is near certain. However, for those without offers, some of the applicants were never-returners and that group stays abroad once they observe their low wages in Malaysia. More

specifically, for this group, $\pi(p = 1) = 1 - \frac{\theta_n(p)N_n}{N_p}$. The predictions can be summarized as follows.

Prediction 2:

(i) *The return probability (π) of all REP applicants is close to 1 at very low approval probabilities (p).*

(ii) *The applicant pool increases but the return probability starts to decrease as p increases.*

(iii) *As p continues to increase, π eventually increases again and reaches 1 when $p = 1$ for applicants with pre-existing job offers. However, for those without a pre-existing job offer, π always remains below 1.*

The final set of predictions is about the wage distribution of the applicants and returnees. As discussed earlier, the wages in Malaysia and abroad (w_m and w_a) both influence the application and return decisions. For those with existing job offers, self-selection occurs in the application stage and those with low wage offers in Malaysia (region R2 in Figure 2b) do not apply at all. There is a trade-off between approval probability and cutoff wage for applicants, so increasing p lowers the cutoff wage, w_m . As a result, the mean relative wage of applicants and returnees decline as approval probability increases.

Expatriates without a job offer base their application decision on their current wage abroad (w_a), the non-pecuniary benefits of returning home (v) and their expected wages. Higher approval probability p encourages expatriates with low v to apply. Once the REP approval decision is made and wages in Malaysia are observed, self-selection takes place and only those with higher wages decide to return to Malaysia. Since at a higher p there are more applicants with a low v , self-selection into the return decision results in higher mean wages among the returnees.

We can summarize the predictions as the following:

Prediction 3: *As the approval probability (p) increases, applicants' mean relative wages in Malaysia ($\frac{w_m}{w_a}$):*

- (i) *decrease for those with pre-existing wage offers, but*
- (ii) *increase for those without pre-existing wage offers.*

3.3. The Treatment Effect and Identification

The goal of the REP is to induce high-skilled expatriates to return to Malaysia. Approval to the program, however, only has an impact on the return decision of compliers. The total impact (δ^{Total}) of an exogenous change in p , from p_0 to p_1 , on the return probability (π) is given by the ratio of the change in the return probability, as defined in equation (4), and the change in p (as in the Wald estimator):

$$\begin{aligned}\delta^{Total} &= \frac{\frac{1}{N} [N_a + p_1 \theta_c(p_1) N_c] - \frac{1}{N} [N_a + p_0 \theta_c(p_0) N_c]}{p_1 - p_0} \\ &= \frac{\theta_c(p_1) N_c}{N} + p_0 \frac{\theta_c(p_1) - \theta_c(p_0) N_c}{p_1 - p_0} \frac{1}{N},\end{aligned}\quad (5)$$

where N is the total number of expatriates.

An increase in the approval probability (p) increases the return probability through two channels. The first channel is a direct effect as more compliers are approved and return. It is given by $\delta^{Direct} = \frac{\theta_c(p_1) N_c}{N}$. This is simply the impact of the program in the absence of self-selection into application and is the fraction of applying compliers among expatriates (at approval probability p_1). The second term is an indirect effect as more compliers apply to the program when p increases, $\frac{d\theta_c}{dp} > 0$ (see Figures 2b and 2c). It is given by $\delta^{Indirect} = p_0 \frac{\theta_c(p_1) - \theta_c(p_0) N_c}{p_1 - p_0} \frac{1}{N}$, and arises due to the self-selection of applicants based on their knowledge of the approval probability.

If all the model assumptions hold, the observed approval probabilities and return rates are sufficient for identifying the marginal treatment effect for every observed p for applicants with pre-existing job offers. The model implies that never-returners (if they have an offer) never apply to the program. Hence, the observed return rate, from equation (4), can be rewritten as:

$$\pi(p)_{job}^{obs} = \frac{\theta_a(p) N_a + p \theta_c(p) N_c}{\theta_a(p) N_a + \theta_c(p) N_c} = (1 - s_c(p)) + p s_c(p), \quad (6)$$

where $s_c(p)$ is the share of compliers among applicants and is given by $s_c(p) = \frac{\theta_c(p) N_c}{\theta_a(p) N_a + \theta_c(p) N_c}$.

Furthermore, $\pi(p)_{job}^{obs}$ and p are observed in the data and thus we can calculate $s_c(p) = \frac{1 - \pi}{1 - p}$.

Since the total number of applicants, $\theta_a(p)N_a + \theta_c(p)N_c$, is observed we can also find $\theta_a(p)N_a$ and $\theta_c(p)N_c$ for every observed p . Then, provided we know the total number of expatriates (N), it is straightforward to estimate the local average treatment effect $\delta(p)^{Total}$ using equation (5), as well the direct and indirect effects, $\delta(p)^{Direct}$ and $\delta(p)^{Indirect}$.¹⁸

In practice, of course, the model does not fully capture program application and return decisions of the expatriates. However, the design of the REP allows us to obtain a fuzzy RD estimate of $\delta(p)^{Direct}$ at the point of discontinuity. If we are then willing to rely on the model assumptions, we can also identify the marginal treatment effects at observed p away from the discontinuity.

4. Empirical Evidence

In this section, we provide suggestive empirical evidence related to the model predictions as they are outlined in the previous section. In the subsequent Section 5 we provide fuzzy RD estimates of the impact of REP approval on return probabilities.

4.1. REP Approval and Return Probabilities

Table 3 shows the number (and fraction) of applicants who returned to Malaysia, by approval status and whether they have a pre-existing job offer. The average program approval probability is high, 80 percent for those without a pre-existing job offer and 77 percent for those with a job offer, where the difference is not statistically significant.

The return probability among approved applicants is 93 percent (231 out of 248) for those with a pre-existing job offer. The fact that it is slightly less than 100 percent suggests that some applicants, 7 percent in our sample, do not return to Malaysia for reasons not captured by the model (and possibly arising after the application decision).¹⁹ The return probability is only 69 percent (738 out of 1070) for the approved without a pre-existing job offer. This suggests that 24

¹⁸ For applicants without pre-existing the observed return probability is:

$$\pi(p)_{NoJob}^{Observed} = s_a(p) + p s_c(p),$$

where $s_a(p)$ is the share of always-returns. The identification problem is that both $s_a(p)$ and $s_c(p)$ are now unknown since applicants also include a fraction of never-returns, $s_n(p)$, and $s_a(p) + s_c(p) + s_n(p) = 1$. Hence, the observed data will not typically provide enough information to derive the MTE.

¹⁹ In our interpretation of the evidence we will continue assuming that 7 percent of applicants do not return to Malaysia for idiosyncratic reasons arising after the application and approval decision falling outside the model and hence cannot be categorized as never-returns, always-returns or compliers.

percent (difference between 93 and 69 percent) of applicants are *ex post* never-returners (since all of the always-returners and compliers return if approved).

The return probability is significantly lower for rejected applicants. It is 76 percent for those with a pre-existing job offer, suggesting that 17 percent of this group (difference between 93 and 76 percent) are compliers. The return rate is only 60 percent for those rejected applicants without a pre-existing job offer, which implies that only 9 percent (difference between 69 and 60 percent) of the applicants without job offers are compliers. This pattern of return probabilities is fully consistent with the predictions of our theoretical framework (see Prediction 1).

The evidence suggests that the program approval probability p is uncorrelated with individual characteristics that also affect the return probability. Specifically, only three variables are robust predictors of whether an applicant actually returns to Malaysia: REP approval, whether they have a job offer in Malaysia before applying, and their age (older applicants are slightly more likely to return).²⁰ The probability of REP approval is not significantly correlated with the age of the applicant nor, most importantly, it does not depend on whether an applicant already has a job offer in Malaysia.

The key determinant of REP approval, once the basic application criteria are fulfilled,²¹ is the education-specific years of work experience abroad. Figures 3a-d plot the probability of approval to the REP against the applicant's months of work experience abroad, normalized by the education dependent threshold.²² Consequently, in the figures the threshold for acceptance for all applicants has been normalized to zero. We plot return probabilities for up to 2 years below the threshold and 6 years above, capturing 76 percent of our sample (the plots look very similar if we change the sample frame).

The figures show clear evidence of a considerable discontinuity in the probability of acceptance at the threshold. Above the threshold, the probability of acceptance is constant at around 95 percent. Just below the threshold, the probability of acceptance is still very high at about 60 percent and then drops rapidly to around 10 percent for applicants whose work experience abroad is two years below the threshold. The relationship between work experience and approval

²⁰ A large set of available variables including income, industry, occupation, gender, and current region of applicant are not robust predictors of the return decision.

²¹ Recall that our sample only includes individuals who fulfill these criteria.

²² We also include the six months leeway that TalentCorp informally tends to give applicants.

probability below the threshold is close to linear. The inclusion of covariates, as discussed above, barely affects the approval probability.

Figures 4a-d replicate Figures 3c and 3d, but for those with and without a pre-existing job offer in Malaysia. Both samples show a large discontinuity at the threshold, a rising approval probability below the threshold and broadly constant thereafter. The main difference is the magnitude of the discontinuity. For those with a pre-existing job offer in Malaysia the discontinuity is 52 percentage points (from below 44 to 96 percent approval rate) while it is only 32 percentage points (from 60 to 92 percent) for those without a job offer.

4.2. Return and Approval Probabilities

Figures 5a and b plot applicant return probabilities against their approval probabilities, in bins based on their work experience, normalized by their education dependent threshold.²³ Figure 5a is for the applicants with an existing wage offer. Just as predicted (see Prediction 2), the return probability is close to one at very low approval probabilities. The return probability then falls as the approval probability increases. At an approval probability close to one the return probability is also once again close to one.²⁴ Figure 5b is for applicants without a pre-existing job offer. The pattern is a lot less pronounced for these applicants (and not statistically significant). As predicted though, the return probability is still only around 68 percent at an approval probability close to one, consistent with a large fraction of *ex post* never-returners applying for the program.

4.3. Wages and Approval Probabilities

Figures 6a and b plot applicants' relative wage in Malaysia against their approval probabilities, again in bins based on their work experience. The relative wage measure is the log of the ratio of the wage in Malaysia to the wage abroad (conditional on returning to Malaysia). Figure 6a is for the applicants with an existing wage offer. For this group the relative wage in Malaysia decreases with the approval probability. Figure 6b is for the applicants without an existing wage offer. For this group the relative wage in Malaysia increases with the approval probability. Note that the relative wage of applicants is actually lower after the discontinuity than just before, however, that difference is not statistically significant. These stark contrasting patterns for the two groups

²³ We use 3-month bins below the threshold and a single bin above the threshold (a 3-year bin).

