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FDI and immigration: a regional analysis

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Abstract Does immigration affect foreign direct investment? Existing studies on immigration and FDI have all looked at aggregate flows at the national level, arguing that immigrant networks lower the risk of foreign investment through increased information flows and a built in market. However, these national-level studies suffer from identification problems since many of the factors that attract immigrants also attract FDI. This study improves upon identification by looking at the regional distribution of both FDI and immigration from 10 source countries to the 50 US states. Using a unique measure of immigrant network size in each state, I find that immigration is not only positively correlated with FDI, it tends to lead it as well. Comparing a state with an average sized immigrant network to one with a network twice as large, I estimate that the stronger network state will get on average 20 more foreign-owned affiliates opening per year, an effect that is quite persistent over time. On average, more skilled immigrant communities attract more FDI, while the pull effect of immigration on FDI also increases with immigrant ties to native countries and with immigrant influence in local communities. These results suggest that immigration creates a positive externality in foreign investment that must be considered when assessing the costs and benefits of labor mobility.

JEL Classification F2 · R3

1 Introduction

In the debate over immigration, many studies have examined the labor market impact that immigrants have in both their native and resident countries. Considerably fewer

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have looked at the effect of immigration on capital markets. This study examines the latter issue, finding empirical evidence that not only are immigration and foreign direct investment (FDI) complementary but also immigration leads FDI.

Simple neoclassical models of trade and growth suggest that labor and capital should flow in opposite directions. Poor (low productivity) countries should have low wages and high returns to capital, while rich (high productivity) countries should have high wages and low returns to capital due to diminishing returns. If both capital and labor are mobile, then we should see capital flowing from the rich country to the poor country and labor moving in the opposite direction. Under these admittedly extreme assumptions, immigration and FDI should move in opposite directions.

As Lucas (1990) famously pointed out, this theoretical result does not stand up to empirical tests. Overwhelmingly, capital does *not* flow from rich nations to poor nations. According to the UN World Investment Report, only 30% of FDI flows in 2006 went to developing countries.[1] At the same time, international migration is concentrated toward the developed world. Nearly 1 in 10 people in the developed world is foreign-born compared with only 1 in 70 people in the developing world.[2] So why are both labor and capital flowing to the same locations?

Lucas (1990) suggests several explanations. He argues that all labor may not be created equal, with skill differences making comparisons of the returns to capital and labor across countries difficult. Further, skilled labor may create positive externalities that raise the productivity of all workers in a country (a skilled manager may increase the productivity of all her employees). Finally, there may be large capital market imperfections, which prevent capital from flowing from rich nations to capital-poor countries. Political instability, opaque regulations, and the risk of appropriation all raise the cost of making long-term investments in a foreign country. As these imperfections tend to be larger in developing countries, we see less investment flowing to these nations.

It is this last explanation that my paper focuses on. When people migrate from one country to another, they bring with them not only their own labor and capital, but also a social network connected to their native country. Through these social networks, some of the barriers to international investment (political risk, asymmetric information) may be lowered. For example, suppose that there is an influx of immigration from India to the United States. An American firm looking to invest in India might employ one of these new immigrants to help explore opportunities in India, utilizing the immigrant's linguistic skills, knowledge of the Indian economy, local contacts, etc. At the same time, an Indian firm might employ one of the immigrants to acquire more information about the US market. In both cases, immigration can lead to increased investment flows between the United States and India. Immigrants serve as a bridge over which capital may more easily flow between their native and current countries.

The rest of this paper will proceed as follows. In Sect. 2, I discuss the contributions of this study in the context of the existing literature, focusing on how migrant networks

[1] If we exclude Brazil, China, Mexico, and India, the developing country share falls to 17%.

[2] 2006 UN World Migration Report. Admittedly, this statistic does not necessarily mean that most immigration is from the developing to the developed world, as it could simply be that developing countries are more populous.

promote both trade and investment flows by reducing transaction costs and increasing contract enforcement. Section 3 presents a simple theoretical model illustrating this idea. Section 4 discusses both the empirical model and the data employed to test the impact of migration on FDI. In Sect. 5, the key empirical findings are presented, focusing not only on the impact of immigration on FDI, but also on how characteristics of these migrant groups affect investment. Section 6 concludes, placing the key results in a broader context.

2 Literature review

2.1 Migrant networks and trade

Whereas the impact of an immigrant diaspora network on investment has received little attention in explaining FDI, it has been widely used to discuss the positive correlation between immigration and trade. Theoretical work by Greif (1993) argued that ethnic trading networks work as an enforcement mechanism against contract violations in regions where the legal environment may be weak. Greif points to international trade in the medieval world, arguing that strong ethnic trading networks allowed for international trade despite a large moral hazard problem in an era when traders and their principals were separated by distances that took months or even years to span.

One of the earliest studies to examine the impact of immigrant networks on trade was Gould (1994). Quoting this paper (p. 302):

> Most economic models of labor migration assume that immigrants add to the stock of labor in the same way current residents do, with no differing economic impact due specifically to the fact that they are immigrants. This approach to describing immigration, however, ignores important aspects of international labor flows, perhaps key among these being the value of ties or links that immigrants have to their home country. Immigrant links to the home country include knowledge of home-country markets, languages, preferences, and business contacts…

Gould argues that immigration affects trade through two channels: retained preferences for home-country products and migrant networks that lower the cost of trade. Immigration increases both bilateral exports and imports, though this relationship exhibits diminishing returns. That immigration has a positive effect on exports back to the immigrants' native countries (and is thus not solely driven by preferences), suggests the importance of the second channel: Immigration lowers the cost of doing business with the immigrants' native countries.[3]

Further evidence for the theory that immigration lowers the cost of international transactions is presented by Girma and Yu (2002). The authors examine the impact of immigration on trade between the United Kingdom and 48 trading partners, including both former British colonies and those without colonial ties. Immigration significantly

[3] Head and Ries (1998) perform a similar study for Canada, finding that a 10% increase in bilateral immigration leads to a 1% (3%) increase in exports (imports).

increases trade for non-Commonwealth countries, but has an insignificant effect for former colonies. One interpretation is that the trade-promoting effects of immigration (contract enforcement, more symmetric information, etc.) do not matter so much for former colonies, as these nations already share many similarities with the United Kingdom (such as in the legal system) and information about foreign markets is plentiful. However, when someone immigrates from a non-colony nation, they are bringing something to the United Kingdom that was not already there. Given that colonial linkages have proven to be an important determinant of both trade and investment in past studies, if immigrant networks work in the same fashion then they too should promote these flows.[4]

2.2 Immigration and FDI

The relative paucity of studies looking at the linkage between FDI and migration is surprising, given that long-term investments would benefit more from the kind of transaction cost savings and lowered risk offered by immigrant networks. If anything, immigration should have a stronger effect on a long-term investment like FDI than on trade.

The existing empirical work on immigration and FDI has focused on two questions: What is the contemporaneous relationship between the two flows and does immigration lead FDI or vice versa? Clemens and Williamson (2000) argue that this relationship is not a new phenomenon, examining the determinants of British capital outflows between 1870 and 1913. One of the strongest determinants of where British capital went was the location of British emigrants.

Among studies using modern data, Groznik (2003) examines aggregate FDI and migration flows for the United States between 1950 and 1997. He finds that not only do labor and capital move in the same direction, labor migration leads to increased capital migration (outward FDI). Complementing this result is Kim (2006), who looks simultaneously at aggregate immigration, FDI, and trade for the United States in a VAR. This study finds that migration leads both trade and FDI, while trade and FDI appear to be substitutes. However, neither FDI nor trade appears to induce migration. By contrast, Aroca and Maloney (2005) looking only at bilateral flows between the United States and Mexico find that while FDI and immigration are positively related, it is FDI that leads immigration.

