

# The social ties of immigrant communities in the United States

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## ABSTRACT

Moving to a new country can be difficult, but relationships made there can ease the integration into the new environment. The social ties can be formed with different groups: compatriots from their home country, people originally from their new country (locals), and also immigrants from other countries. Yet very little research on immigration has addressed this important aspect, primarily because large-scale studies of social networks are impractical using traditional methods such as surveys. In this study we provide the first comprehensive view into the composition of immigrants' social networks in the United States using data from the social networking site Facebook. We measure the integration of immigrant populations through the structure of friendship ties, and contrast it with the spatial density of immigrant communities. Beyond friendships with compatriots and locals, we look at friendships between immigrant groups, deriving a map of cultural friendship affinities.

## CCS Concepts

•Human-centered computing → Social networking sites; •Applied computing → Sociology;

## Keywords

migration, social networks, integration

## INTRODUCTION

Immigrants comprise more than 13% of the United States population [24]. In aggregate, the millions of individual migration decisions have important and varied consequences on both origin and destination societies. And while a large body of literature has focused on the societal-level precursors and outcomes of migration, until now there has not been adequate data to analyze the micro-level processes that lead to these systemic outcomes.

Our study focuses on the composition of migrants' social networks in their country of destination, long a topic of interest to im-

migration scholars. Social networks are one of the main pathways through which the individual migration decisions affect societies, but despite their capital importance, studies on the intersection of social networks and migration have been relatively narrow in scope. Here we seek to broaden this scope by providing the first view of migration and social networks in the United States. We do so by analyzing, in aggregate, de-identified Facebook social network data.

We begin by quantifying the extent to which migrants seek out compatriots, befriend locals, or form ties with other immigrant groups on Facebook. Additionally, we examine a number of explanatory factors underlying this process, including the size of migrant groups, as well as the cultural distance between their home and host country. Our analysis concludes with an examination of the relationship between spatial and social clustering of migrants in destination societies.

## PRIOR WORK

### Integration in a Network Perspective

Interest in the problem of immigrant integration has a long history in sociology. Park and Burgess [15] defined assimilation as “a process of interpenetration and fusion in which persons and groups acquire the memories, sentiments, and attitudes of other persons or groups, and, by sharing their experience and history, are incorporated with them in a common cultural life”. This definition notably lacks any allowance for migrants' prior “memories, sentiments, and attitudes,” as it does for other aspects of integration that go beyond the notion of culture. The concept of assimilation was further elaborated by Gordon [6] in a capstone synthesis of the concept of assimilation. Gordon distinguished seven types of assimilation, second among which was the notion of *structural assimilation*, the notion that immigrants' interaction with the host society comports their integration into native social structures, such as groups or organizations. Shibutani and Kwan [21] likewise emphasized the notion that assimilation involves the successful reduction of social distance between groups.

Perhaps the most important development in assimilation theory has been the shift away from a view of assimilation as a migrant group's linear progress into being completely absorbed by the receiving society [18, 1]. Instead, the current scientific paradigm conceptualizes assimilation (or, more properly termed, integration) as a pluralistic process, and a fundamentally transnational one in which network mechanisms play an important role [1]. Earlier research focused on the social ties that migrants develop with locals, while more recent work has additionally focused on ties within migrant

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communities, as well as on the transnational ties of migrants.

**Migrant-local ties** have long been identified as a key mechanism of assimilation [6, 21]. In the old assimilation theory paradigm, social assimilation occurred when migrant-local ties developed with equal likelihood as the in-group ties of migrants. This was shown to be the case for American Catholics in the second half of the Twentieth Century [2]. It should be noted that opportunities for immigrant integration depend not only on the migrants themselves, but also on the inter-group attitudes of locals. The *contact hypothesis* contends that migrant-local relations may be improved by social interaction, particularly when they are conducted from an equal-status position and backed by institutional support [3]. The formation of migrant-local social ties is both cause and consequence of such contact, and it can be expected that high migrant-local tie densities translate into more favorable attitudinal climates for the further integration of migrants.

**Migrant in-group ties** play a crucial role in the life of immigrant communities, and their quantification is of particular value to understanding the informational and institutional resources upon which immigrant communities draw. Following Granovetter's [7] theoretical manifesto related to the problem of embeddedness, Portes and Sensenbrenner [16] have outlined the sources of social capital in immigrant communities themselves, distinguishing between *value introjection* (shared beliefs and values), *reciprocal exchanges*, *bounded solidarity* and *enforceable trust*. All of these are inherent in the social ties of migrants within the community.