²⁴ Recall that on account of the discontinuity we do not observe individuals with intermediate return probabilities.

are as predicted by our model, see Prediction 3, and reflect the different application incentives of the two groups.

5. Treatment Effects: A Fuzzy Regression Discontinuity Design

5.1 Empirical Strategy

The key concern with a causal interpretation of the correlations described in Section 4 is that there may be unobserved characteristics of applicants that are correlated with both the return and approval decisions. Most importantly, we do not observe an applicant’s individual desire to return to Malaysia, which may be correlated with the approval decision. For example, those who are eager to return may make additional efforts to be approved, resulting in a spurious positive correlation between approval and the return decision. Alternatively, since applying is costly (with regard to time and effort) only highly motivated applicants will apply if their probability of acceptance is low, thus resulting in a spurious negative correlation between approval and return.

In Section 4, we showed that there are large discontinuities in the likelihood of program acceptance at certain thresholds based on years of work experience abroad. This evidence and the discussion of the program rules in Section 2.1 suggest that it may be feasible to evaluate the program using a fuzzy RD design. Formally, the fuzzy RD design can be described as a two equations system:

$$Y = \alpha + \tau D + f(X - c) + \varepsilon, \tag{7}$$

$$D = \gamma + \delta T + g(X - c) + v, \tag{8}$$

where Y , D , and T are binary variables. In our case, Y is equal to one if the applicant returns to Malaysia, D is equal to one when the application is approved. X is the months of experience abroad (i.e. the assignment variable) and T is equal to one when the assignment variable X is greater than the threshold c ($T=1[X \geq c]$). Crucially for identification, the probability of treatment changes discontinuously at the threshold c .

The probability of treatment jumps by less than one at the threshold as seen in the graphs in Section 4. Thus the treatment effect can be recovered by dividing the jump in the relationship between Y and X (at the threshold c) by the increase in the probability of treatment at the

threshold (the discontinuity jump in the relation between D and X). Hahn, Todd and van der Klaauw (2001) show that the interpretation of this ratio as a causal effect requires the same assumptions identified by Imbens and Angrist (1994). More specifically, one must assume “monotonicity”, (i.e. approval of the application cannot decrease the probability any individual returns to Malaysia), and “excludability” (i.e. X crossing the threshold cannot affect the return probability other than by impacting the probability of approval). Monotonicity is a very natural assumption in this context, since it is hard to conceive of a situation in which approval of the application dissuades an individual from returning to Malaysia.²⁵ We present extensive evidence in support of the excludability assumption in Section 5.2 below.

The next issue is the choice of estimation method. Hahn, Todd and van der Klaauw (2001) suggest estimating the treatment effect using two-stage least squares, where equation (8) is the first stage and equation (7) is the outcome equation. This instrumental variables estimate can be interpreted as the weighted average treatment effect for the subpopulation affected by the instrument, that is, a weighted local average treatment effect (LATE). The weights reflect the likelihood that an individual’s X is near the threshold. Local linear regressions are an alternative nonparametric way to estimate the treatment effect. These two estimation techniques have become the standards in the literature (for discussion, see Imbens and Lemieux 2008 and Lee and Lemieux 2010). However, our assignment variable is discrete, since it is measured in months, and this makes it impossible to compare observations ‘just above’ and ‘just below’ the treatment threshold, as Lee and Card (2008) discuss extensively. This requires us to choose specific functional forms for the relationship between the treatment variable and the outcome of interest and, hence, constrains us to using two-stage least squares.

There are two central issues when using two-stage least squares to estimate the treatment effect. First, we need to decide on the order of the polynomials $f(\cdot)$ and $g(\cdot)$. The regression function is allowed to differ on both sides of the threshold by including interaction terms between D and X (Imbens and Lemieux 2008) in every specification. Second, we need to choose the range of X to include in the estimation, specifically decide on the degree to which we exclude X that are far from the threshold.

We follow Lee and Lemieux (2010) in choosing the optimal polynomial model. Month dummies

²⁵ Unless of course Groucho Marx was to apply since he did claim that “I do not care to belong to a club that accepts people like me as members.” Quoted in Look Magazine , March 28, 1950.

are added to the polynomial regressions (7) and (8) and then we jointly test the significance of these bin dummies. We include up to order six polynomials, and the findings are corroborated by the Akaike Information criterion. Five different samples are considered: a sample where all the available data are included and samples where the analysis drops 10, 25, 50, or 75 percent of the X at the tails on either side of the threshold, respectively.

The tests provide clear guidance on the order of the polynomial of X to include in the regressions. A linear first-stage regression, equation (8), fits the data best, as is clear from figures 10a and 10b, with no additional benefit to higher-order polynomials (above the threshold a constant provides a marginally better fit). Also, in the outcome regression, equation (7), a first-order polynomial provides the best fit.²⁶ The main problem with higher-order polynomials is that they ‘over fit’ the data. This results in systematically very large treatment effect estimates, frequently above one. This finding is consistent with Gelman and Imbens (2014) where they recommend the use of low-order polynomials. Following the recommendation of Imbens and Lemieux (2008), the same order polynomial as in the first- and second-stage regressions are included on both sides of the threshold.

It is standard practice in RD designs to use heteroskedasticity-consistent standard errors to account for the different number of observations for each X . In the case of a discrete assignment variable, Lee and Card (2008) recommend using cluster-consistent (clustering on the individual values of X) standard errors to correct for measurement error. However, the cluster-consistent standard errors obtained are practically always smaller than the heteroskedasticity-consistent standard errors and consequently only the robust standard errors are reported.

5.2 The Excludability Assumption

We present evidence on the excludability assumption before we report our estimation results. The eligibility requirements for the program are to a large extent public knowledge, available to the applicants on the website through which they submit their application. If these were precise and rigidly adhered, the program could not be evaluated with the data on applicants. Only those eligible would apply and the acceptance rate would be 100 percent, leaving no control group to test the impact of the program. There are two main reasons why we can actually evaluate the

²⁶ Except when 75 percent of the X are dropped in which case there is a marginal improvement with a second-order polynomial.

efficacy of the REP program.

First, the ‘holistic assessment criteria’, see Section 2.1, leave considerable leeway for the Talent Corp decision panel to accept candidates who do not strictly meet the main eligibility criteria. Even though the approval probabilities are lower for these candidates, it may still be worthwhile for these applicants to apply. Indeed, in our sample 23 percent of applicants do not meet the work experience abroad criterion and 33 percent of those are nevertheless approved. Second, TalentCorp informally gives most applicants some leeway on the employment duration requirement, on the assumption that they will continue working abroad until they actually relocate to Malaysia. Based on the data and discussions with TalentCorp, on average applicants receive up to six months leeway though there is variability in how this is applied.

The preliminary evidence presented suggests that the applicants do broadly have a sense of the likelihood they will be admitted to the REP (as assumed in the theoretical framework). However, the informal criteria used by TalentCorp still generate uncertainty about the exact cutoffs an applicant will face, making it impossible for them to precisely know whether they will be admitted. Lee (2008) shows formally that even when individuals have some control over the likelihood of acceptance into the program (i.e. treatment), the consequence will be local randomization of the treatment as long as this control is imprecise.

An advantage of the RD design is that we can actually test our claim that applicants exercise imperfect control over whether they will be admitted to the REP. Specifically, if individuals have imprecise control over whether they will be admitted to the REP or not, both observed and unobserved characteristics should be continuously distributed around the threshold. In sum, we find that for those with a pre-existing job offer there is strong evidence supporting the hypothesis of no sorting around the threshold (on observables or unobservables). For this group of applicants the timing of the application decision appears driven by the availability of the job offer, making for a valid fuzzy RD design. For those without a pre-existing job offer the evidence is more mixed, with a mass of applicants a few months after the threshold.

5.2.1 Discontinuities in Covariates

We check for discontinuities in the covariates at the threshold for 22 variables.²⁷ These are the

²⁷ We check all variables in the administrative data with at least 100 observations. We use a quadratic fit of the

fraction of applicants with a bachelor's degree, master's degree, PhD, female, married, with children, a Malaysian spouse, a pre-existing job offer in Malaysia, employed as technical experts, middle management, top management, in a particular industry (oil, gas and energy, electronics, business services, communication content, education, healthcare, manufacturing); and mean potential experience, tenure abroad, income abroad and income in Malaysia (for those who return). We find no statistically significant discontinuity at the threshold (with p-values at least above 0.2) for 21 of these variables. The only variable that changes discontinuously at the threshold is the fraction female (a statistically significant 18 percentage point drop). Further exploration shows that the apparent discontinuity in the fraction female is a consequence of the functional form. In particular, we find no evidence of a discontinuity when we simply compare means, use a linear, cubic or quartic specification. Figure 7 depicts the distribution of 8 of the 22 observed variables by experience abroad, using 3-month bins and a quadratic fit on either side of the threshold.

Most importantly, we find no evidence of a discontinuity in the fraction of applicants with a pre-existing job offer in Malaysia (Figure 7, last panel). We also divide the sample into those with and without an existing job offers and check for discontinuities at the threshold for the remaining 21 variables in both samples. In the sample of applicants with pre-existing job offers, there is no discontinuity at the threshold in any of the observables (with p-values at least above 0.2). In the sample without pre-existing job offers, we find no statistically significant discontinuity for 19 of the 21 variables. The two exceptions are the fraction female and the fraction of applicants working in the communication sector. These two discontinuities are specific to the quadratic functional form and they also disappear when comparing means and using linear, cubic or quartic specifications.

5.2.2 Manipulation of the Assignment Variable

The next concern is that there might be discontinuities in unobserved characteristics that affect the return probability. This cannot be tested directly, but an intuitive test suggested by McCrary (2008) suggests looking for evidence of sorting around the threshold as a test for such discontinuities. In our case, we check whether the distribution of the number of applicants by months of experience abroad is discontinuous at the threshold.

assignment variable either side of the threshold.

Figure 8a depicts the 8-year interval for the number of applicants by months of experience abroad. There are a substantial number of applicants on either side of the threshold. The number of applicants increases with months of experience abroad below the threshold and peaks at 4 months above the threshold, with another spike at 17 months. Figure 8b focuses on a 2-year window around the threshold. There is no discontinuity exactly at the threshold. However, thereafter the number of applicants rises sharply, reaching on average of 23 in each of the next three months and then averaging around 25.