Javorcik et al. (2011) examine bilateral FDI and migration between the United States and a a wide range of foreign countries. They find that immigration from a foreign country to the United States leads to an outflow of capital back to the immigrants' native countries. Immigration leads to outward FDI for two reasons. First, immigrants bring with them information about their native countries that US investors are able to utilize. Second, the immigrants themselves may acquire both human and physical capital allowing them to make investments in their native countries that they would

[4] See for example Flandreau (2006) who finds that most capital flows emanating from the United Kingdom during the nineteenth century went to British colonies, while most capital flows emanating from France went to French colonies.

have been unable to do had they stayed at home.[5] In fact, Saxeenian (2001) finds that much of the growth in India's IT sector was driven by the human and physical capital of Indians who had migrated to the United States years earlier.

An implicit assumption underlying the theory linking immigrant networks and FDI is that skilled immigrants will have a larger effect on FDI since they bring with them greater information and influence. Kugler and Rapoport (2005) examine this issue, looking at skilled vs. unskilled immigration across OECD countries. The authors find that skilled migration to the United States is contemporaneously negatively correlated with FDI from the immigrants' native countries. However, skilled migration is associated with positive future FDI from the immigrants' native countries. The authors argue that in the short run, increased immigration causes factor prices to equalize and reduces some of the incentives for FDI. In the long run, immigration can serve as a catalyst to establish the necessary business networks for FDI to occur. While skilled migration has a larger long-term effect on FDI in their study, even unskilled immigration can increase FDI by revealing workforce characteristics and reducing information costs across borders.

2.3 What this paper adds

All of the studies discussed earlier have examined FDI and immigration at the national level. A problem with this is that many of the factors that influence FDI also influence immigration. Both capital and labor tend to flow to rich countries, nearby countries, those with stable political systems, and a common language just to name a few determinants. With these similarities comes an identification problem. Is immigration really causing FDI or are they simply being influenced by the same unobserved variable?

My study mitigates this problem by looking at the regional distribution of FDI and immigration within the United States. By looking within one country, I hold constant any determinants of immigration and FDI at the national level.[6] Any variation in the regional distribution of FDI must, therefore, be due to regional determinants or to regional differences in immigration. The results in this study are further strengthened by looking across several different source countries. This allows us to exploit not only regional variation in the location of FDI and immigration, but variation in source country characteristics as well. Finally, I am able to exploit detailed information about immigrant characteristics across US states such as skill level, time in the US, and income. This allows us to examine what kinds of immigrant networks lead to increased FDI. The results in this study are, therefore, complementary to those found by Buch et al. (2006), who look at the relationship between migrant stocks and FDI

[5] There is a growing literature on this "Brain Gain" effect, by which skilled emigration from developing countries can actually lead to improved development for these nations. For a survey of this literature, please see Stark (2004).

[6] Blonigen (2005) presents an exhaustive review of the literature on FDI determinants. Some of the most widely examined determinants at the national level have been exchange rate levels and risk, taxes, interest rates, property rights, and tariff jumping FDI. Other important national-level determinants include common language, colonial ties, and the ease of travel between countries.

across German states and find that migration and FDI are positively related, though the effect is largest for FDI from high-income countries.

3 A simple model of immigrant networks and FDI

To illustrate the pro-FDI effects of immigration, consider the following simple model adapted from Guiso, Sapienza, and Zingales (2005). There is a multinational enterprise (MNE) considering opening up a foreign affiliate in country j. The value of the MNE's investment is

$$V_j = \begin{cases} V_H > 0 & \text{with prob } \lambda_j \\ V_L < 0 & \text{with prob } 1 - \lambda_j \end{cases}$$

The MNE pays a cost c_j to find out the true value of the investment. Once this cost is paid, the investment's value is known with certainty. If the MNE proceeds with FDI, it expects to split the value of the investment with the local government in country j. However, the local government can choose to appropriate the entire investment once it is made. This is not such a far-fetched assumption, as local governments and power structures may be able to exploit geographic advantages or familiarity with local legal systems to expropriate returns from foreign investors.[7] The MNE attributes probability π_j to this event and predicts that the local government will act honestly with probability $1 - \pi_j$.

The ex-ante value of FDI to the MNE is thus given by: $\lambda_j(1 - \pi_j)\frac{V_H}{2} - c_j$.[8] The MNE will only engage in FDI if this value is greater than or equal to zero. Rewriting this expression, we see that FDI only occurs when $\lambda_j(1 - \pi_j)\frac{V_H}{2} \geq c_j$.

An increase in the probability of success, a decrease in the probability of appropriation, or a reduction in the cost of discovery will cause the inequality to be satisfied at smaller values, enabling more FDI projects to be launched. How does immigration affect the result above? I argue that it works through three channels:

1. As immigration from the MNE's home country to country j increases, the cost of discovering the true value of FDI (c_j) falls.
2. As immigration increases, the probability that country js government will appropriate the entire investment (π_j) also falls.
3. As immigration increases, the probability that the investment will yield positive returns (λ_j) increases.

The first channel fits in with existing work on immigrant networks. The cost of finding out about market conditions in country j will be much lower for the MNE if its management knows people already residing in country j. If country j has received

[7] Guiso et al. (2009) provide a telling anecdote of such an event. A Russian firm organized its shareholder meeting in a small and remote Siberian town only after all plane tickets to that town had been sold. By increasing the cost of attending the meeting to foreign shareholders, the local shareholders were able to expropriate wealth through legal methods.

[8] We divide the investment value by 2 because the MNE splits the returns with the government.

an influx of immigrants from the MNE's headquarters, the MNE should have a relatively easier time than if country j was completely foreign soil.

The second channel can be justified by considering the incentives of the local government in country j. The government (or local power structure) is presumably in place to serve its constituents. If immigrants from the MNE's headquarters represent a sizeable portion of these constituents, the local government should be less willing to appropriate the foreign investment. As an illustration, consider both a Japanese firm and a French firm making direct investments in Senegal. Given that there is a sizeable French population in Senegal, it becomes less likely that the Senegalese government would appropriate the French firm's investment. Stated differently, the risk of appropriation would be higher for the Japanese firm.

The third and final channel depends on immigrants comprising a significant portion of country j's population. If we assume that immigrants bring with them a preference for their native country's goods and services, then a MNE operating in country j should have more success than one operating in a country without such a large population from the MNE's headquarters. For example, there is a sizeable Turkish population in Germany. This population may retain a preference for goods and services originally produced in Turkey. As a result, a Turkish firm should have more success in Germany than in a country without a sizeable Turkish-born population.

This study examines the distribution of FDI and immigration within the United States. The local governments in this case would be state and municipal governments, who are unlikely to engage in outright appropriation.[9] With a few exceptions, immigrants from a particular country do not really comprise significant portions of the population in any US state. Thus, the strongest channel through which immigration can affect FDI for this paper is the immigrant network effect. An MNE may have already decided to open an affiliate within the United States, but where? Why not go to where they get the most information; where the immigrant network is the strongest?

