Local Labor Supply Responses to Immigration*

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October 2013

Abstract

Using detailed labor force data for Malaysia for 1990 – 2010, this paper analyses responses of natives to immigration on multiple extensive margins, and provides rare evidence for a developing destination country. Our IV identification strategy is based on changes in the population and age structure of migrant source countries and the differential propensity of these groups to migrate to particular states within Malaysia for identification. The IV estimates show that immigration to a state results in an inward flow of natives. Both the number of natives employed and out-of-laborforce in a state increase due to immigration. The evidence is consistent with immigration causing relocation of both employed individuals and their entire households. The increase in the out-of-laborforce native population as a result of immigration is due to migration of married housewives and school age children.

*We are grateful to Amir Omar and his team at the Institute of Labor Market Information Analysis (ILMIA) for their support, and the Department of Statistics of Malaysia for making the data available. We thank participants at the 6th International Conference on Migration and Development and the 4th TEMPO Conference on International Migration for comments and suggestions. The findings, conclusions and views expressed 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.

1 Introduction

Labor market behavior of natives in response to immigration is central to an understanding of the impact and associated welfare consequences of international labor mobility. Potential adjustment mechanisms are numerous, but the primary focus of the literature has been on how immigration impacts relative wages in the local labor markets as well as the resulting inflows and outflows of natives (Card, 2009; Borjas 2013). This paper extends the analysis to consider a number of extensive margins along which native labor supply adjusts to immigration shocks, using detailed labor force survey data from Malaysia. We decompose the total causal effect of immigration into changes in the population of a local area, the propensity of those individuals to enter the labor force, or choose alternatives, such as continue with their education, retire or work in household activities. Our results show there is adjustment on all of these dimensions, highlighting the value of a comprehensive analysis.

The paper contributes to growing literature on endogenous native worker (and firm) responses to immigration. The link between arrival of foreign migrants and internal mobility of native workers across geographic areas or sectors has been extensively studied, primarily using U.S. data. Early work by Filer (1992), Frey (1995), and White and Liang (1998) find evidence that immigration into a locality results in outward migration of natives to other areas. Subsequent work by Wright, Ellis and Reibel (1998), Card and DiNardo (2000), Card (2001), and Kritz and Gurak (2001) found the magnitude of these flows to be small, following the influential work by Altonji and Card (1991). On the other hand, Borjas (2006) finds evidence consistent with substantial native responses to immigration. Card and Lewis (2007) find little evidence of such responses looking at changes in industry composition, a finding supported by Gonzalez and Ortega (2011) using Spanish data and Dustmann and Glitz (2012) using German data. Shifting their focus to labor market responses of women, Cortes and Pan (2011) and Cortes and Tessada (2011) find increased hours worked and employment in Hong Kong and the U.S. respectively. Bor-

jas, Grogger and Hanson (2010) find declining employment and rising incarceration rates African-American men. Plausible adjustment mechanisms to immigration are numerous and recent important work by Lewis (2011, 2013) has looked at changes in technology, Peri and Sparber (2009) and Ottaviano, Peri and Wright (2012) at changes in native task specialization. We consider a broader set of native extensive margin responses to immigration than previous work (full-time and part-time employment, unemployment, or occupied outside the labor force as a student, housewife or retiree), providing new insights into how natives adapt to immigration shocks.[1]

The other important contribution of the paper is to help address a pronounced imbalance in the literature where existing evidence is nearly exclusively for OECD destinations,[2] even though almost half of global immigration takes place between developing countries (Artuc et al., 2013). We use detailed data from the Malaysian Labor Force Survey (LFS) for the years 1990 to 2010 for the analysis. Over the past twenty years, Malaysia has experienced a rapid increase in the share of immigrants in the working-age population, going from 3.2 percent in 1990 to 10.4 percent in 2010 according to the LFS data. Immigrants are primarily from Indonesia (55 percent) and the Philippines (20 percent) with the remainder coming from other East and South Asian countries. South-South migration is likely to become more important as diverging demographic patterns and increasing regional economic integration are leading to increased migration flows in many parts of the developing world. The paper contributes to the overall migration and labor markets literature by presenting rare evidence from a developing country that is also a prominent destination for migrants.

We identify the impact of immigration on a number of native labor market outcomes using the variation in the inflow of immigrants across states and over time in Malaysia. In order to deal with the endogeneity of immigration flows, we instrument for these using

[1] The available data does not allow us to identify effects on technological change or task specialization.

[2] Exceptions are Gindling (2009) for Nicaragua and Facchini, Mayda and Medola (2013) for South Africa; both papers focus on employment and wages of natives.

changes in the size and age structure of the populations in migrant source countries and the differential propensity of these groups to migrate to particular states. The instruments rely both on cross-sectional and time-series variation, combining the insights of Hanson and McIntosh (2010) with the typical Altonji-Card (1991) instrument that is used extensively in the literature. This structure allows us to include state-specific linear time trends to control for unobserved local labor market specific long-term demand trends.

We find that immigration into states in Malaysia causes large inflows of natives into that state as well. The surprising fact is that we observe an increase in the numbers of *both* the employed and out-of-labor force people. For every 10 immigrants into a state, there is an additional inflow of 8.2 working-age natives, two-thirds of who are in and one-third of who are out of the labor force. We find that the increase in the number of the out of the labor force people is concentrated in the housewife and student categories, with no effect on other categories such as retirees. Thus, our results are consistent with immigration causing an increase in the demand for native labor which induces both employed individuals and their families to migrate across states. The labor force participation rates of women are low (under 50 percent) and families also bring their children, which explains the rise in the number of housewives and students in a state as a response to immigration. In other words, immigration does not only change the distribution of employment and output across states, but has much larger social ramifications as entire families are induced to move. We find that these effects are concentrated among middle and lower-skilled Malaysians, while those with some tertiary education (vocational or university) remain largely unaffected.

The remainder of this paper is structured as follows. Section 2 describes the data and provides background information on Malaysia. Our empirical strategy and instrument are outlined in Section 3. Section 4 describes our results, and Section 5 concludes.

2 Data and Background

The Labour Force Survey (LFS) of Malaysia provides annual detailed data on various characteristics of the overall population and the structure of employment at the individual level. The sample includes both Malaysians and the migrants whether they are in the labor force, retired, in school or listed as non-wage household workers. The main survey is conducted monthly by the Department of Statistics of Malaysia and data are available for the years 1990 to 2010, with the exceptions of 1991 and 1994 when the survey was not conducted and 2008 where the survey weights were not available. The main survey samples, on average, around 1 percent of the population.