Figure 8c presents the number of applicants with a pre-existing job offer. Clearly, there is no discontinuity in the number of applicants around the threshold. Intuitively this seem plausible, as the REP application of those with a pre-existing job offer is presumably determined by the arrival of an attractive job offer and thus does not allow for sorting around the threshold. Indeed, the average number of monthly applicants before and after threshold is not statistically significantly different. This is true if we use a windows of 3, 6, 12 or 18 months either side of the threshold. This strongly supports the hypothesis that for applicants with pre-existing job offer there is no sorting around the threshold. Indeed, there seems to be near to no sorting at all by months of experience abroad.

Figure 8d presents the same data for applicants without a pre-existing job offer, which looks very similar to that for the whole sample. There is no discontinuity at the threshold but we observe a mass of applicants a few months afterwards. In keeping with the rest of the paper we present a parametric test for a discontinuity around the threshold. The difficulty is that the number of applicants (without a pre-existing job offer) is clearly non-linear around the threshold. The main message of the parametric tests is that there is no evidence of a discontinuity in the number of applicants, provided a sufficiently high-order polynomial of the assignment variable is used. We always use symmetric windows around the threshold, up to a maximum of two years below the threshold, and allow the regression function to differ on both sides of the threshold. Starting at a 6-month window (3-months either side), the mean difference, before and after the threshold, in the number of applicants becomes statistically significant. The discontinuity of course becomes insignificant once we include the assignment variable linearly. Starting with a 22-month window the threshold becomes statistically significant even when we include a linear function of the assignment variable, but is insignificant when we include a quadratic function. With a 4-year window a cubic polynomial of the assignment variable is required so that the threshold is not

statistically significant. With the 8-year window, used for most of our graphs, a quartic polynomial of the assignment variable is required so that there is no statistically significant discontinuity at the threshold.

Finally, it is worth adding that re-application to the program is possible, and in principle a concern for the validity of our estimates. In practice, repeat application is not an important feature of the REP. Using 2011-14 data we found only 14 repeat applications from the 2011-12 cohort of applicants. Of these repeat applicants 11 had initially been approved and only 3 not approved. Those 3 rejected applicants were 3, 9 and 19 months from threshold. There are simply too few repeat applications to affect our estimates, and they do not seem to result in any sorting around the threshold.

5.3 The Fuzzy RD Results

We present fuzzy RD results separately for those with and without pre-existing job offers.

5.3.1. Applicants with Pre-Existing Job Offers

In a fuzzy RD design, it is not treatment (the approval decision) that is randomized, but rather the ‘intent to treat’ (whether an individual is above or below the threshold) that is locally randomized. Figures 9a and 9b depict the intent-to-treat effect by showing scatter plots of the probability of return plotted against the assignment variable (months of work experience) using monthly and quarterly bins, both figures include a linear best-fit line. There appears to be a discontinuity in the return probability at the threshold, though the data is very noisy, making it difficult to see whether the discontinuity is statistically significant.

The two-stage least square results are presented in Table 4. We report results without additional covariates (apart from the assignment variable interacted with the threshold) and with a full set of covariates,²⁸ and for the five different samples of assignment variable X (where X that are far from the threshold are excluded). The first stage is highly significant in every specification, though the first-stage F-statistic decreases as the sample size decreases. The estimated causal impact of the program on the return probability is large and statistically significant (except for the smallest sample). The point estimates increase as the sample size reduces, perhaps suggesting

²⁸ The covariates are polynomials of income abroad, duration in the current job and potential experience, a dummy for marital status, female, year, education and industry fixed effects.

that the return migration decision of applicants close to the threshold is more sensitive to the approval decision. The inclusion of a large set of covariates does not substantially affect the estimates.

The point estimates suggest that approval to the REP increases the probability of returning to Malaysia by 40 percentage points for those individuals who have a pre-existing employment offer in Malaysia (in the full sample without covariates). And the impact is possibly as large as 60 or 70 percentage points. This is clearly a huge impact, though we need to emphasize that it is a LATE estimate and thus, only applies to applicants around the threshold. Specifically, the model suggests that the fuzzy RD is identifying the direct effect of the program (δ^{Direct}), scaled by the fraction of applicants among the population of expatriates, over the range of approval probabilities at the discontinuity. The fuzzy RD is identifying the impact of a higher approval probability for identical applicants, in particular, with the same expected approval probability. In other words, it is the LATE for applicants with different p but identical $\theta(p)$. Our theoretical framework also suggests that the MTE increases with the approval probability (see Figure 2b). Hence, we would expect the impact of the program to be smaller for those further below the threshold. In Section 5.4, below, we use the model to extrapolate to applicants away from the threshold providing a marginal treatment effect at different approval probabilities.

5.3.2. Applicants Without Pre-Existing Job Offers

Figures 10a and 10b are scatter plots of the probability of return plotted against the assignment variable. Thus they depict the intent-to-treat effect of the REP for applicants without pre-existing job offers. There does not appear to be a discontinuity in the return probability for this group of applicants. The two-stage least squares estimates, presented in Table 5, confirm this impression. The point estimates are small and positive but not statistically significant, despite having a highly significant first-stage.

Our theoretical framework, see Figure 2c, suggests why this is likely the case. The REP changes the financial incentives to returning to Malaysia (broadly proportional to income in Malaysia). However, applicants without a pre-existing job offer (those on the right side of the dashed line) are not applying for job-related reasons. In the terminology of the model, they have high non-pecuniary benefits (v/w_a), not high relative wages (w_m/w_a). Consequently, this group of

applicants does not contain many individuals whose decision is swayed by a (marginal) change in the financial incentives to return, i.e. there are fewer compliers among the applicants.

5.4 Using the Model to Identify Marginal Treatment Effects

The fuzzy RD design provides a LATE estimate of the impact of REP approval only around the discontinuity in the approval probability. With the help of our theoretical framework, we can, however, estimate the MTE for all observed approval probabilities (for those applicants with a pre-existing job offer). Section 3.3 outlines how to identify the marginal direct, indirect and total marginal treatment effect from the observed data.

The data shows that return probability declines with the approval probability (see Figure 5a). Based on that relationship we can identify the share of applicants that are compliers. The fuzzy RD design estimates suggest that the share of compliers is between 40 and 70 percent of applicants around the discontinuity. The model estimates fall at the upper-end of that range with 64 percent of the sample as compliers. As predicted by the theoretical framework, the fraction of compliers among applicants decreases as the approval probability falls. At an approval probability of 10 percent the share of compliers is only 9 percent.

To go from the fraction of compliers among applicants to estimates of the impact of the program on the return rate among all expatriates (and not just applicants) we need to know the fraction of expatriates (at each p) that apply to the REP. The UK Labour Force Survey and the American Community Survey data suggest that over the relevant range of approval probabilities (based on years of work experience abroad) the distribution of expatriates is uniform, and for those above the threshold the application rate (N_p/N) is 1.47 percent. The application rate is lower at lower approval probabilities.

We depict the total, direct and indirect treatment effects by approval probability in Figure 11. The x-axis depicts the REP approval probability from 10 percent to 44 percent (which is just below the discontinuity). The direct MTE of program approval on the expatriate return probability is simply the fraction of compliers at each p multiplied by the application rate. It is around 0.1 percentage points at p of 10 percent and 1 percentage point at the discontinuity (and presumably thereafter). This is the MTE that is relevant for evaluating the ATE of the REP as compared to no program at all. We weight our estimates of the MTE by the share of applicants at

each approval probability (recall that three-quarters of applicants are above the threshold) to obtain the ATE of the program. We find an ATE of 57 percentage points, somewhat below the estimate at the discontinuity since the program is less effective at lower approval probabilities.

In addition to the direct effect an increase in the approval probability will also induce more applications to the REP. We calculate that this indirect impact of changing the approval probability by 1 percentage point. At the margin this indirect impact tends to be larger than the direct effect, and it too increases with the approval probability. It is 0.12 percentage points at p equal to 0.1 and 1.9 percentage points just below the threshold. The total MTE is given by the sum of direct and indirect effects. For example, at a 40 percent approval probability the total effect is 2.2 percentage points.

6. The Fiscal Impact of the REP

The REP has a large, positive impact on the probability of an approved applicant returning to Malaysia for the subset of applicants with a pre-existing job offer. However, that does not necessarily mean that the program has a positive fiscal impact since it entails considerable costs.

There are four distinct costs that arise from the REP. First, there are the costs of administering the program. Second, there is the cost of foregone tax revenues for the expatriates who would have returned even in the absence of the REP, but still take advantage of the tax break offered by the REP for five years. Third, there is the tax exemption on cars. Fourth, there are additional public expenditures (such as education) as the REP attracts additional people back to Malaysia.

The fiscal benefits of the REP arise from the fact that it induces additional high-income people to return to Malaysia. These people pay income and consumption taxes (even if at a lower rate for five years). In addition, the goal of the REP is to attract individuals who can help Malaysia become a high-income nation by 2020 and so is entirely motivated by possible positive externalities. The hope is that REP beneficiaries are high-skilled individuals who create jobs, and raise the productivity of other workers. This section only provides estimates of the direct fiscal

impact of returning expatriates. We do not attempt to assess the external benefits that may accrue as high-skilled individuals return to Malaysia.²⁹

Income and Consumption Taxes

In evaluating the fiscal impact of the REP, the analysis is limited to the sample of applicants who have returned to Malaysia and for whom a wage is observed. Their age-specific wage growth is imputed using a comparable sample of individuals from the Malaysian Labor Force Survey (LFS) for 2007–10.³⁰ Finally, the top and bottom 1 percent of wage earners in Malaysia are excluded from the analysis so as to reduce measurement error in the extreme tails of the income distribution. The most current income tax schedule is used to calculate the fiscal impact. The analysis assumes that 70 percent of people's income is consumed as the savings rate for high-income earners in Malaysia is below 30 percent (based on the latest Household Expenditure Survey) and around two-thirds of consumption is taxed at the 6 percent sales tax.

We assume that individuals work until they are 64 years of age and that the re-migration rate of returnees (from Malaysia) is 1 percent per annum.³¹ Further, the government discount rate is assumed to be equal to the rate of economic growth, so that the government has no pure time preference. In practice, the nominal of return on long-term Malaysian government bonds over the past several years has been around 4.5 percent, significantly lower than the expected growth rate.

Car Taxes

Malaysia has very high tax rates on the import and sale of motor vehicles (around 120 percent for medium-sized imported vehicles, 90 percent for completely knocked down vehicles and above 250 percent for luxury models). The average tax break provided by REP for these cars are

²⁹ We also do not attempt to assess the additional impact high-skilled expatriates' tied-mover spouses and children might have on the Malaysian economy. The fiscal impact of REP applicant spouses is difficult to determine since we do not have information on these (other than from a non-representative follow-up survey). Though they too tend to be high-skilled and so would generate additional fiscal benefits for the Malaysian economy provided they work (and female labor force participation tends to be low in Malaysia, see Peck and Gibson 2013). Similarly, the children of returnees will tend to be high-skilled and now more likely to remain in Malaysia yielding additional long-term benefits for the economy.