**Transnational ties**, or social ties with people in the home country, likewise represent an important dimension underpinning the identity of migrants, and implicitly the particular context in which immigrant integration happens in the destination society [25]. Furthermore, social ties with the country of origin help create and maintain transnational business networks [20], as well as enable transnational political action [8]. Transnational ties also play a role in better understanding the process through which migration choices happen. The phenomenon of *chain migration*, where current migrants facilitate the further immigration of family members, friends or clients was described by MacDonald and MacDonald [12]. Chain migration reduces the informational and economic cost of international residence changes [13].

**Migrant inter-group ties** are of particular consequence in considering the process of *segmented assimilation* [17]. The segmented assimilation hypothesis holds that, rather than assimilating to a single mainstream ethnicity (e.g. Anglo-Saxon Protestants, cf. [10]), newly-arrived immigrants may adopt one of many identities. For instance, in the US, migrants as diverse as Chinese, Korean, Japanese, Thai and Laotian may well be lumped together into the generic term of "Asian." These ascribed, often haphazard monikers have important consequences, one of them being the creation of a basis for inter-ethnic solidarity among migrant groups.

## Migration and Online Data

New communication technologies have created the opportunity for researchers to study international migrations on a global scale. Zagheni and Weber [30] used Yahoo! IP geolocation to produce bilateral estimates of migration, whereas State, Weber, and Zagheni [23] have computed a global migration matrix from the same data source. Zagheni et al. [29] used geolocated Twitter data to produce estimates of migration for OECD countries. State et al. [22] employed data from LinkedIn to estimate the global flow of highly-skilled migrants. A distinguishing factor with these studies is that they focus on the measurement of migration events, rather than on quantifying post-migration outcomes, or inter-ethnic relations. Studying social networks of migrants provides a first opportunity to go beyond mi-

gration events and study how immigrant communities integrate into their new country.

## NEW METHODS FOR MEASURING INTEGRATION

Different migrant groups experience different patterns of integration in their destination societies. Though this is a facile qualitative observation, its quantification has proven to be rather difficult due to insufficient data. The one exception we are aware of is the *composite assimilation index* produced by Vigdor [27] for the United States, using US Census Data. Our goal is to produce similar measures of integration, using the social network structure of immigrants who have moved from one country to the US.

Our focus is on the social networks of migrants, and we use Facebook friendships to proxy for social ties. Though Facebook friendships may not offer complete information about offline social ties we contend that, in aggregate, the composition of immigrants' online social networks can offer a window into offline friendships not possible by other means.

Taking a sample of people on Facebook from the United States who specify a hometown outside of the United States in their profile, we examine the distribution of their friendship ties – particularly, ties to people born in the United States (identified via a US hometown specified in the profile), to compatriots also living in the US, and inter-group friendships with immigrants from other countries. The relative proportion of ties to each of these groups is a signal of things such as the ease of assimilation within the host country, as well as the cultural affinity (or distance) between countries.

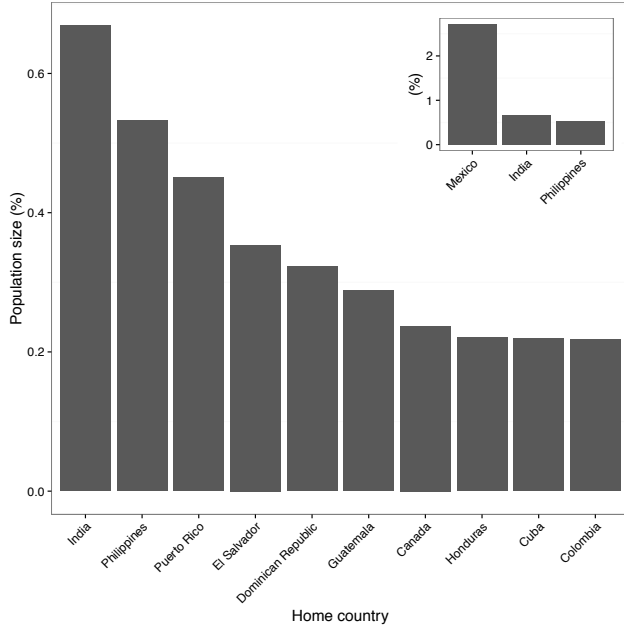
Prior research has shown that sociocultural adaptation, or how well an individual manages daily life in the new culture, is predicted by cultural knowledge, degree of contact, and intergroup attitudes [5, 28]. It seems reasonable that these factors may be captured in the creation of new friendships between people from different cultures, and to the extent they are captured in Facebook friendships, could be a useful way of operationalizing cultural distance.