The LFS records the state people live in and our main unit of analysis is one of the 15 states of Malaysia in a particular year.[3] One of the key variables is an individual's labor market status: employed, unemployed or out of labor force. There is detailed information on the reasons why a person remains out of the labor force which we divide into four main categories: student, housewife, retired and all other reasons. For those employed, we are able to distinguish between full-time and part-time employment.[4] We also have information on an individual's age, gender, marital status. We aggregate the various educational classifications into six main categories: no formal education, primary education, lower secondary education, upper secondary education (including post-secondary, STPM), certificate / diploma (vocational training), and university degree and above.

Tables 1 and 2 present summary statistics for three years of the survey: 1992, 2001 and 2010.[5] Table 1 describes the characteristics of Malaysians by gender, and Table 2 compares these to those of the immigrants. This is a period of rapid economic growth for Malaysia,[6] and an impressive transformation of the Malaysian-born labor force's educa-

[3] We include Putrajaya in Selangor throughout the analysis.

[4] The LFS does not contain detailed questions on an individual's income except for a smaller subsample for the years 2007-2010.

[5] We choose 1992, rather than 1990, since it is the first survey conducted after the 1990 census and hence uses more accurate survey weights. 2001 is the first survey after the 2000 census.

[6] Malaysia experienced rapid economic growth with an average annual growth rate of 6.6 percent. GDP per capita in current US dollars went from $2,418 in 1990 to $8,691 in 2010 (World Bank national

tional attainment levels In 1992, 56 percent of the native labor force had primary school education or less, and only 4.5 percent had education beyond upper secondary education. By 2010, the share of the labor force with at most primary school education declined to 24 percent while 16 percent had a vocational diploma or a university degree. The transformation is most impressive among the new entrants to the labor force (ages of 20-25). As of 2010, around 80 percent of this group had obtained (at least) a high school degree.

Labor force participation rates are significantly higher for men (around 80 percent) than women (around 46 percent). However, the long term trend is downward-sloping for men but stable for women. Unemployment rates are low and stable at 3-4 percent. The share of the part-time employment has been declining over time, from 11 to 6 percent for women and 6 to 4 percent for men. The self-reported fraction of the retired has been rising rapidly over time for men, reaching 18 percent of those out of the laborforce; while it continues to be close to zero for women.[7]

There are two types of formally registered immigrants in Malaysia: expatriates and foreign workers.[8] Expatriates are highly skilled managerial, professional, and technical workers who are able to obtain long-term visas and enjoy privileges, such as the ability to bring their families, admission under different visa regimes and exemption from certain taxes. These highly-skilled or educated professionals make up only 2 percent of the total visas issued to immigrants (Del Carpio et al., 2013). The remaining 98 percent of immigrant workers only receive temporary work permits that are valid for at most a year and renewable for at most five years. These workers are not allowed to bring any dependents and are required to exit Malaysia upon termination of their contracts. There is almost no pathway to citizenship. Formal employment of foreign workers is regulated by quotas assigned to specific sectors, which are adjusted annually if there are

accounts data).

[7]It is an interesting question why women do not self-report being retired; but that is an issue beyond the scope of this paper.

[8]The material in this section draws on Del Carpio et al. (2013) who provide an extensive discussion of the Malaysian immigration system.

extraordinary circumstances. Foreign workers are hired either directly by a company, or through a recruitment agency that handles the administrative burden of obtaining work permits in return for a fee. Such hiring costs are comparatively low by international standards, but hiring and work permit procedures can be arduous and include medical checks. In addition, annual levies (payable by the employer up until 2013) are charged for the employment of foreign workers. These levies vary by sector, and differ for Peninsula Malaysia and Sabah and Sarawak for certain sectors. They range between RM1200-1800 per year which would be around 10-15 percent of the minimum wage.

There is a substantial number of irregular or undocumented foreign workers in the labor force. Many of them may have entered Malaysia legally but overstayed their permits. Reliable estimates are not available, but a 1996/97 regularization exercise resulted in almost one million unregistered migrants being legalized. Another new program, labelled the 6P, implemented in 2011 registered over half a million undocumented foreign workers. This suggests that as many as half might be employed without proper documentation. In principle our data capture these undocumented immigrants. Moreover, as discussed below, our empirical methodology is designed to address most of the challenges arising from undocumented migration.

According to the LFS, between 1990-2010 the share of immigrants increased from 3.6 to 10.6 percent of the labor force. Immigrant workers are disproportionately employed in agriculture and unskilled labor intensive service sectors, such as, construction. Their share in manufacturing also increased rapidly during this period, while they are under-represented in relatively skill-intensive service sectors such as health, education and public administration. Immigrants are significantly less educated than Malaysians, 86 percent have (at most) primary school education in 1992. Even though this number had fallen to 66 percent in 2010, only 19 percent had completed high school. A closer look at the LFS reveals that a large portion of these high school educated immigrant workers are also employed in low-skilled occupation categories indicating that their actual human capital

is lower than Malaysian high-school graduates. Around 55 percent of all immigrants are from Indonesia, 20 percent from the Philippines and the remainder from countries such as Bangladesh, Cambodia, India, Laos, Myanmar, Sri Lanka, Thailand, and Vietnam.

3 Empirical Strategy

3.1 Empirical Framework

The central contribution of this paper is in understanding different native responses to immigration. While the literature has focused mainly on employment, we consider a large set of extensive margin choices by natives. We decompose the employment effect into a number of important components to provide a coherent framework for empirical analysis. We denote the population in state r in year t, Pop_{rt}, as the sum of the people in the labor force, L_{rt}, and out of the labor force, NL_{rt}:

$$Pop_{rt} = L_{rt} + NL_{rt}. \tag{1}$$

Those in the labor force can either by employed full-time E^F_{rt}, part-time E^P_{rt}, or unemployed U_{rt}:

$$L_{rt} = E^F_{rt} + E^P_{rt} + U_{rt}. \tag{2}$$

Out-of-labor force individuals can be students S_{rt}, housewives H_{rt}, retired R_{rt}, or in the other reasons category, O_{rt}:

$$NL_{rt} = S_{rt} + H_{rt} + R_{rt} + O_{rt}. \tag{3}$$

The employment-population ratio, e_{rt}, is defined as

$$e_{rt} = \frac{E_{rt}}{Pop_{rt}},$$

where $E_{rt} = E^F_{rt} + E^P_{rt}$. By substituting equation (1) and rearranging, we can express total employment, E_{rt}, as the product of the employment-population ratio and the sum of the labor force and out-of-labor force populations:

$$E_{rt} = e_{rt} \left(L_{rt} + NL_{rt} \right). \tag{4}$$

The focus in the literature has been on the impact of immigration, M_{rt}, on the total employment level of native workers, E_{rt}. The identity above, given by equation (4), implies that the impact of immigration on employment can be decomposed into the effect of immigration on the size of the labor force, on the size of the out-of-labor force and on the employment-population ratio:

$$\frac{dE_{rt}}{dM_{rt}} = \left(\frac{dL_{rt}}{dM_{rt}} + \frac{dNL_{rt}}{dM_{rt}} \right) e_{rt} + Pop_{rt} \frac{de_{rt}}{dM_{rt}}, \tag{5}$$

We can further decompose the impact on the labor force and out-of-labor force groups as the following, based on equations (2) and (3):

$$\frac{dL_{rt}}{dM_{rt}} = \frac{dE^F_{rt}}{dM_{rt}} + \frac{dE^P_{rt}}{dM_{rt}} + \frac{dU_{rt}}{dM_{rt}} \tag{6}$$

$$\frac{dNL_{rt}}{dM_{rt}} = \frac{dS_{rt}}{dM_{rt}} + \frac{dH_{rt}}{dM_{rt}} + \frac{dR_{rt}}{dM_{rt}} + \frac{dD_{rt}}{dM_{rt}} + \frac{dO_{rt}}{dM_{rt}} \tag{7}$$

3.2 Estimating Equations

We separately estimate the derivatives in equations (5), (6), and (7) in order to understand the various channels through which natives respond to immigration. Our estimating equation to identify the various outcomes of interest y_{rt} is given by:

$$y_{rt} = \beta M_{rt} + \delta_r + \delta_t + \delta_r t + \varepsilon_{rt}, \tag{8}$$

where δ_r are state fixed effects, δ_t are year fixed effects, $\delta_r t$ are state-specific linear time trends, and ε_{rt} is an error term. The outcomes we use as dependent variables, y_{rt}, are the native population of a state in year (Pop_{rt}), total native employment (E_{rt}), full-time employment $\left(E^F_{rt}\right)$ and part-time employment $\left(E^P_{rt}\right)$, unemployment (U_{rt}), out-of-laborforce (NL_{rt}), students (S_{rt}), housewives (H_{rt}), and retired (R_{rt}). The full-time average impact of immigration on the unemployment rate and the employment-population ratio are also derived from these estimates.

3.3 Instrument

The central challenge in estimating the equations defined by (8) is the endogeneity of immigrant location decisions, which are likely to be correlated with unobserved shocks (positive or negative) to the demand for labor in a state. The likelihood of biased OLS estimates makes it important to instrument for the inflow of immigrants to a state.

Our instrumenting strategy is closely related to Ozden and Wagner (2013). A valid instrument for immigration flows needs to be uncorrelated with any demand shocks, caused by changes in technology or output prices, that may affect the demand for native or immigrant labor in a given locality at a given time. We use changes in the population and age structure of immigrant source countries over time to construct such an instrument. The source countries are Bangladesh, Cambodia, India, Laos, Myanmar, Sri Lanka, Thailand, Vietnam, and most importantly Indonesia and Philippines. Using the data from the United Nations Population Division, we calculate the number of individuals in each of 7 age-groups in each of these source countries in every year during 1990-2010.[9] These population numbers form the potential pool of immigrants to Malaysia, where the likelihood of migration would vary by age group, country of origin and year. This is our measure of

[9] The age groups are 15-19, 20-24, 25-29, 30-34, 35-39, 40-44, and 45 and above.

the supply of immigrants S_t^{ac} to Malaysia from source country c in age-group a and year t.[10] Since data on immigrants' nationality are grouped into Indonesians, Filipinos and the rest of the world, we add our measure of the supply of immigrants for all other countries into a single category, such that effectively we have three source countries: Indonesia, the Philippines, and Other.

What remains to be determined is the distribution across states within Malaysia in which the immigrants choose to work. In order to construct this variable, we calculate the average probability of individuals from a source country and age group to be employed in a certain state

$$\lambda_r^{ac} = \frac{\frac{1}{T}\sum_{t=1990}^{2010} M_{rt}^{ac}}{\frac{1}{T}\sum_{t=1990}^{2010} M_t^{ac}},$$

where M_{rt}^{ac} is the number of immigrants from a source country in an age group, state, and year, and M_t^{ac} is the total number of immigrants in Malaysia from a source country and in an age group.

The source country and age-group specific instrument for the immigration flows in a certain state and year is given by:

$$IV_{rt}^{ac} = \lambda_r^{ac} * S_t^{ac}. \tag{9}$$

As mentioned above, we have three source countries (Indonesia, Philippines and Other) and seven age groups for a total of twenty-one instruments. The identifying variation comes from the interaction of λ_r^{ac} and S_t^{ac}, conditional on the included fixed effects, and is due to changes in the size of cohorts in source countries (which are experiencing their demographic transition at different rates) and their differential propensity to be employed in certain states in Malaysia. The variation in the instrument generated by the differential

[10] We multiply these population numbers by the average propensity of people from each country to migrate to Malaysia. This is so as to ensure that the magnitudes of the coefficients on each instrument are broadly comparable. These propensities are calculated from data provided by the Ministry of Home Affairs of Malaysia and are: Bangladesh 1.96%, Cambodia 1.03%, India 0.11%, Lao 0.01%, Myanmar 2.18%, Sri Lanka 0.16%, Thailand 0.22%, Vietnam 0.78%, Indonesia 5.56% and Philippines 0.38%.

propensity of immigrant groups (defined by nationality and age) to work in different local labor markets is similar to the commonly used Altonji-Card instrument (Altonji and Card, 1991; Card, 2001). The variation induced by the demographic changes in source countries is inspired by Hanson and McIntosh (2010).