³⁰ The sample from the Malaysian LFS includes only individuals between the ages of 25 and 64 years, with an educational qualification beyond high school completion, and employment in the same 3-digit occupations as the REP applicants. The (log) wage regression includes a fourth-order polynomial in age (minus 25), a female dummy, and education, industry, and year fixed effects.

³¹ The remigration rate is found with the help of a survey conducted in 2014 in which REP applicants are asked whether they are currently living in Malaysia. Matching the survey to the TalentCorp administrative data allows estimation of a remigration rate.

considerable: on average estimated for a CBU about RM 375,000 and for a CKD vehicle RM 73,000.³² In practice, the average applicant took advantage of the tax break for more than one car. These numbers do not, however, reflect the foregone taxes to the Malaysian government.

To assess the foregone taxes from the tax exemption on vehicles, we need an estimate of the type of car a returning expatriate would have bought in the absence of the tax exemption. In this scenario, the return migrants are likely to buy considerably less expensive cars and pay lower taxes. In the absence of estimates of the elasticity of demand across types of cars, we assume that the total expenditure of return migrants on cars would have been the same with and without the program (i.e. unit elastic demand). Moreover, the foregone taxes only apply to those people who would have returned to Malaysia in the absence of the REP.

Other Costs

The REP generates two additional costs: administrative costs and government expenditures due to those additional people who return on account of REP. A total cost of around RM 10,000 per month is estimated for the administrative cost to undertake the processing of REP applications.³³ To estimate the public expenditures on goods and services that arise due to the returning expatriates we include all government expenditures except for defense, education, debt service charges and transfer payments. The remaining public expenditures amounted to around RM 2,375 per capita in 2011. We assume that these public expenditures continue to arise for each returnee until age 85 (provided that they do not re-migrate).

Cost-Benefit Analysis

The results of the cost-benefit analysis are presented in Table 6. Each column corresponds to a different scenario. In the first column we use the OLS estimate for the whole sample (including a full set of covariates): a 12-percentage point increase in the return probability due to REP approval. The next two columns are based on the fuzzy RD design estimates of the program impact for those with a pre-existing job offer, and assume no impact for those without a pre-existing job offer. The lower and upper bounds correspond to an estimated impact of 40.0 and

³² Approved applicants used to be able to take advantage of the tax break for two CKD cars (pre-April 2014). Since April 2014 they only receive the tax break for one CKD/ Complete Built-Up CBU) car limited to RM150, 000 in taxes and duties.

³³ These costs do not include the overhead that accrues from the operations of TalentCorp (which includes a large number of programs), nor does it include the information campaigns to disseminate knowledge about the program.

61.9 percentage points respectively. The fourth column uses the model-based estimate of the ATE of the program (56.9 percentage points) for those with a pre-existing job offer and assumes no impact for everyone else. All costs and benefits are discounted to the present in current Malaysian ringgit.

The per applicant net fiscal benefit estimates of the REP program are modest and centered around zero, suggesting that the program is likely pay for itself. At the lower-end, the two-stage least square estimates suggest a net cost of RM 20,576 (around \$6,900) per applicant, while we find net benefits of RM 12,683 (around \$4,200) at the upper-end. We obtain these estimates despite the assumption that there is no treatment effect for three-quarters of all applicants. The OLS estimates are very close to the upper-bound of the RD estimates, and the model-based estimates show smaller net benefits (RM 5,090 or around \$1,700 per applicant). Recall that these are the net present discounted value of benefits, accruing on average around 30 years, and hence these costs or benefits are modest.

Gross benefits and costs are much more substantial, around RM 80-95,000 per applicant. Most of the benefits accrue due to higher income taxes as additional expatriates return to Malaysia, with consumption taxes a lot less important. Foregone income and vehicle taxes are equally important as all approved expatriates (including those who would have returned in the absence of the REP) can take advantage of the tax breaks. The estimated additional public expenditures are less important and are effectively covered by the consumption taxes collected. While fiscal costs and benefits are broadly balanced, the costs tend to arise during the first five years (the foregone vehicle and income taxes), while the benefits (additional income and consumption taxes) accrue throughout the working-life of a return migrant.

7. Conclusions

High-skilled expatriates returning to their home countries can generate significant economic, social and cultural benefits. Implementing policies to encourage these flows can be an important way in which a country can gain from integration of global labor markets for the highly skilled. This paper provides the first evidence on a major program incentivizing high-skilled expatriates to return. The program is highly successful for a subset of applicants - those who already have a job offer in Malaysia. Our fuzzy RD estimates suggest that REP approval leads to a 40 – 70

percentage point increase in their return probability. The fiscal cost-benefit analysis implies that the REP roughly pays for itself, even without taking into account potentially significant external benefits, which motivate the implementation of the program in the first place.

The REP is a new program, beginning in 2011, and new issues may arise as it continues to operate. It is conceivable that – if effective in encouraging return migration – it may also encourage outward migration (brain drain) of high-skilled Malaysians. In particular, it may reduce the perceived risks associated with a failed migration experience by subsidizing return. The design of the program mitigates this problem as it requires three years of continued employment abroad, and has recently introduced income requirements for eligibility. Hence, the REP does not provide a safety net against failed migration experiences, and is also unlikely to attract an adversely selected applicant pool. Indeed, if it encourages outward migration by encouraging return, then the end results might be an even greater increase in brain circulation, and possibly even greater gains.

References

- Bakija, Jonathan, and Joel B. Slemrod (2004). “Do the Rich Flee from High State Taxes? Evidence from Federal Estate Tax Returns,” *NBER Working Paper*, No. 10645, 2004.
- Docquier, Frédéric and Hillel Rapoport (2012). “Globalization, brain drain and development”, *Journal of Economic Literature*, 50, 3, 681-730.
- Dos Santos, Domingues and Fabien Postel-Vinay (2003). “Migration as a Source of Growth: The Perspective of a Developing Country”, *Journal of Population Economics*, 16(1), 161-75.
- Dustmann and Kirchkamp (2002). “The Optimal Migration Duration and Economic Activities after Re-Migration,” *Journal of Development Economics*, 67, 351-372.
- Gibson, John and David McKenzie (2011). “Eight questions about Brain Drain,” *Journal of Economic Perspectives*, 25(3): 107-28.
- Gibson, John and David McKenzie (2012). “The Economic Consequences of “Brain Drain” of the Best and Brightest: Evidence from Five Countries”, *Economic Journal*, 122: 339-75.

Hahn, Jinyong, Petra Todd, and Wilbert van der Klaauw (2001). "Identification and Estimation of Treatment Effects with a Regression-Discontinuity Design." *Econometrica*, 69(1): 201–09.

Imbens, Guido W., and Thomas Lemieux (2008). "Regression Discontinuity Designs: A Guide to Practice." *Journal of Econometrics*, 142(2): 615–35.

Imbens, G., and J. Angrist (1994), "Identification and Estimation of Local Average Treatment Effects," *Econometrica*, Vol. 61, No. 2, 467-476.

Kirchgassner, Gebhard, and Werner Pommerehne (1996). "Tax Harmonization and Tax Competition in the European Union: Lessons from Switzerland," *Journal of Public Economics*, 60, 351–371.

Kleven, Henrik, Camille Landais, and Emmanuel Saez (2013). "Taxation and International Migration of Superstars: Evidence from the European Football Market," *American Economic Review*, 103, 1892–1924.

Kleven, Henrik, Camille Landais, Emmanuel Saez, and Esben Schultz (2014). "Migration and Wage Effects of Taxing Top Earners: Evidence from the Foreigners' Tax Scheme in Denmark", *Quarterly Journal of Economics*, 129(1), 333-378.

Lee, David and David Card (2008). "Regression Discontinuity Inference with Specification Error," *Journal of Econometrics*, 142(2): 655–74.

Lee, David and Thomas Lemieux (2010). "Regression Discontinuity Designs in Economics," with, *Journal of Economic Literature*, 48(2), 281-355.

Liebig, Thomas, Patrick A. Puhani, and Alfonso Sousa-Poza (2007). "Taxation and Internal Migration: Evidence from the Swiss Census using Community-Level Variation in Income Tax Rates," *Journal of Regional Science*, 47, 807–836.

McCrary, Justin (2008). "Manipulation of the Running Variable in the Regression Discontinuity Design: A Density Test," *Journal of Econometrics*, 142(2): 698–714.

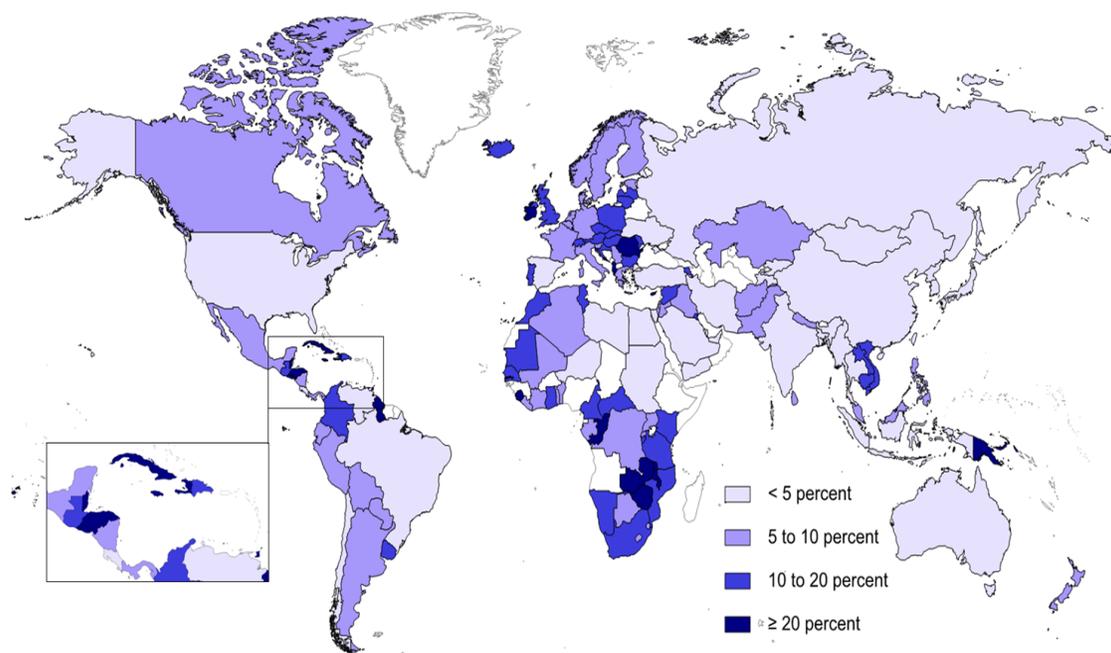
McKenzie, David and Dean Yang (2015). "Evidence on policies to increase the development impacts of international migration," *World Bank Research Observer*.