4 Empirical methodology

4.1 The data

The goal of this study is to assess the impact of immigrant networks on foreign direct investment. The novelty is to examine this relationship at the regional level, seeing how the distribution of immigrant groups across US states affects inward direct investment from various source countries. This requires two broad data types: information on the distribution of direct investment in the United States and information on where immigrants reside in the United States.[10]

The first is available from the US Bureau of Economic Analysis' "Foreign Direct Investment in the United States: Operations of US Affiliates of Foreign Companies." From this database, I extract two key variables over the period 1990–2004: the number

[9] They could still appropriate some of the FDI surplus through taxation, though regional competition for FDI in the US (the so called "golden straightjacket" effect) has tended to harmonize state tax rates.

[10] A complete description of all variables used in the analysis is given in Table 1.

Table 1 Variable definitions and data sources

Source: US Bureau of Economic Analysis, Foreign Direct Investment in the United States	
Affiliates$_{i,j}$	The total number of affiliates owned by country i in state j
Value$_{i,j}$	The value of gross property, plants, and equipment owned by country i in state j
Source: US Census Bureau, Integrated Public Use Microdata	
Immigration share$_{i,j}$	The share of immigrants from country i living in state j
Agglomeration$_{i,j}$	Share of state j population born in country i divided by state j's share of the US population
College degree$_{i,j}$	The share of migrants from country i in state j with at least a bachelors degree
Average age$_{i,j}$	The average age of migrants from country i living in state j
YearsUSA$_{i,j}$	The average number of years resided in the US by migrants from country i living in state j
Source: Google Earth	
Distance$_{i,j}$	The distance (in km) between the capital city of country i and the capital city of state j. For Canada, distance is computed from the capital of state j to either Toronto, Winnipeg, or Vancouver (whichever is closest)
Source: US Bureau of Economic Analysis, Regional Economic Accounts	
Y_j	Gross State Product for state j
PIpc$_j$	Per capita employer contribution to pension insurance in state j
Wage$_j$	Annual per capita wage rate in state j
Interest$_j$	Annual interest payments made by employers in state j

of majority-owned affiliates of foreign companies by state and source country and the value of these affiliates' gross property, plant, and equipment also by state and source country.

The first four rows of Table 2 summarize this dataset for 2 years: 1990 and 2000. The total number of affiliates from each of the ten source countries grows substantially between 1990 and 2000.[11] Interestingly, the same cannot be said for the value of the affiliates' gross property. While this may reflect a shift toward smaller enterprises in the 1990s, it may also be due to data limitations due to the level of disaggregation. Ideally, we would like to examine how immigration affects the value of direct investments so as to distinguish between two affiliates of different sizes. While the value of gross property would seem to be a good proxy for this, there is quite a bit of missing data for this variable due to confidentiality. Given that the smaller enterprises that are excluded for confidentiality reasons are likely to be those that would benefit the most from a migrant network, the selection bias inherent in the gross property measure is likely to underestimate the effect of migrant networks on FDI. Therefore, the preferred definition of FDI in this study will be the number of foreign affiliates in a particular state.[12]

[11] The ten countries/regions for which I have data are Africa, Australia, Canada, France, Germany, Japan, the Middle East, the Netherlands, Switzerland, and the United Kingdom. The BEA also has data on Latin America and Asia, but the coverage is not as complete.

[12] Both definitions of FDI (number of affiliates and value of gross property) are used and reported in this paper. While the results are stronger for affiliates, using gross property as the measure of FDI does not yield any contradictory results.

Table 2 Summary statistics

	Africa	Australia	Canada	France	Germany	Japan	Mid East	Netherlands	Switzerland	UK
Total affiliates										
1990	46	497	1,538	1,217	1,045	1,356	67	618	697	3,291
2000	108	594	3,691	3,544	4,544	8,475	676	2,460	2,220	6,103
Value of FDI ($ millions)										
1990	$1,936	$8,203	$9,573	$12,968	$10,216	$7,874	$5,752	$13,215	$11,563	$10,908
2000	$605	$6,889	$5,494	$8,667	$7,137	$10,142	$4,178	$9,516	$13,603	$6,602
Average agglomeration index										
1990	0.83	0.96	1.12	0.89	0.94	0.99	0.59	0.89	0.89	0.88
2000	0.85	1.01	0.95	1.04	0.97	0.99	0.96	1.01	0.99	1.00
College degree										
1990	0.41	0.26	0.23	0.27	0.16	0.25	0.31	0.25	0.36	0.20
2000	0.35	0.37	0.30	0.35	0.23	0.32	0.42	0.37	0.37	0.29
Average age										
1990	32.8	38.2	47.3	41.0	37.2	31.2	33.5	45.5	48.3	43.7
2000	34.7	41.6	47.2	48.2	51.5	40.7	39.3	54.0	48.0	50.1
Average years in the USA										
1990	11.7	17.4	24.7	23.3	21.9	14.7	12.0	22.7	23.7	22.1
2000	11.0	18.8	27.9	27.1	32.8	17.4	16.1	31.8	26.2	28.0

Total affiliates refers to the total number of foreign-owned affiliates in the United States. The value of FDI is computed as the total value (in millions) of the gross property, plants, and equipment of foreign-owned affiliates located in the United States. These statistics are taken from the Bureau of Economic Analysis' survey of direct investment in the United States. The agglomeration index for a given US state is defined as the percentage of total immigrants from country j that reside in that state divided by that state's share of the total US population. College degree, age, and years in the United States all refer to characteristics of the immigrant groups from country j residing in a particular state. All immigration data are taken from either the 1990 or 2000 decennial census, public-use microdata

To assess the impact of immigrant networks on FDI, we need some metric that gauges the strength of these networks across different states. A simple measure would be to just use the number of immigrants from a given country in a particular state. I argue that this is a flawed measure, however, since it does not account for general size differences across states. For example, New York is a much more populous state than Hawaii. Looking only at the number of immigrants in each state, we would see that there are many more native Australians residing in New York than there are residing in Hawaii. Does this mean that the Australian immigrant network is stronger in New York? Not necessarily, since Australians make up a much larger percentage of the population in Hawaii.

A better measure of the strength of an immigrant network would be one that accounts for the immigrant group's relative share of the state's population. This measure controls for size differences across states while still preserving the key information flow aspect of immigrant networks. Returning to our previous example, if native Australians account for 5% of Hawaii's population and only 0.1% of New York's population, then we should expect a much clearer signal and stronger information about local market conditions flowing from Hawaii to Australia than from New York to Australia. Furthermore, the larger the presence of an immigrant community in a particular state, the more influence that community will have on the local government. Stronger influence suggests a smaller risk of appropriation, increasing the attractiveness of that state for FDI.

To measure immigrant network strength, I compute an "immigrant agglomeration index" defined as:

$$A_{i,j} = \frac{\text{Mig}_{i,j}/\text{Mig}_i}{\text{Pop}_j/\text{Pop}} = \frac{\text{Mig}_{i,j}/\text{Pop}_j}{\text{Mig}_i/\text{Pop}} \tag{1}$$

The index is defined as the share of immigrants from country i living in state j divided by state j's share of the US population. Alternatively, it can be defined as the ratio of country i's share of state j population to country i's share of US population. For example, $\text{A}_{\text{JPN,CAL}}$ would be the share of all Japanese immigrants living in California divided by the share of all US residents that live in California. The index gives a measure of how much more or less likely an immigrant from a particular country is to live in a state than the typical US resident. For example, if $A_{\text{JPN,CAL}} = 2$, then a Japanese immigrant is twice as likely to live in California than the typical US resident. If $A_{\text{JPN,CAL}} = 0.5$, then a Japanese immigrant is half as likely to live in California. The larger this number is, the stronger the immigrant network. An advantage of this measure over simply using the immigrant population share ($\text{Mig}_{i,j}/\text{Pop}_j$) is that it penalizes the network in a large state (Pop_j/Pop is large) and rewards the network in small states. This makes sense, as a strong immigrant network in a small state should give both stronger information and exert more political influence than one in a large state.[13]

[13] As a robustness check, Table 4 includes estimates with the immigrant network defined by the immigrant share of state j population ($\text{Mig}_{ij}/\text{Pop}_j$). These estimates support those found by the agglomeration index.