Considering potential threats to the validity of this instrument, it is worth noting that the supply of potential migrants to Malaysia from different source countries (S_t^{ac}) is determined by the demographic patterns and transition in those countries, and hence clearly exogenous with respect to contemporaneous labor market shocks in Malaysia. The average propensity of an immigrant from a source country to be employed in a certain state (λ_r^{ac}) depends on permanent differences in the levels of demand across local labor markets, which is why we include state specific fixed effects in all our regression specifications. It is of course independent of any transitory shocks that may affect demand for natives (and immigrants) in a particular year. However, the concern is that persistent demand shocks, i.e. long periods of decline or growth in certain states and/or industries, would result in a correlation between the average distribution of immigrants and current demand shocks. The advantage of our instrument, as compared to the Altonji-Card instrument, is that it uses both time-series and cross-sectional variation. Consequently, we can include local labor market (state) specific linear time trends to account for this concern, and use the variation induced by the non-linearities in the demographic transition of source countries for identification.[11]

An additional advantage of the IV approach is that it helps deal with measurement problems. For example, undocumented immigrants are likely undercounted by the LFS, resulting in attenuation bias in the OLS estimates. For the IV estimates to be consistent, it is only necessary that - conditional on the fixed effects - the flows of illegally employed

[11] In interpreting our results, it is worth noting that the variation captured by the instrument will account for the migration decisions of only a subsection of all immigrants. These migrants are ones for whose social networks at the region level are important for their location decisions. Such immigrants may be systematically different from those whose locations decisions are determined primarily by demand shocks, and we would be estimating a local average treatment effect (which may or may not be the same as the average treatment effect for all immigrants).

immigrants are uncorrelated with the instrument.

4 Results

4.1 Overall

We present OLS and IV results from estimating equation (8) in Table 3. OLS results with state and year fixed effects, as well as state-specific linear time trends, are reported in the first and second column respectively; the corresponding IV results are reported in the third and fourth column The results from the first-stage are in the Appendix Table A1.

In both the OLS and IV specifications the inclusion of state-specific linear trends substantially decreases the coefficient on the immigration variable, both for employment and out-of-labor force variables. The implication is that there are very pronounced state-specific long-term trends that generate a spurious correlation between immigration and native labor market outcomes. This highlights the importance of using an instrument which relies on both cross-sectional and time-series variation, thereby enabling us to control for such long-term trends. The differences between the OLS and IV estimates provides evidence on the factors that determine the location decisions of immigrants. The OLS results are slightly smaller than IV when using employment as an outcome, suggesting that immigrants are somewhat more likely to migrate to states experiencing negative demand shocks. For out-of-labor force variables, OLS and IV results are almost identical.

Focusing on the IV results with a full set of fixed effects, we find that immigration has a large positive impact on the number of native workers employed in a state; for every 10 immigrants there are an additional 5.6 natives employed, with 4.7 full-time and 0.9 part-time employment. Given its low level (6 percent of total labor force), part-time employment is a lot more responsive to immigration than full-time employment,

with elasticity of 0.16 versus 0.05. The number of unemployed people is unaffected by immigration, though as employment increases, there is a slight fall in the unemployment rate with an elasticity of -0.02.

The other set of results indicate that the number of people out of the laborforce in a region also increases substantially due to immigration. For every 10 immigrants in a state, there are an additional 2.4 individuals who are not in the labor force, and, thus the total native population in a state increases by 8. The increase in the out-of-labor force population is driven by an increase in those attending schools or post-secondary education, and the number of housewives. For every 10 immigrants in a state, there are 0.9 additional students (above the age of 15)[12] and 1.6 housewives. There is no significant effect on the number of retirees. Notably, the employment-population ratio increases only slightly (with an elasticity of 0.1, or a semi-elasticity of 0.06). An explanation is that immigration encourages the inflow of families into a state, with a significant fraction of women staying at home and young adults (above age 15) going to school. We further explore this interpretation in Section 4.2. It also suggests that while immigration results in substantial reallocation of people across states, it is unlikely to have substantial effects on employment at the national-level.

We present some robustness checks in Table 4. Our results are broadly unaffected when using a log-log specification. The elasticity of employment and out-of-laborforce with respect to immigration is around double that the levels specification, 0.12 and 0.09 respectively. The main difference is that in the log-log specification we find a negative impact of immigration on native unemployment in a state, and no significant impact on part-time employment. Further, weighting observations by the average of the dependent variable in a state over this period does not substantially affect our estimates. Finally, clustering the error term at the state-level actually decreases standard errors, since there

[12]There is also an additional 2.8 students below the age 14. These are excluded from the main regressions which only include the working-age population. We run the estimation for the 0-14 age group separately.

is negative serial correlation conditional on the large set of fixed effects and state time trends.

4.2 By Gender and Age

Tables 5 and 6 report IV results by gender and for four age groups (ages 15-19, 20-29, 30-49, and 50-64). Appendix Tables A2 and A3 report the corresponding OLS results.

We find that immigration has a far larger impact on male than female employment, where additional 10 migrants lead to 4.1 additional male and 1.5 female employees. The corresponding elasticities are 0.043 and 0.016 respectively. The difference is driven by full-time employment, where the impact on part-time employment is of a similar magnitude. In contrast, the impact of immigration on people in a state who are not in the laborforce is far larger for women than men where 10 additional immigrants imply 2 additional female and 0.4 male out-of-labor force Malaysians. This difference is fully driven by the large increase in the number of housewives in a state as a consequence of immigration, an additional 1.6 for every 10 immigrants. The increase in the number of people in school is evenly divided among men and women, a bit less than one additional student for every 10 immigrants who arrive in a state.

In terms of the age distribution of the impact, the positive employment effects of immigration are concentrated among those aged between 20 and 49, with a small and positive effect on teenagers (ages 15 to 19) and no real effect on workers above age 50, except a marginal effect for those employed part-time. Among the out-of-labor force group, there is an increase for all age groups between 15 to 49, but for very different reasons. For the 15-19 age group, the main increase is for attending school. For the 20-29 age group, the largest increase is for the housewives and a smaller increase among students. Finally, for the 30-49 group, the only effect is in the number of housewives. Again there is no effect for Malaysians who are older than 50 and not in the labor force.

Our results are consistent with several other analyses. Recall that, 10 additional

immigrants into a state leads to internal movement of 8.2 Malaysians between the ages of 15-64. Among these 4.7 are men and 3.5 are women. Of these women, 1.5 are employed and 2.0 are out of the labor force which are further split between 1.6 housewives and 0.4 students. Thus we have 3.1 women who move and have completed their education. Among these movers, 1.5 of them are employed which gives us a labor force participation ratio of slightly below 50 percent for women who completed their schooling and this is consistent with national averages.