Tan, Peck and John Gibson (2013). "Impact of foreign maids on female labor force participation in Malaysia," *Asian Economic Journal*, 27, 2, 163-183.

Thom, Kevin (2010). “Repeated Circular Migration: Theory and Evidence from Undocumented Migrants,” mimeo.

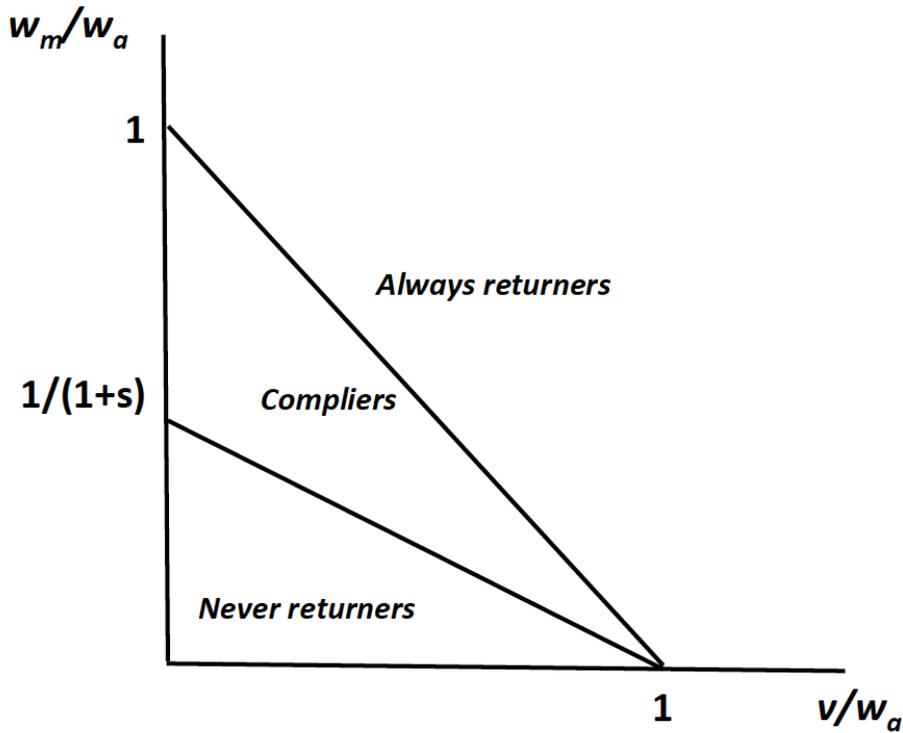
Young, Cristobal and Charles Varner (2011), “Millionaire Migration and State Taxation of Top Incomes: Evidence from a Natural Experiment,” *National Tax Journal*, 64 (2011), 255–284.

Figure 1. Emigration Rates of the Highly Skilled to OECD Countries (Ages 15 and Above)



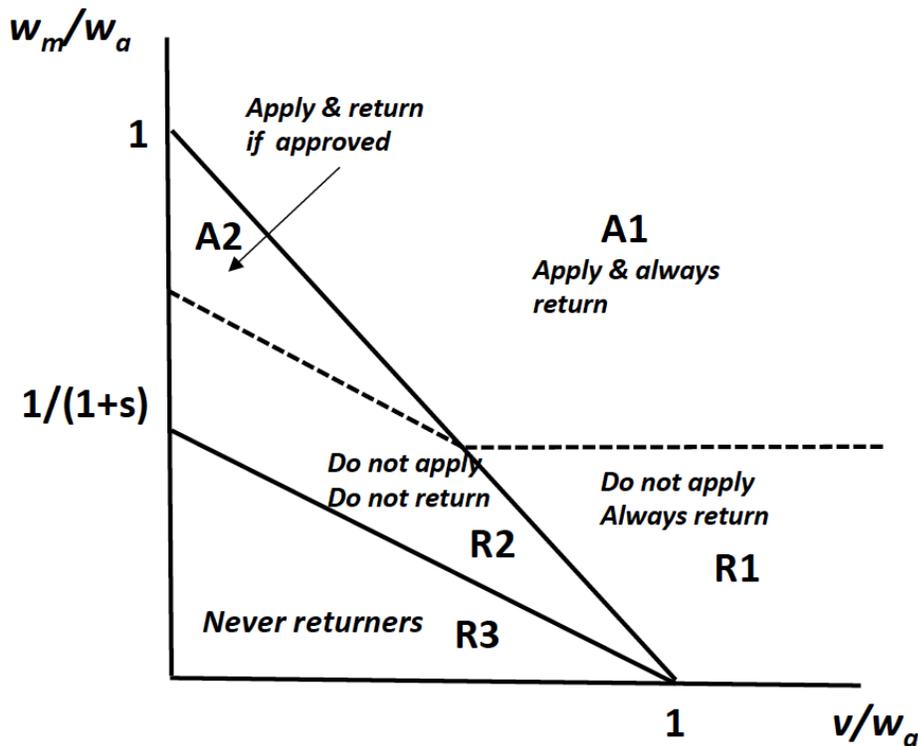
Source: Global Migration Database 2010.

Figure 2a: The Return Migration Decision for Expatriates



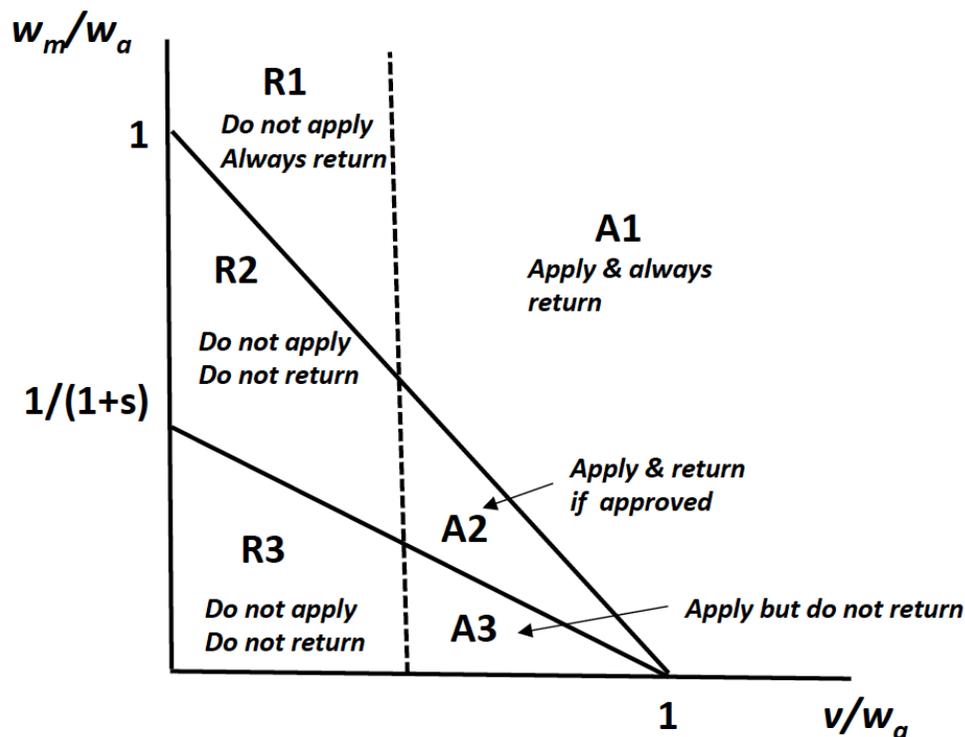
Notes: We scale all variables by an expatriates wage abroad w_a . The non-wage utility associated with returning, relative to remaining abroad, v/w_a , is on the x-axis. The relative wage in Malaysia, w_m/w_a is depicted on the y-axis. There are three types of people and the solid lines depict the relevant cutoffs. The 45-degree line $\frac{w_m}{w_a} + \frac{v}{w_a} = 1$ separates always-returners from the compliers and the line $w_m(1 + s)/w_a + v/w_a = 1$ separates the compliers from the never-returners.

Figure 2b: Application and Return Decision for Expatriates *With* a Pre-Existing Job Offer



Notes: We scale all variables by an expatriates wage abroad w_a . The non-wage utility associated with returning, relative to remaining abroad, v/w_a , is on the x-axis. The relative wage in Malaysia, w_m/w_a is depicted on the y-axis. The solid lines depict the relevant cutoffs for the return decision, the dotted lines the cutoffs for the application decision. The never-returners are in region R3 and they do not apply or return. The compliers are split into two sub-groups. Region A2 include those compliers who will apply and return if approved. The compliers in region R2 do not find it worthwhile to apply and do not return. The always-returners are also split into two groups. Those in region A1 apply to REP but return regardless of the outcome of the application. Those in R1 do not apply but return nevertheless.

Figure 2c: Application and Return Decision for Expatriates *Without* a Pre-Existing Job Offer



Notes: We scale all variables by an expatriates wage abroad w_a . The non-wage utility associated with returning, relative to remaining abroad, v/w_a , is on the x-axis. The relative wage in Malaysia, w_m/w_a is depicted on the y-axis. The solid lines depict the relevant cutoffs for the return decision, the dotted line the relevant cutoff for the application decision. The application decision is made before applicants know their type (always-returners, compliers and never-returners) and hence there are applicants of all types (in regions A1, A2, A3). Only always-returners (regions R1 and A1) and REP approved compliers (those approved in region A2) actually return.