To compute the agglomeration index, I extract a sample from the Integrated Public Use Microdata Sample (IPUMS) of the US census in 1990 and 2000. The sample is restricted to foreign-born persons from the ten countries/regions for which I have FDI data. The resulting datasets included roughly 300,000 observations each. For each source country, I then computed immigrant state population shares across all 50 US states and the District of Columbia. These shares were then combined with Census data on the share of total US population for each state to compute the agglomeration index above.

The Census microdata were also used to compute immigrant characteristics for each state and source country. Three key immigrant variables were the percentage of immigrants in the sample with a college degree, the average number of years residing in the United States, and the average age of each immigrant group. Do skilled immigrants exert a stronger network effect? How does the length of time an immigrant has been in the United States affect the results? On one hand, an established community (i.e. has been in the US for a long time) should have more political influence and a better understanding of local conditions. On the other hand, immigrants who have been away for so long may have weaker ties to their native countries. Similarly, the average age of immigrants in a network could either increase FDI if older immigrants are more skilled (or experienced) and have more influence, or decrease it if older immigrants have weaker connections to their native countries.[14]

Table 2 summarizes these immigrant characteristics across the ten source countries at the national level for both 1990 and 2000. There is a decent amount of heterogeneity across source countries in skill levels, tenure in the United States, and the average age of immigrants. Interestingly, immigrants from the two developing regions in the study, Africa and the Middle East, are also the ones with the highest share of college graduates. This is, perhaps, not surprising, as immigration from these regions is more costly than from the other eight countries, thereby only attracting immigrants with the most to gain (having high skills also considerably speeds up the visa process from these regions.) Furthermore, there is likely to be a larger difference in skilled wages between these two developing regions and the United States than between the other developed countries and the United States, inducing more skilled migration. The developing regions also tend to be younger and have less tenure in the United States, reflecting historical patterns of immigration for the United States.

Table 3 looks closer at the immigrant agglomeration index for each country. Listed are both the top three and bottom three states as ranked by agglomeration index. Looking at the data, we see that immigrant networks form in both predictable and unpredictable locations. A Japanese immigrant is nearly 13 times as likely to live in Hawaii than the average American resident, reflecting the relatively close proximity of Hawaii to Japan as well as historical ties. Proximity also factors in for Canadians, with their immigrant networks the strongest in states that border Canada. Less clear is

[14] An additional variable of interest would be refugee status. Though unavailable, the exclusion of this variable may actually strengthen the conclusion about any positive effect of migrant networks on FDI, given that refugees are less likely than labor migrants to maintain the kind of ties with their native countries that would promote FDI. By lumping these two groups of migrants together, we are likely underestimating the true effect of migrant networks on FDI.

Table 3 Immigrant agglomerations in 1990 and affiliate shares in 1995

	Top 3 Agglomerations			Bottom 3 Agglomerations		
	State	Index	Affiliate share (%)	State	Index	Affiliate share (%)
Africa	Maryland	3.37	1.2	Kentucky	0.18	1.6
	New Jersey	2.42	1.6	Mississippi	0.13	2.0
	New York	1.98	6.5	South Dakota	0.11	1.6
Australia	Hawaii	5.40	1.5	Mississippi	0.23	1.7
	California	2.45	9.8	Arkansas	0.19	1.1
	Nevada	2.30	2.1	Nebraska	0.09	0.6
Canada	Maine	5.45	1.1	Alabama	0.19	1.3
	Vermont	4.08	0.9	West Virginia	0.17	0.6
	New Hampshire	3.62	0.9	Mississippi	0.15	0.8
France	Nevada	2.05	1.0	Idaho	0.25	0.7
	California	1.72	7.1	North Dakota	0.25	0.5
	New York	1.64	7.0	West Virginia	0.23	0.8
Germany	Colorado	1.75	2.2	North Dakota	0.45	0.4
	Washington	1.62	2.2	Mississippi	0.40	1.0
	New Jersey	1.57	4.1	West Virginia	0.37	1.0
Japan	Hawaii	12.78	5.0	Mississippi	0.29	0.7
	California	2.58	15.2	Wisconsin	0.26	1.4
	Washington	2.23	3.8	West Virginia	0.22	0.7
Middle East	California	2.39	10.2	Idaho	0.10	0.4
	New York	2.07	7.2	South Dakota	0.05	0.1
	New Jersey	1.99	3.4	Montana	0.05	0.1
Netherlands	Utah	2.73	1.1	Louisiana	0.22	2.1
	Oregon	2.27	1.8	Arkansas	0.15	1.2
	California	2.22	5.7	Mississippi	0.13	1.4
Switzerland	New Jersey	2.29	3.0	Alabama	0.11	1.6
	California	2.29	6.5	Oklahoma	0.11	1.2
	New Hampshire	2.08	1.5	Nebraska	0.07	0.9
UK	Connecticut	1.87	2.3	Alabama	0.32	1.7
	Florida	1.85	4.2	Kentucky	0.30	1.7
	New Jersey	1.74	3.5	Iowa	0.28	1.1

Index refers to the immigrant agglomeration index, defined as the share of immigrants from country i living in state j divided by the percentage of the US population living in state j. For example, the agglomeration index for Africa and Maryland is 3.37, implying that an immigrant born in Africa is 3.37 times as likely to reside in Maryland than the average American resident (both native and foreign-born). The affiliate share is defined as the share of country i's foreign affiliates located in state j. Thus, 1.2% of all African-owned affiliates in the United States are located in Maryland. Immigration data are taken from the US Census, while Foreign Affiliate Data come from the US Bureau of Economic Analysis

why African immigrants are more than three times as likely to live in Maryland, why Dutch immigrants are 2.7 times as likely to live in Utah, or why French immigrants are twice as likely to live in Nevada. The states with weak immigrant networks tend to be

clustered in the Southeast and Midwest, perhaps reflecting a lack of opportunities or a lack of historical precedent. Immigrant networks (or the lack thereof) across the ten source countries are fairly spread out, without any one state having a large network for every country. This is reassuring, as this reduces the possibility that the agglomeration variable is simply picking up an unobserved state fixed effect.

4.2 The econometric model

The econometric model needs to test for the effect of migrant networks on FDI, while controlling for key determinants of FDI. Since we are looking at the distribution of FDI *within* a country, we have effectively controlled for any national-level determinants such as exchange rates, language, or import tariffs. However, there are several characteristics of individual states that could influence a multinational's location decision.

Several studies have examined state-level determinants of FDI. Friedman et al. (1992) find that access to foreign markets and a large local market positively affects FDI, while foreign firms are less likely to choose states with high wages and taxes. Interestingly, Friedman et al. find no evidence that pollution regulations significantly change a firm's location decision, perhaps reflecting the fact that most FDI into the United States is horizontal and market-seeking rather than vertical and seeking low costs. List (2001) finds that state-level FDI tends to exhibit agglomeration effects, with states that start out with high levels of FDI tending to get more FDI in successive years. Woodward (1992) also finds compelling evidence for agglomeration effects, though property taxes and wages turn out to be insignificant.