Another source, Malaysian *Migration Survey Report* (2011) finds that around half of all migrating women do so on the account of their husband. The marriage ratio is around 70 percent for Malaysian women in the relevant age range, which implies that 2.5 of the 3.5 Malaysian women who moved are married. Since 1.6 of these are housewives, we can assume they are those who move due to their husband's relocation which gives us a ratio of 65 percent, close to the level cited in the *Migration Survey Report*.

We also find that for every 10 immigrants an additional 2.8 children below the age of 14 (Table 3, last row) move to a state. We have 7 adult Malaysians between the ages of 20-49 move for 10 immigrants (Table 6, first row). This is approximately 4.8 married Malaysians (or 2.4 couples) given the 70 percent marriage rate. The average number of children per household in Malaysia is 1.7 while our internal migrant Malaysian couples have on average 1.2 children (2.8 children in 2.4 families relocate due to the arrival of immigrants), suggesting that families with children are less likely to move.

4.3 By Education

The IV (and OLS) results for the five education groups are reported in Table 7 (and Appendix Table A4).We see an increase in employment at the state level due to immigration for all education categories, except for those with a university degree. The gains have an inverse u-shape; it is already positive for those without primary education, and largest for those with primary and lower and upper secondary education. At the top-end

of the education distribution immigration has no significant impact on those with a vocational degree or certificate and actually reduces the employment of those natives with a university degree. The implication is that even very low-skilled natives have benefited economically from low-skilled immigration in these two decades.[13] The increase in the number of Malaysians not working in a state, particularly those who are housewives, is also concentrated at the lower-end of the skill distribution. Provided there is assortative matching on education among Malaysians, this finding is consistent with our interpretation that immigration causes families to move together.

5 Conclusions

This paper provides a comprehensive analysis of native responses to immigration, and rare evidence for a developing country. We find that immigration causes substantial internal movement of natives, specifically an inflow of natives (both in and out-of the labor force) into the states that experience the arrival of immigrants. The evidence is consistent with both employed individuals and entire households relocating; about three-quarters of married female migrants are occupied as housewives and their children are attending school. The results speak to broader economic and social impact of immigration, as spouses and children move together with primary wage earners, than typically consider in the literature. An important line of inquiry that naturally follows from this work is understanding the effect of immigration on women, who are frequently tied-movers, and the implications for their labor force attachment and fertility decisions.

[13] This finding contrasts somewhat with Del Carpio et al. (2013) and Ozden and Wagner (2013) for those with minimum education. They find that immigrants displace low-skilled natives and primarily benefit middle-skilled natives. An explanation for the discrepancy is that their analysis was focused on the period 2003-10, while we consider the period 1990-2010. Since Malaysians rapidly improved their educational attainment (as did the immigrants though at a slower pace), over time the lowest education groups had to increasingly compete with immigrants, something that was not yet true during the nineties.

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Table 1: Descriptive Statistics I, Malaysians by gender (Fractions)

	Male			Female		
	1992	2001	2010	1992	2001	2010
Labor Force / Population	0.84	0.82	0.77	0.47	0.46	0.45
Employed / Population	0.81	0.79	0.75	0.45	0.44	0.44
Unemployed / Labor Force	0.04	0.04	0.03	0.04	0.04	0.04
Part-time / All Employed	0.06	0.05	0.04	0.11	0.08	0.07
In School / Out of Labor Force	0.67	0.68	0.65	0.19	0.25	0.29
Housewife / Out of Labor Force	0.03	0.03	0.02	0.77	0.71	0.66
Retired / Out of Labor Force	0.13	0.14	0.18	0.01	0.01	0.01
Education distribution:						
No formal	0.06	0.03	0.02	0.15	0.09	0.05
Primary	0.46	0.34	0.20	0.43	0.33	0.20
Lower secondary	0.18	0.20	0.20	0.15	0.17	0.18
Upper secondary	0.25	0.33	0.41	0.23	0.33	0.42
Certificate/Diploma	0.03	0.05	0.09	0.02	0.05	0.08
Degree and above	0.03	0.05	0.07	0.01	0.03	0.07
Married	0.56	0.57	0.54	0.61	0.61	0.59
No. Observations	70,943	67,555	119,961	73,655	68,508	122,315
Total	5,283,050	7,169,698	8,551,266	5,350,709	6,822,395	8,428,412

Table 2: Descriptive Statistics II, Malaysians and Immigrants (Fractions)

	Malaysians			Immigrants		
	1992	2001	2010	1992	2001	2010
Age distribution:						
Ages 15 to 19	0.17	0.16	0.15	0.12	0.16	0.07
Ages 20 to 29	0.30	0.29	0.27	0.42	0.29	0.19
Ages 30 to 49	0.39	0.41	0.39	0.39	0.41	0.62
Ages 50 to 64	0.14	0.14	0.19	0.06	0.14	0.12
Education distribution:						
No formal	0.11	0.06	0.04	0.22	0.18	0.14
Primary	0.45	0.33	0.20	0.64	0.66	0.51
Lower secondary	0.17	0.18	0.19	0.05	0.05	0.14
Upper secondary	0.24	0.33	0.42	0.05	0.07	0.14
Diploma	0.02	0.05	0.09	0.02	0.01	0.02
Degree and above	0.02	0.04	0.07	0.03	0.03	0.04
Industry distribution:						
Agriculture, Mining	0.21	0.15	0.12	0.40	0.33	0.33
Manufacturing	0.24	0.22	0.17	0.15	0.24	0.18
Construction	0.07	0.09	0.09	0.17	0.12	0.14
Services	0.33	0.39	0.43	0.26	0.29	0.34
Public Administration, Health, Education	0.15	0.16	0.19	0.01	0.02	0.01
Gender distribution:						
Female	0.50	0.49	0.50	0.42	0.47	0.43
No. Observations	144,598	136,063	242,276	7,967	9,267	16,224
Total	10,633,759	13,992,093	16,979,678	461,861	1,162,942	1,395,003