Figure 3: REP Acceptance Probability and Normalized Work Experience Abroad

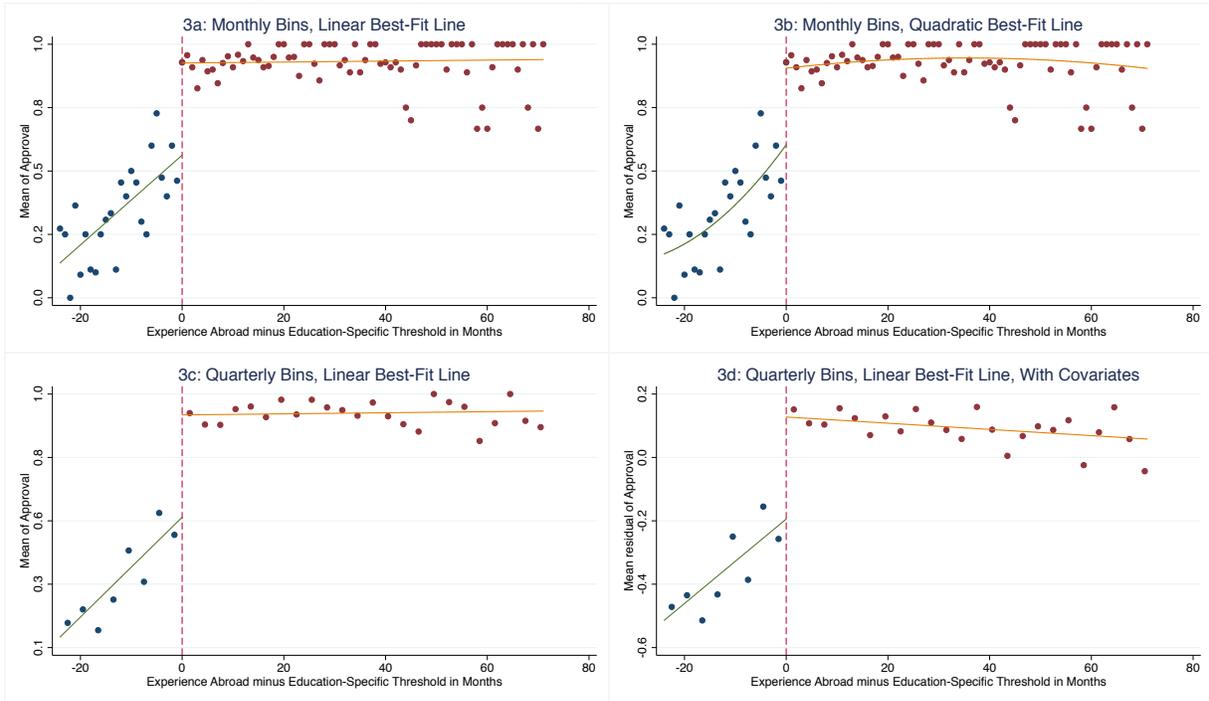


Figure 4: REP Acceptance and Work Experience Abroad, by Type of Applicant, Quarterly Bins

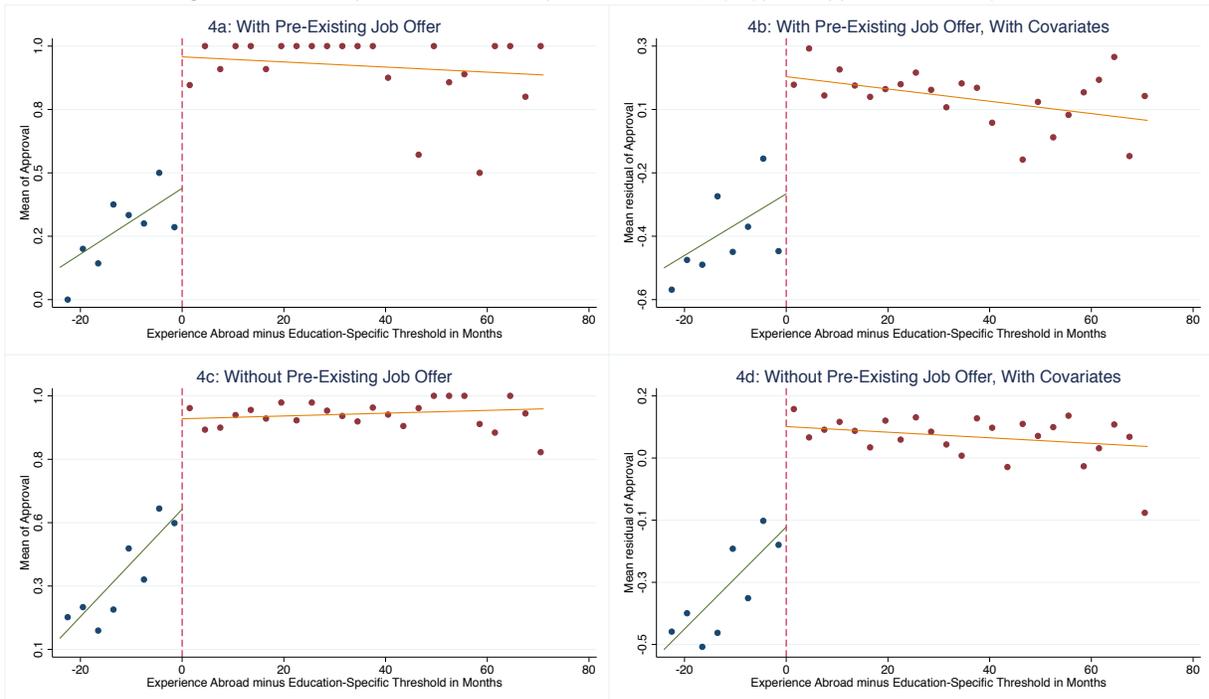
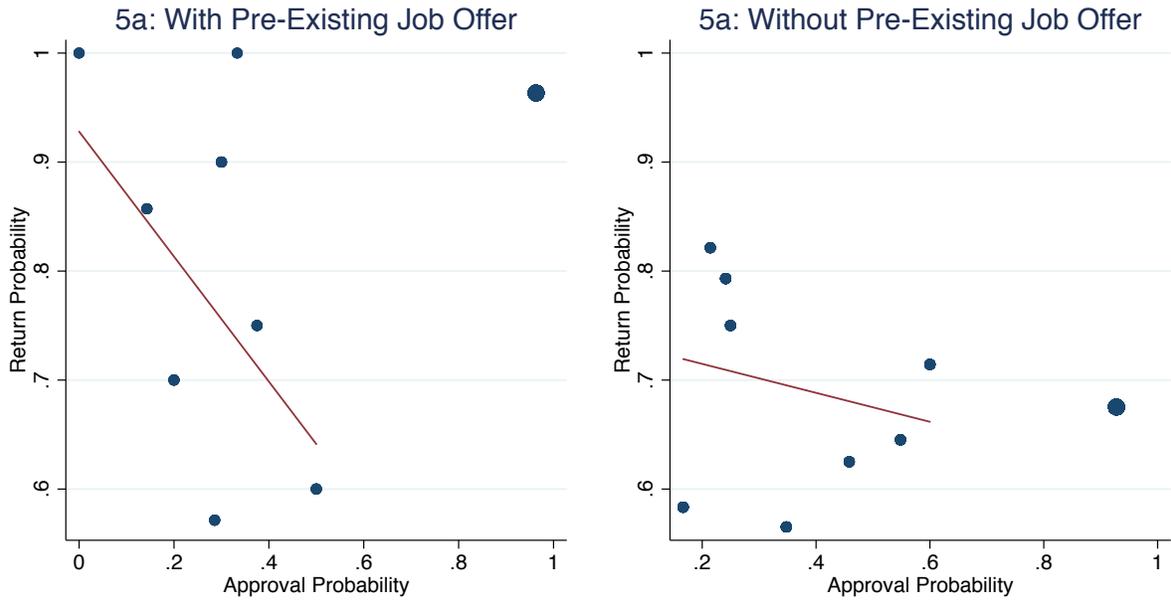
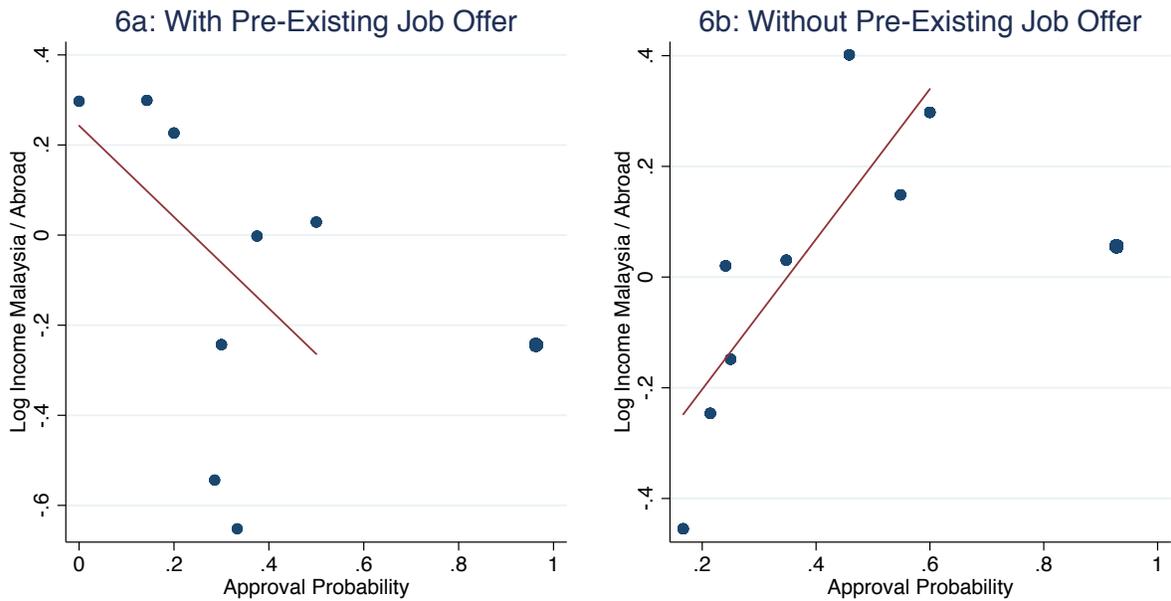