## DATA AND TERMINOLOGY

We limited our analyses to aggregate measures based on identified social network data for people from the U.S. who used Facebook at least once in the 30 days prior to the analyses. We used the home town specified by the person in their profile to determine the person's home country. Furthermore, we also restrict our analysis to people with at least two friends currently living in their home country and another two friends currently living in the United States. Our results are based on a sample of more than 10 million people who satisfy these criteria. Throughout the paper, all references to people on Facebook will implicitly assume these constraints.

As a general overview, in Figure 1, we provide the relative sizes of the largest immigrant communities among people on Facebook currently living in the United States. The top communities, Mexico, India, Philippines, Puerto Rico, El Salvador, etc., roughly correspond with the current immigrant population sizes in the United States [24]<sup>1</sup>. The proportion of individuals in our sample from a given country and the number of individuals from that country who have immigrated to the US between 1960 and 2014 [14] are highly correlated (Spearman  $\rho = 0.68$ ). This overall alignment lends va-

<sup>1</sup>This is true with the exception of the immigrant community from China, which is underrepresented in our sample, presumably because Facebook is not used in China.



**Figure 1: Top immigrant communities in the US as a percentage of total population in the country. The home country with the largest community, Mexico, is not shown in the main plot, but in the inset to keep the scale interpretable.**

lidity to using Facebook data as a rough proxy for real-world patterns concerning immigrant communities.

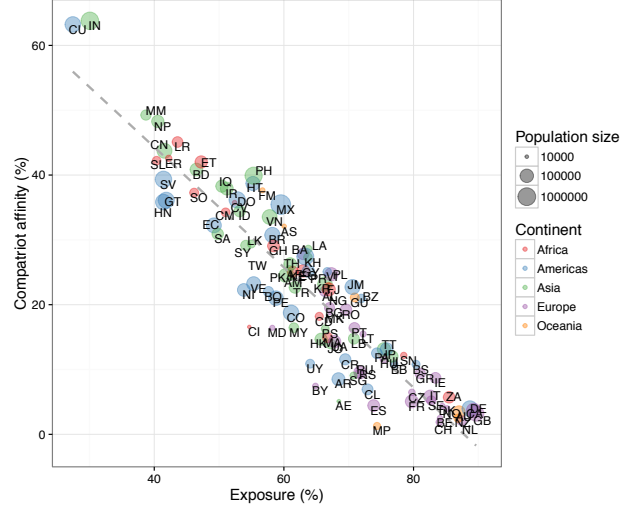
## METHODOLOGY

The key metric we use to characterize the friendship structure of an immigrant community from the same home country living in the United States is the ratio of in-group friendships for people from a particular migrant group. In other words, we quantify the extent to which people in an immigrant community have social ties with one another, relative to all of their friendships ties within the US. We call this metric the *compatriot affinity*. A complementary metric is the ratio of the friendships that people in that community form with US-born individuals, relative to all of their friendship ties within the US. We call this value the *exposure ratio*. The two metrics are highly-correlated (Figure 2) but are not linear transformations of one another, due to the fact that a migrant group can also form friendships with other immigrants to the United States.

To measure the affinity between two immigrant communities who reside in the US, we generalize the notion of compatriot affinity to a pair of communities by defining the *co-immigrant affinity* of a community  $a$  to another community  $b$  as the ratio of friendship ties between  $a$  and  $b$  to the total number of friendships community  $a$  forms. This results in an asymmetrical affinity score between two communities which can be interpreted as the conditional probability of observing a friendship tie between two communities, given the home country of one. Also, note that the compatriot affinity of community  $a$  simply becomes the co-immigrant affinity of  $a$  to itself.

## RESULTS

First, we observe that while immigrant groups vary in how integrated their social networks are, they all have a significant pro-



**Figure 2: Compatriot affinity and exposure ratio for US immigrant groups. Colors denote continent. Spearman’s  $\rho=-0.93$ .**

portion of friends originally from the US. People who have moved from Germany, Great Britain, Canada, Australia, or South Africa have upwards of 90% of their social networks composed of Americans. People from Mexico have about 60% of their Facebook social ties within the US to locals, while for China this is 42% and for India, 29%. Immigrants from Cuba have the lowest exposure in their social networks to Americans, consistent with their settling predominantly in a few geographical areas with high immigrant populations [19].