Table 3: Main Results

	OLS	OLS	IV	IV
	(1)	(2)	(3)	(4)
A: Dependent Variable = Native Population Ages 15-64				
Immigrant Employment	2.563***	0.747***	3.020***	0.818***
	(0.472)	(0.185)	(0.572)	(0.211)
B: Dependent Variable = Total Native Employment				
Immigrant Employment	1.547***	0.499***	1.816***	0.56***
	(0.285)	(0.129)	(0.338)	(0.158)
C: Dependent Variable = Full-Time Native Employment				
Immigrant Employment	1.442***	0.425***	1.695***	0.467***
	(0.278)	(0.126)	(0.327)	(0.153)
D: Dependent Variable = Part-Time Native Employment				
Immigrant Employment	0.106***	0.074***	0.122***	0.093***
	(0.019)	(0.022)	(0.021)	(0.024)
E: Dependent Variable = Native Unemployment				
Immigrant Employment	0.087***	0.011	0.111***	0.02
	(0.017)	(0.015)	(0.02)	(0.018)
F: Dependent Variable = Native Out of the Labor Force				
Immigrant Employment	0.928***	0.236***	1.092***	0.238***
	(0.179)	(0.07)	(0.223)	(0.062)
G: Dependent Variable = Native Out of the Labor Force - Students				
Immigrant Employment	0.369***	0.08***	0.438***	0.087***
	(0.094)	(0.024)	(0.12)	(0.023)
H: Dependent Variable = Native Out of the Labor Force - Housewife				
Immigrant Employment	0.443***	0.15***	0.522***	0.156***
	(0.069)	(0.053)	(0.081)	(0.047)
I: Dependent Variable = Native Out of the Labor Force - Retired				
Immigrant Employment	0.063***	-0.002	0.075***	-0.008
	(0.022)	(0.008)	(0.027)	(0.012)
J: Dependent Variable = Native Population Ages 0-14				
Immigrant Employment	0.784***	0.292**	0.905***	0.282**
	(0.224)	(0.119)	(0.267)	(0.115)
State and Year Fixed Effects	Yes	Yes	Yes	Yes
State Linear Time Trend	No	Yes	No	Yes
F-statistic			104.6	13.9
Observations	270	270	270	270

Note: Each coefficient is from a separate regression. Standard errors are robust to heteroskedasticity. *** p<0.01, ** p<0.05, * p<0.1.

Table 4: Robustness Checks

	Log-log Specification	Weighted Regressions	SEs clustered by State
A: Dependent Variable = Native Population Ages 15-64			
Immigrant Employment	0.087**	0.826***	0.818***
	(0.044)	(0.234)	(0.153)
B: Dependent Variable = Total Native Employment			
Immgrant Employment	0.116**	0.567***	0.56***
	(0.055)	(0.17)	(0.097)
C: Dependent Variable = Full-Time Native Employment			
Immigrant Employment	0.119**	0.46***	0.467***
	(0.055)	(0.169)	(0.103)
D: Dependent Variable = Part-Time Native Employment			
Immigrant Employment	0.037	0.109***	0.093***
	(0.43)	(0.027)	(0.021)
E: Dependent Variable = Native Unemployment			
Immigrant Employment	-0.466***	0.037**	0.02*
	(0.111)	(0.016)	(0.011)
F: Dependent Variable = Native Out of the Labor Force			
Immigrant Employment	0.085***	0.226***	0.238***
	(0.033)	(0.075)	(0.058)
G: Dependent Variable = Native Out of the Labor Force - Students			
Immigrant Employment	0.14***	0.079***	0.087**
	(0.04)	(0.022)	(0.039)
H: Dependent Variable = Native Out of the Labor Force - Housewife			
Immigrant Employment	0.102***	0.159***	0.156***
	(0.038)	(0.052)	(0.039)
I: Dependent Variable = Native Out of the Labor Force - Retired			
Immigrant Employment	-0.004	-0.03	-0.008
	(0.1)	(0.023)	(0.022)
State and Year Fixed Effects	Yes	Yes	Yes
State Linear Time Trend	Yes	Yes	Yes
F-statistic	234.1	*See note*	13.9
Observations	126	270	270

Note: Each coefficient is from a separate regression. Regressions in the second column are weighted by average value of the dependent variable in a state over time. In the log-log specification, observations for which the independent variable is equal to zero are dropped. First stage F-statistics in the weighted regressions are between 10.9 and 16.4. Standard errors in the first two columns are robust to heteroskedasticity. *** p<0.01, ** p<0.05, * p<0.1.

Table 5: IV Regressions by Gender

	Male	Female
A: Dependent Variable = Native Population Ages 15-64		
Immigrant Employment	0.466***	0.352***
	(0.132)	(0.084)
B: Dependent Variable = Total Native Employment		
Immigrant Employment	0.411***	0.149**
	(0.104)	(0.058)
C: Dependent Variable = Full-Time Native Employment		
Immigrant Employment	0.36***	0.107**
	(0.102)	(0.054)
D: Dependent Variable = Part-Time Native Employment		
Immigrant Employment	0.051***	0.042***
	(0.014)	(0.011)
E: Dependent Variable = Native Unemployment		
Immigrant Employment	0.015	0.004
	(0.013)	(0.008)
F: Dependent Variable = Native Out of the Labor Force		
Immigrant Employment	0.039*	0.199***
	(0.022)	(0.048)
G: Dependent Variable = Native Out of the Labor Force - Students		
Immigrant Employment	0.044***	0.043***
	(0.014)	(0.014)
H: Dependent Variable = Native Out of the Labor Force - Housewife		
Immigrant Employment	-0.003	0.159***
	(0.003)	(0.046)
I: Dependent Variable = Native Out of the Labor Force - Retired		
Immigrant Employment	-0.005	-0.003
	(0.01)	(0.002)
State and Year Fixed Effects	Yes	Yes
State Linear Time Trend	Yes	Yes
F-statistic	13.9	13.9
Observations	270	270

Note: Each coefficient is from a separate regression. Standard errors are robust to heteroskedasticity. *** p<0.01, ** p<0.05, * p<0.1.