Figure 5: REP Approval and Return Probabilities, by Type of Applicant



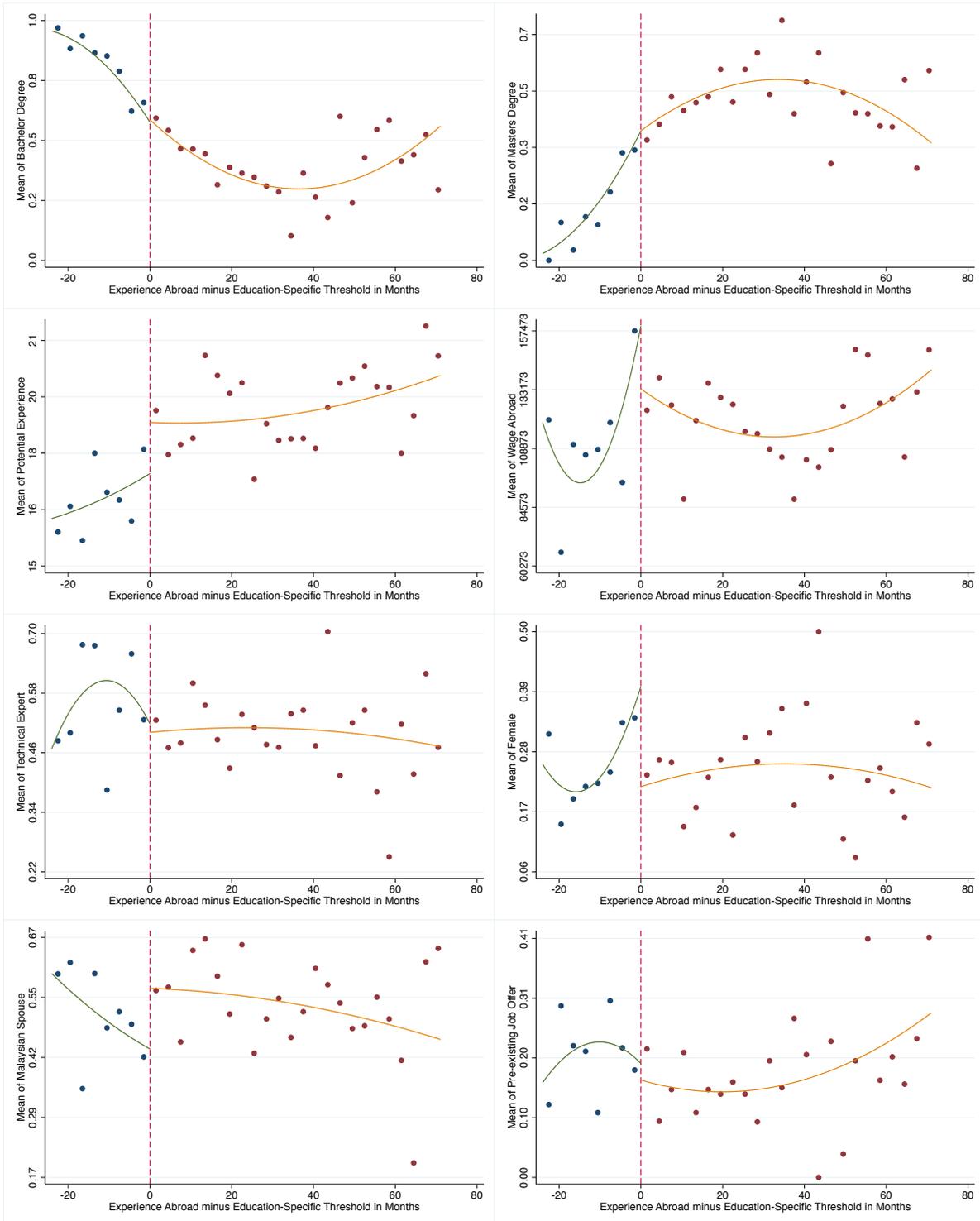
Note: observations are averages in 3 month work experience abroad bins (normalized by education-specific threshold), except the final marker which is based on all observations above threshold (up to 3 years).

Figure 6: Wages Malaysia / Abroad and Return Probabilities, by Type of Applicant



Note: observations are averages in 3 month work experience abroad bins (normalized by education-specific threshold), except the final marker which is based on all observations above threshold (up to 3 years).

Figure 7: Observables and Work Experience Abroad



Note: observations are in 3-month bins, a quadratic fit line is included

Figure 8: Number of Applicants by Months of Experience Abroad (1-month bins)

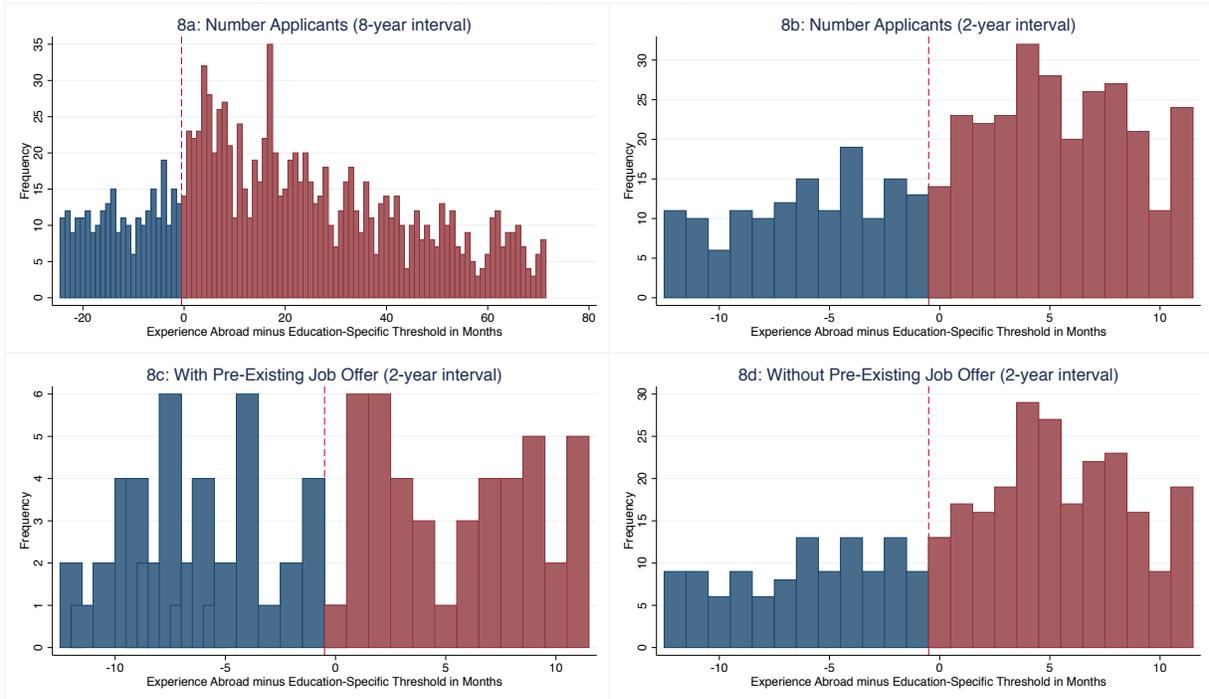


Figure 9: Return Probabilities for Applicants With Pre-Existing Job Offer

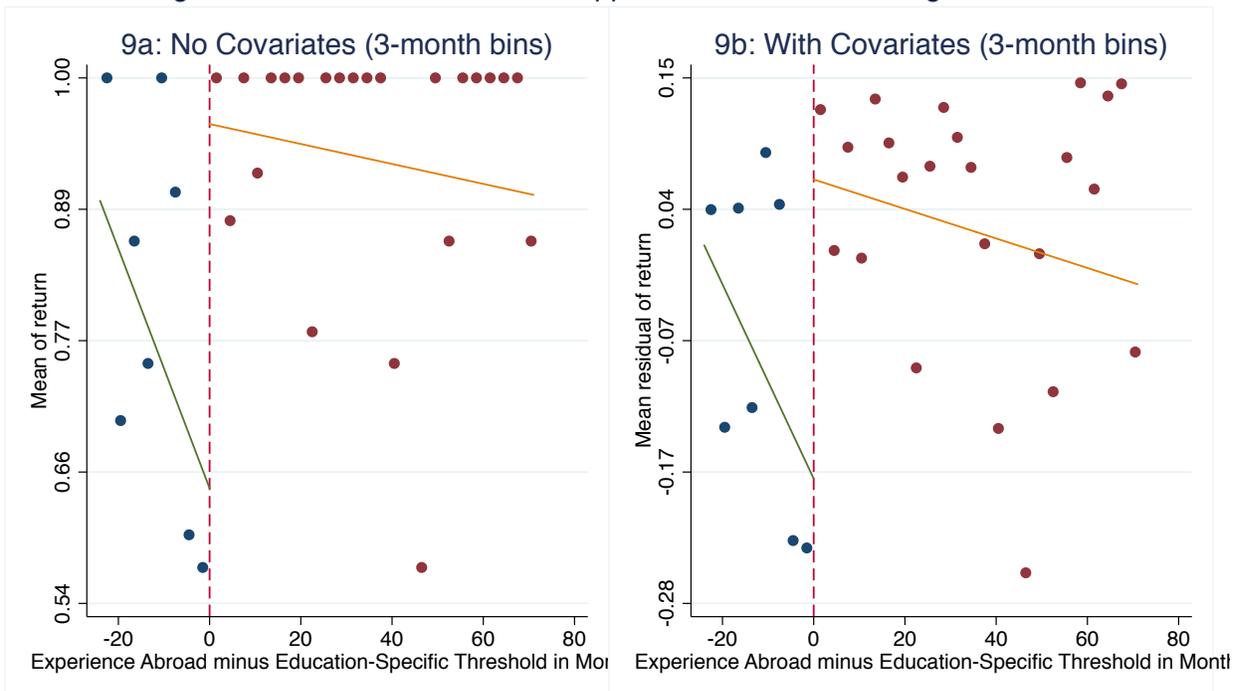


Figure 10: Return Probabilities for Applicants Without Pre-Existing Job Offer

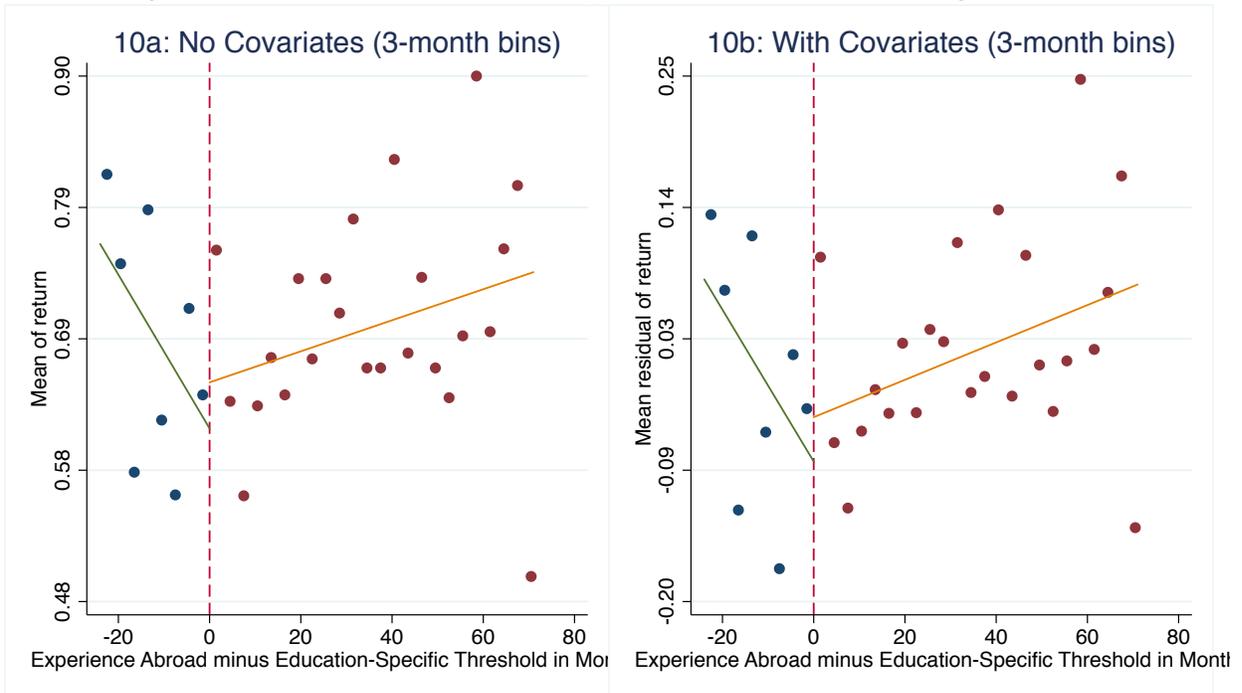


Figure 11: Impact of Changes in the Approval Probability on the Return Probability (Model-Based)