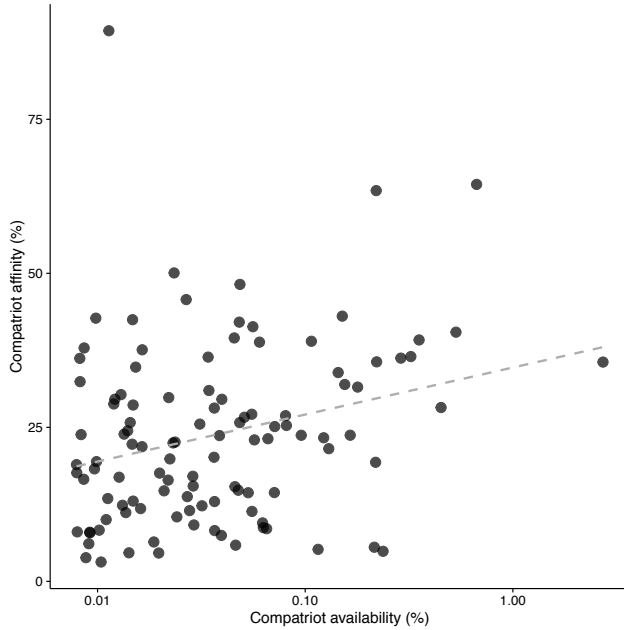
Compatriot affinity is, notably, not simply a function of how many compatriots are living in the United States. In Figure 3, the proportion of migrants and their compatriot affinity values are presented. While there is a weak correlation between the population size of an immigrant community and compatriot affinity (Spearman’s  $\rho = 0.25$ ), we observe large variance among immigrant communities with comparable sizes in the United States. In later sections, we discuss the relation between affinity and availability at local levels in more detail.

## Validation

While “ground-truth” data on migrants’ social networks is scarce, we can compare our measurements against established metrics of immigrant integration. In particular, we focus on Vigdor’s [27] *composite assimilation index* (CAI), which attempts to quantify the extent to which different migrant groups are integrated in US society.

If an immigrant community is highly assimilated in a country then it should be nearly impossible to tell which individuals are immigrants and which individuals are originally from America, by just looking at the characteristics of the individuals. Vigdor [26] trained a probit regression model on census-provided factors such as educational attainment, employment status, home ownership, English-speaking ability, marriage, and childbearing patterns of individuals, and defined the *assimilation index* of an immigrant community as the separation power of this model [26].

Vigdor [26] defines four different indices of assimilation: cul-



**Figure 3: Compatriot availability and affinity in the US.** Compatriot availability is the ratio of immigrants as a percentage of the total US population. Spearman’s  $\rho$  value is 0.25 and the dashed line is the best fitting linear model.

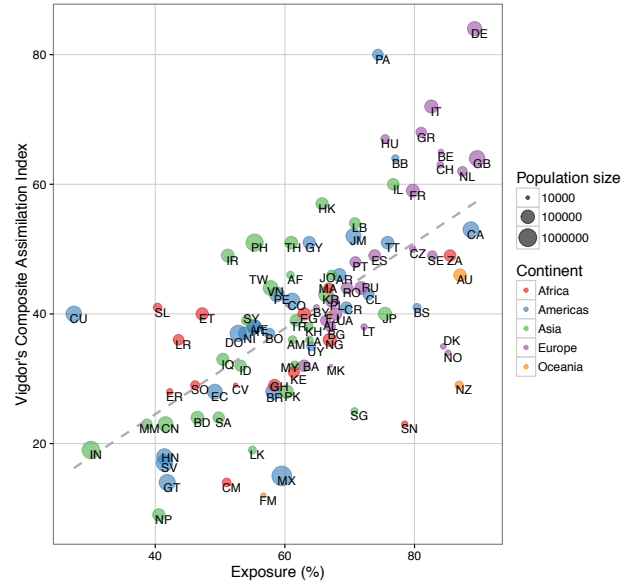
tural, economic, civic, and as a combination of all three, composite. The indices differ in which factors are used in the regression model. In a follow-up report [27], more up-to-date values of the indices for the immigrant communities in the US are provided; we use the 2011 values from this report. Our hypothesis is that the compatriot affinities are closely related to indices of assimilation. We compare exposure and compatriot affinity metrics for US immigrants to the composite assimilation index.

### Integration and exposure

As social ties are expected to be an important mediator of immigrant integration, we expect this composite index to be directly correlated with the exposure ratio we computed for migrants in the US. Figure 4 shows there is indeed a fairly high correlation (Spearman’s  $\rho = 0.65$ ) between the exposure ratio and the composite assimilation index<sup>2</sup>. Likewise, we find a similarly high negative correlation (Spearman’s  $\rho = -0.60$ ) between compatriot affinity and the composite assimilation index: better-integrated groups tend to have fewer in-group ties as a proportion of all their social ties in the United States (Figure 5).