Table 6: IV Regressions by Age Group

	15-19	20-29	30-49	50-64
A: Dependent Variable = Native Population				
Immigrant Employment	0.125***	0.46***	0.24**	-0.006
	(0.023)	(0.083)	(0.108)	(0.06)
B: Dependent Variable = Total Native Employment				
Immigrant Employment	0.043***	0.329***	0.19**	-0.002
	(0.01)	(0.063)	(0.09)	(0.033)
C: Dependent Variable = Full-Time Native Employment				
Immigrant Employment	0.035***	0.296***	0.157*	-0.022
	(0.01)	(0.061)	(0.087)	(0.033)
D: Dependent Variable = Part-Time Native Employment				
Immigrant Employment	0.007***	0.033***	0.033***	0.02***
	(0.002)	(0.008)	(0.01)	(0.007)
E: Dependent Variable = Native Unemployment				
Immigrant Employment	0.01	0.013	-0.001	-0.002
	(0.006)	(0.01)	(0.004)	(0.002)
F: Dependent Variable = Native Out of the Labor Force				
Immigrant Employment	0.071***	0.118***	0.051**	-0.002
	(0.018)	(0.022)	(0.026)	(0.029)
G: Dependent Variable = Native Out of the Labor Force - Students				
Immigrant Employment	0.06***	0.027*	-0.00002	-0.0001
	(0.016)	(0.016)	(0.0006)	(0.0002)
H: Dependent Variable = Native Out of the Labor Force - Housewife				
Immigrant Employment	0.014**	0.092***	0.046*	0.003
	(0.006)	(0.015)	(0.025)	(0.016)
I: Dependent Variable = Native Out of the Labor Force - Retired				
Immigrant Employment	9.95e-06	0.0002	-0.0001	-0.008
	(0.0001)	(0.0002)	(0.0008)	(0.012)
State and Year Fixed Effects	Yes	Yes	Yes	Yes
State Linear Time Trend	Yes	Yes	Yes	Yes
F-statistic	13.9	13.9	13.9	13.9
Observations	270	270	270	270

Note: Each coefficient is from a separate regression. Standard errors are robust to heteroskedasticity. *** p<0.01, ** p<0.05, * p<0.1.

Table 7: IV Regressions by Education Category

	No formal	Primary	Lower Secondary	Upper Secondary	Certificate/Diploma	Degree and above
			A: Dependent Variable = Native Population Ages 15-64			
Immigrant Employment	0.087***	0.463***	0.262***	0.05	-0.008	-0.034
	(0.029)	(0.144)	(0.048)	(0.052)	(0.015)	(0.021)
			B: Dependent Variable = Total Native Employment			
Immigrant Employment	0.054***	0.309***	0.172***	0.067*	-0.009	-0.032*
	(0.021)	(0.105)	(0.034)	(0.038)	(0.013)	(0.018)
			C: Dependent Variable = Full-Time Native Employment			
Immigrant Employment	0.041**	0.27***	0.164***	0.048	-0.022*	-0.034*
	(0.02)	(0.1)	(0.032)	(0.036)	(0.012)	(0.018)
			D: Dependent Variable = Part-Time Native Employment			
Immigrant Employment	0.013**	0.038***	0.008*	0.019***	0.013***	0.002
	(0.005)	(0.012)	(0.004)	(0.007)	(0.003)	(0.002)
			E: Dependent Variable = Native Unemployment			
Immigrant Employment	-0.0006	0.01	0.017***	-0.002	-0.001	-0.002
	(0.001)	(0.007)	(0.005)	(0.01)	(0.002)	(0.001)
			F: Dependent Variable = Native Out of the Labor Force			
Immigrant Employment	0.033**	0.145***	0.073***	-0.014	0.001	-0.0002
	(0.013)	(0.041)	(0.024)	(0.018)	(0.004)	(0.004)
			G: Dependent Variable = Native Out of the Labor Force - Students			
Immigrant Employment	-0.0003	0.01	0.032***	0.041**	0.005	0.0007
	(0.0003)	(0.007)	(0.012)	(0.02)	(0.003)	(0.002)
			H: Dependent Variable = Native Out of the Labor Force - Housewife			
Immigrant Employment	0.029**	0.121***	0.045***	-0.035**	-0.002	-0.001
	(0.012)	(0.027)	(0.014)	(0.014)	(0.002)	(0.001)
			I: Dependent Variable = Native Out of the Labor Force - Retired			
Immigrant Employment	0.001	0.003	0.0009	-0.011**	-0.001	-0.0006
	(0.002)	(0.006)	(0.001)	(0.005)	(0.001)	(0.002)
State and Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
State Linear Time Trend	Yes	Yes	Yes	Yes	Yes	Yes
F-statistic	13.9	13.9	13.9	13.9	13.9	13.9
Observations	270	270	270	270	269	270

Note: Each coefficient is from a separate regression. Standard errors are robust to heteroskedasticity. *** p<0.01, ** p<0.05, * p<0.1.

Table A1: First Stage Estimates for Baseline Specification

	(1)	(2)
IV - Indonesia 15-19	-1560.468	1509.791***
	(1392.884)	(539.065)
IV - Indonesia 20-24	-1748.764	-3243.658***
	(1241.865)	(810.630)
IV - Indonesia 25-29	2757.388*	3463.707***
	(1512.468)	(962.999)
IV - Indonesia 30-34	-969.176	-1964.528*
	(3136.581)	(1193.549)
IV - Indonesia 35-39	444.170	-1140.637
	(3313.685)	(1734.345)
IV - Indonesia 40-44	1786.904	3075.940**
	(2498.966)	(1363.695)
IV - Indonesia 45+	-1048.818**	-825.544***
	(441.782)	(296.465)
IV - Philippines 15-19	-45948.520	-31574.170
	(64534.200)	(29689.760)
IV - Philippines 20-24	51657.800	41772.480
	(58399.460)	(40147.450)
IV - Philippines 25-29	-297385.200***	-157707.900***
	(68859.130)	(33368.320)
IV - Philippines 30-34	99271.200	56509.600
	(67076.540)	(42245.570)
IV - Philippines 35-39	462784.400*	113312.900
	(256024.400)	(86535.410)
IV - Philippines 40-44	-11171.870	63817.720
	(118155.300)	(39173.320)
IV - Philippines 45+	-32112.790	-1292.845
	(31814.900)	(7153.489)
IV - Other 15-19	316.624	274.251*
	(479.319)	(161.872)
IV - Other 20-24	-829.531	-1162.925*
	(2344.008)	(634.140)
IV - Other 25-29	1975.367	-203.220
	(2982.469)	(769.786)
IV - Other 30-34	-1362.002	797.093
	(4828.835)	(1990.051)
IV - Other 35-39	6716.705	6462.048*
	(5756.680)	(3307.344)
IV - Other 40-44	-4401.589**	-2243.116
	(2173.572)	(1777.355)
IV - Other 45+	-374.214	-1087.085***
	(552.162)	(366.662)
State and Year Fixed Effects	Yes	Yes
State Linear Time Trend	No	Yes
F-statistic	104.6	13.9
Observations	270	270

Note: Standard errors are robust to heteroskedasticity.
*** p<0.01, ** p<0.05, * p<0.1.