Motivated by these studies, the basic model I use is:

$$\mathrm{FDI}_{i,j,t} = \phi A_{i,j} + \rho \mathrm{FDI}_{i,j,t-1} + \Gamma X_{j,t} + u_{i,j,t} \tag{2}$$

Direct investment from country i into state j in year t is a function of the immigrant network from country i in state j (proxied for by the agglomeration index), lagged FDI, and a vector of state-level control variables. These controls include gross state product, the per capita employer social security contribution, the average annual earnings per job, and the per capita interest payments for that state. The controls, respectively, cover each state's local market size, a measure of taxation, labor costs, and capital costs. To the baseline model, I add the proportion of immigrants from country i in state j with a college degree, the average number of years in the United States, and the average age of immigrants.[15] I also include the log distance between the source country i and state j to control for a common factor that could influence both FDI and migration. This variable was computed as the straight line distance in kilometers between the capitals of country i and state j. [16]

[15] Including both average age and average years in the US does present a concern with multicollinearity. However, the correlation between these two variables is 0.83, suggesting that though they are highly correlated, they are not perfectly collinear.

[16] The distance variable for Canada was computed as the distance between state j and whichever of the following major Canadian cities were closest to state j: Toronto, Winnipeg, and Vancouver.

Given data limitations, the preferred definition of FDI in this study is the number of foreign affiliates from country i in state j. As this variable will always be a non-negative integer, an OLS regression may yield biased estimates. To address this, the model given above will be estimated with a Poisson regression, which has been widely used when dealing with count data. Effectively, the expected number of affiliates observed in a given state in a given year is defined as:

$$E(\mathrm{FDI}_{i,j,t}|Z) = \exp\left\{\phi A_{i,j} + \rho \mathrm{FDI}_{i,j,t-1} + \Gamma X_{j,t}\right\} \tag{3}$$

where Z refers to all explanatory variables on the right hand side. The parameters are then estimated through maximum likelihood with an underlying Poisson distribution.[17] With this model, the marginal effect of the agglomeration index will be

$$\frac{\partial E(\mathrm{FDI}_{i,j,t}|Z)}{\partial A_{i,j}} = \phi * \exp\left\{\phi A_{i,j} + \rho \mathrm{FDI}_{i,j,t-1} + \Gamma X_{j,t}\right\}$$

Alternatively, we can take the log of (3) and differentiate:

$$\frac{\partial \ln E(\mathrm{FDI}_{i,j,t}|Z)}{\partial A_{i,j}} = \phi \tag{4}$$

We can therefore roughly think of ϕ as a semi-elasticity. A one-unit change in the agglomeration index from country i in state j yields a $\phi\%$ change in expected FDI going from country i to state j in year t.

A potential problem with this empirical model is that the agglomeration index and immigrant characteristic variables are only available for 1990 and 2000. When estimated within the time series model above, they turn out to be fixed effects. There is valuable cross-sectional variation, but we are lacking within group variation over time. Essentially, we are trying to explain the distribution of FDI over 15 years (1990–2004) using a measure of immigration that is defined only for 1990 and 2000.

To address this issue, I also estimate the model on a year-by-year basis. The regression is adjusted to:

$$\mathrm{FDI}_{i,j,1990+s} = \phi A_{i,j} + \rho \mathrm{FDI}_{i,j,1990} + \Gamma X_{j,1990+s} + u_{i,j,1990+s} \tag{5}$$

Foreign affiliates from country i located in state j in year $1990 + s$ are regressed on the agglomeration index in 1990, FDI in 1990, and state control variables in 1990+s. This regression is run separately for $s = 0, \ldots, 14$ (from 1990 to 2004). Under this setup, we are simply looking at a cross-section, which should provide a nice robustness check. The results of this year-by-year estimation are presented in Fig. 1.

Of additional concern is a potential simultaneity bias between FDI and immigration. Does a state have a high degree of FDI because of a strong immigrant network

[17] A concern when using the Poisson model is overdispersion, caused by the distribution characteristic that the mean be equal to its variance. To address this issue, the model was also estimated using a negative binomial distribution, but there was no qualitative change in either the sign of significance of the key parameters.

or is there a strong immigrant network because of a high degree of FDI? Suppose that Volkswagen opens a factory in Kansas despite a relatively small German immigrant network in that state. Volkswagen is likely to bring with them some German employees (at least at the management level) to Kansas. If the plant does well or the immigrants find that Kansas is a hospitable place, more immigrants may follow. Simply looking at FDI and the immigrant network years after the plant was opened, there will be a positive correlation, but it is unclear which caused the other. In fact, there is likely to be positive feedback between the two, with immigration drawing in FDI, which in turn draws in more immigration.

To account for this, I also look at how the strength of an immigrant network affected the change in affiliates between 1990 and 1990+s:

$$\Delta \text{FDI}_{i,j,1990+s} = \phi A_{i,j} + \rho \text{FDI}_{i,j,1990} + \Gamma X_{j,1990+s} + u_{i,j,1990+s} \tag{6}$$

This regression is estimated separately for $s = 1, \ldots, 14$ (1991–2004). Looking at changes in FDI has two advantages. First, endogeneity is less of a concern since we are seeing how immigration in 1990 affects *new* FDI in years after 1990. Second, the FDI variable is now a difference and can take on negative values. While the dependent variable is still constrained to be an integer, its wider range of possible values allows us to estimate the model using OLS and avoid the potential pitfalls of the Poisson regression. The year-by-year estimates for FDI flows are presented in Fig. 2.

While looking at changes in FDI should reduce the endogeneity problem, it does not completely eliminate it. To this end, I instrument the agglomeration index using deep lags of migration as in Card (2001). The idea here is that immigrants are likely to move to established enclaves. Specifically, I instrument the agglomeration index in 1990 with the agglomeration indexes computed from the 1980 and 1970 censuses as well as all state-level controls variables and immigrant state characteristics such as age, years in the United States, education, and distance. Interestingly, the coefficient estimates on the agglomeration index do not significantly change when using the instrumented agglomeration index. Therefore, all estimations are done using the instrumented agglomeration index.

5 Discussion of results

The goal of this paper was to assess the relationship between immigration and FDI. The econometric analysis suggests that the relationship is positive and immigration does in fact lead FDI. Furthermore, the effect of immigrant networks is economically significant, comparable in some cases to the effect of state market size. Finally, there is remarkable heterogeneity in how immigrant network characteristics affect FDI, both through the skill profiles of these groups and their age/tenure in the United States.