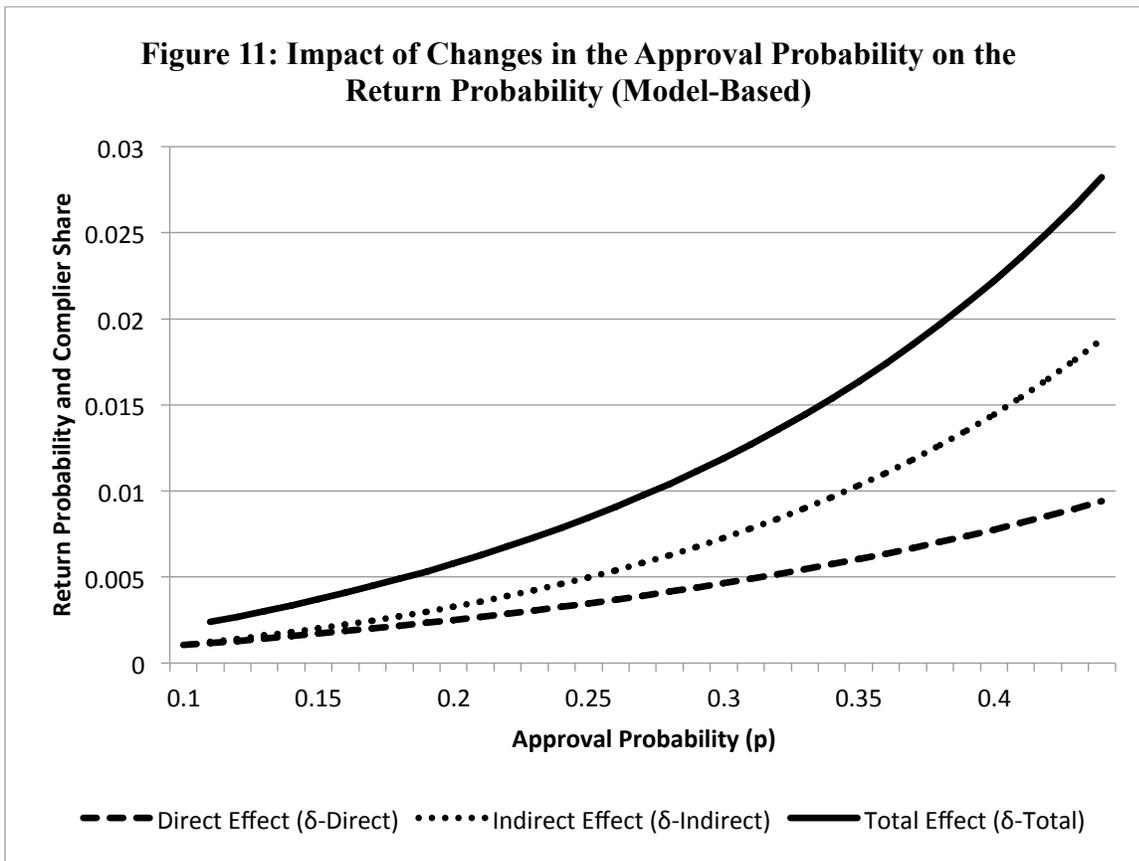


Table 1: Summary Statistics

<i>Education (%)</i>		<i>Job Title (%)</i>	
Bachelor	48.4	Top Management	11.9
Diploma	3.5	Middle Management	35.9
Master	41.5	Technical Experts	51.3
PhD	6.6		
<i>Other Demographics (%)</i>		<i>Country of Residence (%)</i>	
Female	23.3	United Kingdom	16.7
Married	67.6	Singapore	15.3
Foreign Spouse	16.3	China	10.7
Job Offer in Malaysia	19.5	Australia	7.7
Mean Age (yrs)	38.3	USA	7.7
Mean Exp. Abroad (yrs)	7.3	UAE	6.1
		Qatar	5.2
		Ireland	3.6
		Taiwan	3.2
		Saudi Arabia	3.1
		Brunei	2.6
		Hong Kong	2.4
		Japan	1.8
		New Zealand	1.7
		Vietnam	1.6
<i>Industry (%)</i>			
Business Services	32.4		
Manufacturing	13.1		
Communication Content	12.3		
Healthcare	11.4		
Oil, Gas & Energy	10.5		
Electronics & Electrical	9.0		
Education	6.2		
<i>Labor Income (in US dollar, Purchasing Power Parity)</i>			
	Mean	Median	Interquartile
Abroad	120,164	84,108	86,280
Malaysia (All)	137,067	106,849	115,069
Malaysia (Offer)	143,772	112,500	131,944
Log Malaysia/Abroad	0.112	0.105	0.784
Log Offer/Abroad	0.063	0.111	0.726

Note: summary statistics for full sample of 1654 applicants, except labor income information. Foreign income is available for 1108 applicants, Malaysian income for 770 approved applicants who returned, and income of those with a pre-existing job offer in Malaysia for 283.

Table 2: Summary Statistics for UK and US Diaspora and Applicants

	United Kingdom		United States	
	Applicants	Diaspora	Applicants	Diaspora
Stock		9,142		10,033
Inflow	185	611	95	490
<i>Education (%)</i>				
Bachelor	34	58	47	54
Master	51	31	37	37
PhD	13	11	13	8
<i>Other Demographics</i>				
Female (%)	38	61	28	45
Married (%)	58	61	44	64
Mean Age (years)	35	36	36	38
Years in Country	7	15	8	15
<i>Labor Income (in 2012 US dollars, Purchasing Power Parity)</i>				
Income (mean)	79,666	58,672	105,815	90,642
Income (median)	64,635	53,504	83,130	75,959
Observations	276	214	127	488

Note: summary statistics for the UK and US diaspora are from UK Labour Force Survey (2009-12) and the American Community Survey (2008-12) respectively. The applicant flow and the diaspora inflow and stock are annual averages.

Table 3: Return Probabilities of REP Applicants

	With Job Offer		Without Job Offer	
	Approved	Not Approved	Approved	Not Approved
Returned	231 93%	56 76%	738 69%	158 60%
Not Returned	17 7%	18 24%	332 31%	104 40%
Total	248	74	1,070	262

Table 4: Impact of REP Approval on Return Probability, Applicants With Pre-Existing Job Offer, 2SLS Estimates

	Full Sample	90% Sample	75% Sample	50% Sample	25% Sample
No Additional Covariates					
REP Approval	0.400** (0.163)	0.527** (0.210)	0.596** (0.272)	0.702* (0.364)	0.797 (0.633)
First-Stage F-Statistic	36	25	17	11	4.5
Full Set of Covariates					
REP Approval	0.487*** (0.184)	0.574** (0.229)	0.585** (0.270)	0.619** (0.302)	0.600 (0.393)
First-Stage F-Statistic	31	24	19	15	9.7
Observations	322	280	216	137	70

Note: sub-samples are based on excluding values of the assignment variable that are far from the threshold. The covariates are polynomials of income abroad, duration in the current job and potential experience, a dummy for marital status, female, year, and education and industry fixed effects. *, **, and *** denote significance at the 10, 5 and 1 percent significance levels respectively.

Table 5: Impact of REP Approval on Return Probability, Applicants Without Pre-Existing Job Offer, 2SLS Estimates

	Full Sample	90% Sample	75% Sample	50% Sample	25% Sample
No Additional Covariates					
REP Approval	0.032 0.118	0.028 0.158	0.025 0.205	0.044 0.311	0.208 0.464
First-Stage F-Statistic	79	42	25	11	4.7
Full Set of Covariates					
REP Approval	0.017 (0.118)	0.035 (0.158)	0.047 (0.205)	0.077 (0.311)	0.220 (0.464)
First-Stage F-Statistic	76	41	24	10	5.7
Observations	1332	1205	1013	674	341

Note: sub-samples are based on excluding values of the assignment variable that are far from the threshold. The covariates are polynomials of income abroad, duration in the current job and potential experience, a dummy for marital status, female, year, and education and industry fixed effects. None of the estimates are statistically significant.

Table 6: Fiscal Costs and Benefits of REP per Applicant (in current RM)

	Scenarios			
	OLS	2SLS - Lower	2SLS - Upper	Model-Based
Additional Taxes Due to REP (in present discounted value)				
Income Taxes	82,958	53,922	83,445	76,705
Consumption Taxes	11,484	7,464	11,551	10,618
Total Benefits	94,441	61,387	94,996	87,323
Additional Costs Due to REP (in present discounted value)				
Processing Costs	114	114	114	114
Foregone Income Taxes	35,352	37,040	35,324	35,716
Foregone Vehicle Taxes	36,111	37,835	36,082	36,482
Public Expenditures	10,729	6,974	10,792	9,921
Total Costs	82,307	81,962	82,313	82,233
Net Benefits	12,134	-20,576	12,683	5,090

Note: estimated magnitude of treatment effects: OLS = 0.120, 2SLS-Lower = 0.400, 2SLS-Upper = 0.619, Model-Based (weighted sum of estimated MTE) = 0.569. OLS effect is for whole sample, 2SLS and Model-Based is only for those with pre-existing job offer, 19.5% of sample, for everyone else the treatment effect is assumed to be equal to zero. 1 Malaysian Ringitt (RM) is around 1/3 US\$.