Table A2: OLS Regressions by Gender

	Male	Female
A: Dependent Variable = Native Population Ages 15-64		
Immigrant Employment	0.402***	0.345***
	(0.108)	(0.082)
B: Dependent Variable = Total Native Employment		
Immigrant Employment	0.352***	0.147***
	(0.085)	(0.051)
C: Dependent Variable = Full-Time Native Employment		
Immigrant Employment	0.311***	0.114**
	(0.084)	(0.048)
D: Dependent Variable = Part-Time Native Employment		
Immigrant Employment	0.041***	0.033***
	(0.013)	(0.01)
E: Dependent Variable = Native Unemployment		
Immigrant Employment	0.009	0.002
	(0.01)	(0.007)
F: Dependent Variable = Native Out of the Labor Force		
Immigrant Employment	0.041**	0.195***
	(0.02)	(0.056)
G: Dependent Variable = Native Out of the Labor Force - Students		
Immigrant Employment	0.038***	0.042***
	(0.014)	(0.012)
H: Dependent Variable = Native Out of the Labor Force - Housewife		
Immigrant Employment	-0.003	0.153***
	(0.003)	(0.051)
I: Dependent Variable = Native Out of the Labor Force - Retired		
Immigrant Employment	-0.0003	-0.002
	(0.007)	(0.002)
State and Year Fixed Effects	Yes	Yes
State Linear Time Trend	Yes	Yes
Observations	270	270

Note: Each coefficient is from a separate regression. Standard errors are robust to heteroskedasticity. *** p<0.01, ** p<0.05, * p<0.1.

Table A3: OLS Regressions by Age Group

	15-19	20-29	30-49	50-64
A: Dependent Variable = Native Population				
Immigrant Employment	0.122***	0.388***	0.224***	0.013
	(0.026)	(0.082)	(0.086)	(0.042)
B: Dependent Variable = Total Native Employment				
Immigrant Employment	0.041***	0.279***	0.171**	0.008
	(0.011)	(0.06)	(0.068)	(0.024)
C: Dependent Variable = Full-Time Native Employment				
Immigrant Employment	0.035***	0.254***	0.142**	-0.006
	(0.011)	(0.06)	(0.066)	(0.023)
D: Dependent Variable = Part-Time Native Employment				
Immigrant Employment	0.006***	0.025***	0.028***	0.014**
	(0.002)	(0.007)	(0.01)	(0.006)
E: Dependent Variable = Native Unemployment				
Immigrant Employment	0.002	0.013	-0.001	-0.002
	(0.006)	(0.009)	(0.003)	(0.002)
F: Dependent Variable = Native Out of the Labor Force				
Immigrant Employment	0.079***	0.095***	0.055**	0.007
	(0.02)	(0.023)	(0.028)	(0.02)
G: Dependent Variable = Native Out of the Labor Force - Students				
Immigrant Employment	0.062***	0.018	-0.00006	-0.00008
	(0.018)	(0.014)	(0.0006)	(0.0002)
H: Dependent Variable = Native Out of the Labor Force - Housewife				
Immigrant Employment	0.014**	0.076***	0.051*	0.01
	(0.007)	(0.018)	(0.027)	(0.012)
I: Dependent Variable = Native Out of the Labor Force - Retired				
Immigrant Employment	-0.0001	0.0003	-0.0002	-0.002
	(0.0001)	(0.0002)	(0.0007)	(0.008)
State and Year Fixed Effects	Yes	Yes	Yes	Yes
State Linear Time Trend	Yes	Yes	Yes	Yes
Observations	270	270	270	270

Note: Each coefficient is from a separate regression. Standard errors are robust to heteroskedasticity. *** p<0.01, ** p<0.05, * p<0.1.

Table A4: OLS Regressions by Education Category

	No formal	Primary	Lower Secondary	Upper Secondary	Certificate/Diploma	Degree and above
			A: Dependent Variable = Native Population Ages 15-64			
Immigrant Employment	0.062**	0.41***	0.235***	0.051	0.013	-0.025
	(0.026)	(0.116)	(0.047)	(0.052)	(0.015)	(0.018)
			B: Dependent Variable = Total Native Employment			
Immgrant Employment	0.036**	0.271***	0.14***	0.069*	0.008	-0.026*
	(0.018)	(0.085)	(0.028)	(0.037)	(0.012)	(0.015)
			C: Dependent Variable = Full-Time Native Employment			
Immigrant Employment	0.028*	0.243***	0.135***	0.051	-0.003	-0.028*
	(0.017)	(0.08)	(0.028)	(0.036)	(0.011)	(0.015)
			D: Dependent Variable = Part-Time Native Employment			
Immigrant Employment	0.008	0.028***	0.006*	0.019***	0.012***	0.002
	(0.005)	(0.01)	(0.003)	(0.007)	(0.003)	(0.001)
			E: Dependent Variable = Native Unemployment			
Immigrant Employment	-0.001	0.005	0.011***	-0.003	-0.0001	-0.0009
	(0.001)	(0.006)	(0.004)	(0.01)	(0.002)	(0.001)
			F: Dependent Variable = Native Out of the Labor Force			
Immigrant Employment	0.028*	0.134***	0.084***	-0.015	0.005	0.001
	(0.014)	(0.037)	(0.024)	(0.018)	(0.004)	(0.003)
			G: Dependent Variable = Native Out of the Labor Force - Students			
Immigrant Employment	-0.0002	0.008	0.038***	0.027	0.005	0.002
	(0.0003)	(0.006)	(0.011)	(0.018)	(0.003)	(0.002)
			H: Dependent Variable = Native Out of the Labor Force - Housewife			
Immigrant Employment	0.026**	0.11***	0.043***	-0.029**	0.0006	-0.0007
	(0.013)	(0.029)	(0.015)	(0.013)	(0.001)	(0.001)
			I: Dependent Variable = Native Out of the Labor Force - Retired			
Immigrant Employment	0.002*	0.004	0.002	-0.009**	-0.0003	-0.0006
	(0.001)	(0.005)	(0.001)	(0.004)	(0.0008)	(0.002)
State and Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
State Linear Time Trend	Yes	Yes	Yes	Yes	Yes	Yes
Observations	270	270	270	270	269	270

Note: Each coefficient is from a separate regression. Standard errors are robust to heteroskedasticity. *** p<0.01, ** p<0.05, * p<0.1.