Table 4 presents estimates of the baseline model in (2) for FDI defined as both the total number of affiliates and the value of gross property, plants, and equipment and for two definitions of the immigrant network variable. The first four columns present the results for FDI as measured by affiliate count. The immigrant agglomeration variable has a significantly positive effect on FDI under all specifications. Proxying

Table 4 The determinants of state-level FDI

	Affiliates				Gross property			
	Model 1		Model 2		Model 1		Model 2	
	AggIndex	ImmShr	AggIndex	ImmShr	AggIndex	ImmShr	AggIndex	ImmShr
Immigration	0.060*	78.462*	0.066*	60.029*	0.010	10.877*	0.014	10.817*
	(0.001)	(0.705)	(0.002)	(0.827)	(0.008)	(3.758)	(0.008)	(3.882)
$FDI_{i,j,t-1}$	0.004*	0.004*	0.004*	0.004*	0.976*	0.973*	0.965*	0.963*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.004)	(0.004)	(0.004)	(0.004)
Age	–	–	−0.037*	−0.037*	–	–	−0.006	−0.005*
	–	–	(0.000)	(0.000)	–	–	(0.001)	(0.001)
Years USA	–	–	0.067*	0.064*	–	–	0.011*	0.011*
	–	–	(0.001)	(0.001)	–	–	(0.002)	(0.002)
College	–	–	−0.833*	−0.584*	–	–	−0.004	0.017
	–	–	(0.012)	(0.017)	–	–	(0.046)	(0.047)
$\ln Dist_{i,j}$	−0.145*	−0.145	−0.090*	−0.085*	−0.006	−0.008	−0.003	−0.006
	(0.000)	(0.000)	(0.000)	(0.000)	(0.345)	(0.193)	(0.638)	(0.411)
$\ln Y_{j,t}$	0.337*	0.348*	0.368*	0.370*	0.024*	0.028*	0.041*	0.043*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.008)	(0.008)	(0.008)	(0.008)
$PIpc_{j,t}$	0.041*	0.027*	0.060*	0.055*	0.026	0.027	0.015	0.017
	(0.009)	(0.009)	(0.009)	(0.009)	(0.031)	(0.031)	(0.031)	(0.031)
$\ln Wage_{j,t}$	−0.424*	−0.412*	−0.325*	−0.351*	−0.150	−0.152*	−0.114*	−0.118
	(0.013)	(0.019)	(0.019)	(0.019)	(0.065)	(0.065)	(0.066)	(0.066)
$\ln Interest_{j,t}$	−0.144*	−0.208*	−0.039*	−0.053*	0.001	−0.004	0.010	0.008
	(0.009)	(0.009)	(0.009)	(0.009)	(0.034)	(0.034)	(0.035)	(0.035)
R^2	0.571	0.589	0.625	0.631	0.957	0.957	0.957	0.957
Obs	6,980	6,980	6,980	6,980	4,205	4,205	4,205	4,205

Empirical estimates of Eq. (2), with standard errors in parentheses and 5% significance given by asterisk (*). Affiliates are defined as the number of majority-owned affiliates of foreign companies from country i located in state j in year t. The gross property variable is defined as the log of the dollar value of gross property, plant, and equipment majority owned by country i in state j in year t. Immigration is defined as the immigration agglomeration index for country i in state j in 1990 for the "AggIndex" column and the share of state j's population born in country i in 1990 for the "ImmShr" column. In both cases, the immigration variable has been instrumented with two lags (1970 and 1980) of the agglomeration or immigrant share variable and all other exogenous variables. Age is the average age of an immigrant group while years United States of America refers to the average number of years members of a given immigrant group have resided in the US college is the fraction of an immigrant group with at least a college degree. $Y_{j,t}$ is the gross state product for state j in year t, $PIpc_{jt}$ is the per capita employer contribution to pension insurance in that state, wage is the annual per capita wage in that state, while interest is the average annual interest payment per employer. The affiliate regressions were estimated by maximum likelihood using an underlying Poisson distribution, while those for gross property are estimated by OLS

the immigrant networks with the agglomeration index for the baseline model (column 1), a 1-unit change in the index will lead to a roughly 6% increase in affiliates. Across the sample, the average number of affiliates in each state across both years and source countries is 60. Doubling the intensity of the immigrant network will lead to about 3.6

new affiliates from the immigrants' native country. While this may seem like a small number, consider that the immigrant agglomeration index ranges from a low of 0.05 to a high of over 12 in 1990 (from Australians in Nebraska to Japanese in Hawaii.).[18] Furthermore, the foreign affiliate count has a wide range as well, reaching as high as 1,335 (Japanese affiliates in California in 1993). Thus, the impact of this immigration variable could potentially be very economically significant.

Defining the strength of immigrant networks with the share of state j's population born in country i, we see a similar result. For the baseline model, a 1 percentage point increase in the share of state j's population born in country i will lead to a 78 percent increase in foreign affiliates located in state j. Put into context, this result predicts that holding all other factors constant, there should be 47 more foreign affiliates from Canada in Maine (1.7% of Maine's residents born in Canada) than in Arizona (0.4% born in Canada). Across the sample, foreign population shares tend to be smaller and less dispersed, with a mean value of 0.13% in 1990 (0.15% in 2000) and a standard deviation of 0.18% (0.36% in 2000). Using the 1990 data, a 1 standard deviation increase in population share is associated with a 14% increase in foreign affiliates, a number more in line with that found for the agglomeration index.

The third and fourth columns of Table 4 include characteristics of the immigrant networks. Interestingly, the share of college graduates in an immigrant group appears to reduce FDI, suggesting that more skilled immigrant groups actually deter FDI. As will be seen later in this section, this result is being almost entirely driven by Africa, and in fact, the skill level relation with FDI is not significantly negative for any other country. Age has a negative effect while tenure in the United States has a positive effect. This may suggest that while older immigrants tend to have weaker ties with their native countries, immigrant groups that are more established in the United States have the political influence and social capital that attracts FDI from their native countries. This result could also be driven by differences across source countries. Looking at the state control variables, local market size has a large and positive effect as expected, while both labor and capital costs tend to deter FDI. Interestingly, per capita employer social security payments tend to attract FDI. This is a surprising result that may simply be due to this variable being a poor proxy for state taxation.

The next four columns in Table 4 list the results measuring FDI as the log value of gross property. The immigrant network variable has a positive coefficient, but is significantly different from zero only for the population share definition, reflecting the fact that this definition likely overestimates the true effect of immigrant networks. To avoid this problem, the agglomeration index will be the preferred measure of immigrant network strength from here on. None of the other estimated coefficients have contradictory signs. It must be reiterated that this definition of FDI is flawed in two ways. First, data coverage is lacking due to confidentiality restrictions. Data are likely to be missing when there are only a few affiliates in a particular state. Given that these small or solitary affiliates are the ones most likely to benefit from a strong immigrant network, there is a potential downward bias clouding the results from this regression. Second, the model using gross property is subject to a spurious regression problem, as

[18] The range is even larger in 2000, going from a low of 0.008 (Middle Easterners in Montana) to 17 (Japanese in California).

Table 5 The determinants of state-level FDI by source country

	Affiliates				Gross property			
	Immigration	Age	Years in the US	College	Immigration	Age	Years in the US	College
Africa	0.039	−0.012	−0.010	−0.698*	0.016	0.010	0.020	0.037
	(0.042)	(0.018)	(0.019)	(0.152)	(0.045)	(0.022)	(0.022)	(0.356)
Australia	0.092*	0.008*	−0.015*	0.291	0.055	0.001	0.003	0.031
	(0.017)	(0.004)	(0.006)	(0.131)	(0.036)	(0.005)	(0.009)	(0.220)
Canada	0.085*	−0.006*	0.005	0.606*	0.031	0.005	0.005	0.118
	(0.007)	(0.002)	(0.003)	(0.165)	(0.025)	(0.009)	(0.013)	(0.281)
France	0.083*	−0.001	−0.003	0.241*	0.040	0.002	0.007	0.300
	(0.016)	(0.002)	(0.003)	(0.083)	(0.041)	(0.005)	(0.007)	(0.155)
Germany	0.249*	−0.062*	0.135*	1.535*	0.080	0.001	0.000	0.896*
	(0.021)	(0.003)	(0.008)	(0.499)	(0.064)	(0.011)	(0.023)	(0.368)
Japan	0.102*	0.025*	−0.033*	1.130*	0.019	0.005	0.004	0.543*
	(0.003)	(0.002)	(0.002)	(0.174)	(0.018)	(0.009)	(0.008)	(0.208)
Middle East	0.223*	0.001	0.008	1.747*	0.146	0.008	0.013	0.167
	(0.030)	(0.005)	(0.008)	(0.703)	(0.075)	(0.012)	(0.018)	(0.313)
Netherlands	−0.023	0.001	−0.004	0.376*	0.003	0.004	0.006	0.149
	(0.012)	(0.002)	(0.004)	(0.096)	(0.031)	(0.005)	(0.010)	(0.140)
Switzerland	0.021*	0.002	−0.013*	−0.058	0.013	0.001	0.000	0.047
	(0.011)	(0.001)	(0.002)	(0.035)	(0.030)	(0.003)	(0.005)	(0.083)
UK	0.094*	0.006*	−0.006	1.367*	0.137*	0.010	0.021	0.387
	(0.014)	(0.002)	(0.004)	(0.326)	(0.057)	(0.008)	(0.016)	(0.301)

See Table 4 for a complete description of methods and variables. Empirical estimates of model (2) in the text with standard errors in parentheses and coefficients significantly different from zero at the 5% level denoted by asterisk (*)

indicated by the remarkably high R^2 and the near unity coefficient on lagged property. Given these issues, I prefer the definition of FDI as the number of affiliates in each state, though I will continue to report the results for gross property.

The results above pooled across source countries, but there is merit to looking at the dynamics of the immigrant-FDI relationship on a country-by-country basis. Results from such an analysis are presented in Table 5. Immigrant networks have a significantly positive effect on FDI from all but two countries/regions: Africa and the Netherlands (in both cases, the coefficient is insignificant). The strongest effect is for Germany, where a 1-unit change in the German agglomeration index leads to a nearly 25% increase in FDI. Across states and years, the average number of German affiliates is 82. The model, therefore, predicts that Colorado, with a German index of 1.82, should have about 20 more German affiliates than a state like Kentucky with an index of 0.88, holding constant such factors as the size of the local market, labor and capital costs, and certain characteristics of the immigrant community.

Looking at the characteristics of immigrant communities, we see varied results. For FDI from Australia, we see that immigrant communities that are ten years older than the average will get about 8% more FDI. At the same time, immigrant communities that have been in the United States 10 years longer than the Australian average will get 15% less FDI. The reverse holds for Germany, where a 10 year increase in average age lowers FDI by 62%, but a 10 year increase in immigrant tenure actually increases FDI by 132%. Interestingly, the average age and immigrant tenure variables have opposite sign for every country in which at least one of the variables significantly differs from zero. This strongly suggests that these variables are picking up on two different trends, but with insufficient information for full identification. The longer an immigrant has been in the United States, the weaker their ties are with their home countries. At the same time, immigrants that have been in the United States for a long time have better knowledge of local market conditions and exert more political influence. Both age and years in the United States are picking up these trends, but it is not clear which variable belongs to which trend.

For every country except Africa, FDI rises with the skill level of the immigrant community. The variable "college" represents the proportion of immigrants in a particular state that have a college degree. A one-unit change in this variable would be going from zero college graduates to 100% college graduates. While an extreme change, it is useful to note that such a movement in the skill level of immigrant communities would cause FDI to increase by 175% from the Middle East, by 154% from Germany, and 137% from United Kingdom to name the largest three coefficients. Only for Africa is the education coefficient negative, with a 1-unit change in college graduate proportion causing FDI to decrease by 70%. Why does African FDI tend to avoid those states with the most educated Africans? One possible explanation could be the clustering of African immigrants in the greater Washington, DC area. These immigrants tend to be highly educated, but the local region may be unfavorable to FDI. Another possible explanation is that several of the large African immigrant networks (in states like Minnesota and Ohio) have a significant refugee population from places like Somalia. These immigrants tend to be low skilled, but FDI may have developed there to serve the local community. Finally, the negative skill-FDI relation could simply be an artifact of the small number of both immigrants and FDI coming from Africa. With a small sample, outliers play an inflated role, perhaps biasing the results.

Since immigration is only observed in 1990 and 2000, the results discussed above may conflate the effect of immigration with unobserved fixed effects by state. As a robustness check, the model is estimated on a year-by-year basis, regressing FDI in year $1990 + s$ on FDI in 1990, immigrant agglomeration and characteristics in 1990, and state control variables for 1990+s. None of the estimated coefficients for immigrant characteristics or for the controls contradict any of the results discussed above for the time series model. An interesting result does emerge for the immigrant network variable, as depicted in Fig. 1. The contemporaneous relationship between immigrant networks and FDI in 1990 is actually negative. This suggests that immigration and FDI are substitutes, confirming the several results at the national level that found the same contemporaneous relationship. Within two years, however, immigrant networks have a strong and positive effect on FDI, with a 1-unit increase in the agglomeration index leading to over 20% more FDI averaged across all countries.

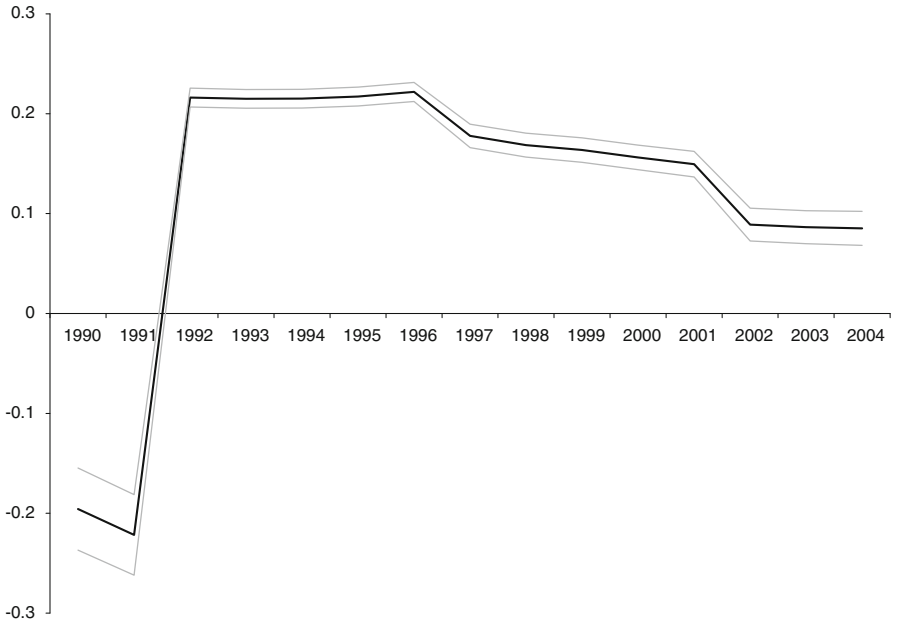

Fig. 1 FDI and immigration, 1991–2004. Poisson estimates of the immigrant agglomeration index coefficient using model 5 in the text; 95% confidence interval in gray on either side of the year-by-year coefficient estimates. The marginal effect can be interpreted as follows: a one-unit change in the immigrant index in 1990 leads to a $\phi\%$ change in the number of foreign affiliates in year t, where t is the horizontal scale on the graph above and ϕ represents the vertical scale

This positive effect persists across the remaining 12 years in the sample, though the marginal effect does drop below 20% starting in 1997 and below 10% after 2001.

So why should immigration exhibit a contemporaneously negative, but positive lagged effect on FDI? The contemporaneous relationship may be explained by factor returns. A state that offers very high wages will be attractive to an immigrant from a particular country, but unattractive to a firm from that country looking to expand operations. As the immigrant network in that state grows, the multinational gains both access to better information and local influence as well. As these benefits grow, they will trump the potentially low return on capital offered by that state and more and more foreign firms will choose to invest in that state over another that may offer higher potential returns, but is also more unknown.

As a final robustness check, I consider the potential simultaneity bias between immigration and FDI. Does FDI rise because of a strong immigrant network or is the immigrant network strong because a beachhead had been established by FDI? To get around this problem, I look at changes in FDI since 1990 as discussed in the econometric model given by (6). As before, none of the immigrant characteristic effects or the state control effects suffered a qualitative change using this model. The immigrant network variable confirmed the results found by both the time series and the year-by-year regression in levels results. Figure 2 displays the evolution of this variable for

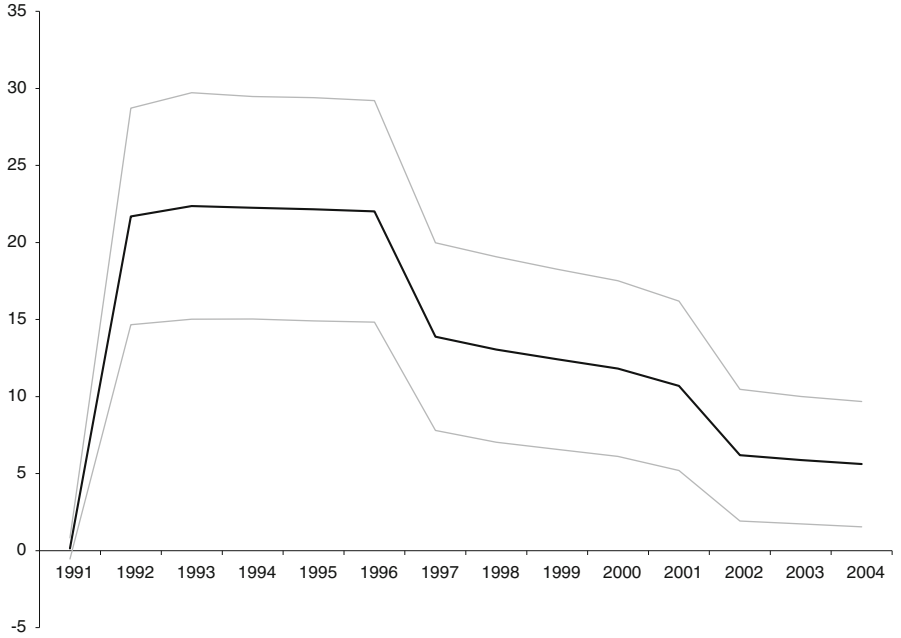

Fig. 2 Immigrant networks and new foreign affiliates, 1991–2004. OLS estimates of the immigrant agglomeration index coefficient using model 6 in the text. The 95% confidence interval is given in gray on either side of the year-by-year coefficient estimates. The marginal effect may interpreted as follows: a one-unit change in the immigrant index in 1990 leads to ϕ new foreign affiliates opening up in year t, where t represents the horizontal scale above and ϕ represents the vertical scale

each year. Immigrant networks in 1990 have an insignificant effect on new FDI in 1991. Starting in 1992, however, we see that the size of the network in 1990 has a significantly positive and persistent effect on new FDI. Going from 1992 to 1996, a one-unit change in the immigration index yields 20 new foreign affiliates. Starting in 1997, this number consistently falls, going all the way down to a smaller, albeit still significant, marginal effect of 5 new affiliates for a 1-unit index change.

6 Conclusion

The key contribution of this study is to look at the relationship between FDI and immigration at the regional level. Within the small (but growing) literature relating these two factor flows, this is the first study that I am aware of that examines the issue at such a high level of disaggregation. A regional level analysis allows us to strip away any of the determinants of FDI that occur at the national level and focuses on how the regional distribution of immigrants within a country affects the regional distribution of FDI within that same country. To assess this relationship, a wide range of data sources was utilized, and a new variable measuring the intensity of an immigrant network within a particular region was created.

The results in this paper strongly support past findings of an overall complementary relationship between cross-border flows of labor and capital. Growth in the relative presence of an immigrant community leads to new FDI from those immigrants' native countries. The results in this study suggest that the effect is not immediately seen, and in fact, the contemporaneous relationship between immigration and FDI may be negative. However, the immigrant network effect on FDI kicks in within a few years and is remarkably persistent. The most reliable model in this paper suggests that if an immigrant community goes from being equally prevalent in a state to twice as prevalent in that state as the national average, that state will see up to 20 new foreign affiliates from the immigrants' native country opening per year. That this result holds even after accounting for local market size as well as local costs of labor and capital strongly suggests that cross-border investment should join cross-border trade as an international flow significantly influenced by immigrant networks.

Characteristics of the local immigrant communities appear to have an influence on inward FDI as well. With the exception of Africa, more educated communities tend to attract more FDI. This follows the result in previous studies that the strength of an immigrant network's pull increases with the skill level of the immigrants therein. Interestingly, immigrant tenure and age combine to give a push/pull result. While older immigrants tend to have weaker ties with their native countries (thereby weakening the network), they do tend to greater knowledge of market conditions and greater political influence (thereby strengthening the flow of information and access of the network).

The results of this study suggest that immigration creates a positive externality for both the receiving and sending country. The receiving country (a US state in this case) benefits because greater immigration eventually draws in new foreign investment.[19] The sending country benefits because a local firm is able to capture larger returns in a foreign market than if immigration had not occurred. In the debate over the benefits and costs of immigration, these positive externalities cannot be ignored. Critics of immigration in the United States often point to increased competition in labor markets as a cost of immigration. Increased foreign investment may now be cited as a potential benefit. Many development economists have worried for years about the brain drain incurred with outward migration. The results of this study suggest that some of this drain may be reversed, if a sending country's best and brightest are in fact sending back to their native countries information and influence in their new homes.

While promising, the results presented here must be taken with caution. The most compelling case came with defining FDI as the number of foreign affiliates in a state. While a useful measure of FDI, we would like to have a measure that actually computes the dollar value of these investments. Another shortcoming of this study is that while the FDI data are available on an annual basis, the immigration data are only updated every ten years. We are therefore left with trying to explain annual variations in FDI with decennial variations in immigration. While the methods used in this study tried to account for this issue, it would obviously be an improvement to use a more frequently

[19] I make the distinction between a positive externality at the state level and a positive externality at the national level here. I cannot tell if immigration to a state causes FDI to rise overall or if one state's gain is the loss from another state. Given the growth in inward FDI for the nation as a whole, it is most likely the former.

updated measure of immigration. It would also be useful to examine a wider set of immigrant characteristics beyond education and age/tenure to see why immigrant networks bring in foreign investment. Finally, an interesting companion study would be to examine how immigrant networks affect more short-term portfolio investment flows. FDI is a long term and at least partially irreversible investment, while foreign portfolio flows can be readily liquidated. Given that one of the main benefits of the immigrant network is reduced risk, both through a smaller chance of appropriation and increased market information, we should see the immigrant network effect be larger for FDI flows. Such a result, along with those in this study, would help confirm the theory relating immigrant networks and foreign investment.

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