An additional and important factor in immigrants’ assimilation is how much of their lives have been spent in the United States. Since our dataset does not include the date when the individuals in our sample moved to the US, we instead look at the average year of immigration as recorded for different communities since 1960 [14] and compare against the community’s average exposure ratio on Facebook and Vigdor’s composite assimilation index (CAI). Indeed, the correlation between average year and CAI is negative  $\rho = -0.68$ , as is the correlation with exposure ratio  $\rho = -0.65$ , showing that communities where individuals immigrated more recently have not assimilated as far, nor have they integrated their

<sup>2</sup>For 93 immigrant communities in the US with at least 10000 people in our sample.



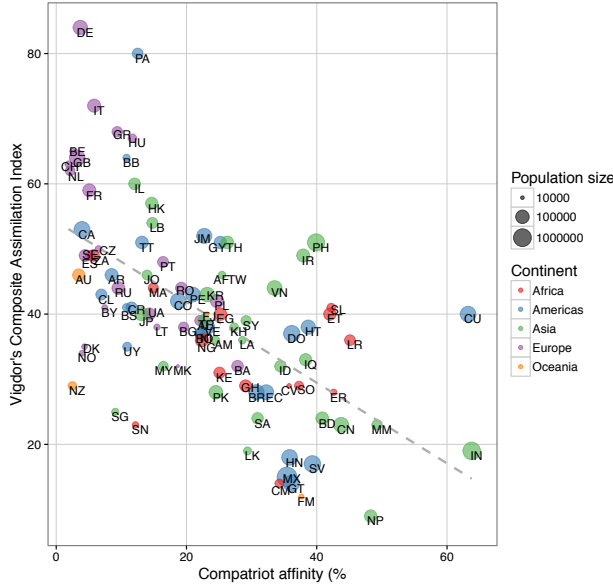
**Figure 4: Comparison of Vigdor’s composite assimilation index and exposure ratio for immigrant communities in the US.** Spearman’s  $\rho = 0.64$

social networks as much. For example, the immigrant community from India, which has both a low CAI and exposure ratio, has a very recent average immigration year of 2006. Colombia, Mexico and the Philippines, all with an exposure percentage between 55 and 60%, have an average immigration year between 2002 and 2003. Germany, with very high exposure and CAI, is one of the “oldest” immigrant communities and has an average immigration year of 1985. The above suggests that integration for communities is largely a matter of time. Finally, combining both exposure and average year of immigration gives us a slightly better ability to explain CAI for a community ( $R^2 = 0.61$ ) vs.  $R^2 = 0.54$  for exposure ratio alone (ANOVA p-value = 0.003).

### Co-immigrant affinity

The evolution of an immigrant’s social network depends not only on cultural affinity, but also a variety of other factors: the country’s immigration history, the presence of other immigrant populations, and the host country’s language, immigration policies, and other programs geared to immigrants. One way to obtain a measure of cultural affinity that is less sensitive to specific policies and history of host country and immigrant population is to look at immigrant populations from two countries and their friendship patterns in a third country. By looking at these co-immigrant friendships across every common host country, the friending patterns between two countries emerge.

When finding themselves in a new country, immigrants may gravitate not only toward their compatriots, but also toward others who share their language or cultural norms. *Co-immigrant affinity* as defined in the methodology section, is a measure of how likely the members of an immigrant community will form connections with the members of another one. Using co-immigrant affinity, we can construct a directed and weighted graph of immigrant communities in the US. We visualize this graph in Figure 6 and observe a strong clustering of culturally similar communities with high affin-



**Figure 5: Comparison of Vigdor’s composite assimilation index and compatriot affinity for immigrant communities in the US. Spearman’s  $\rho = -0.60$**

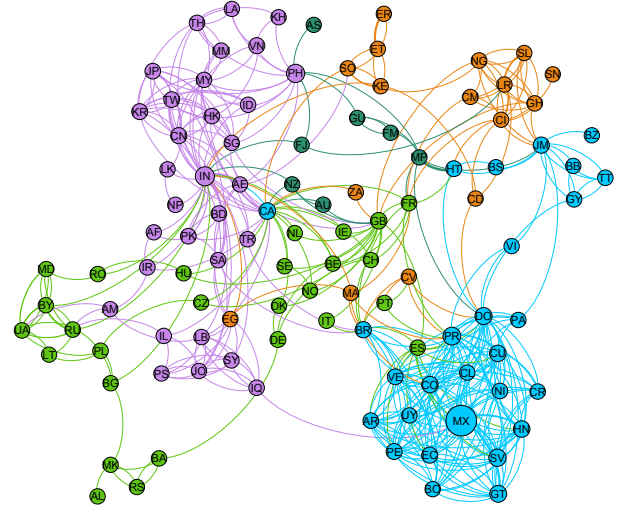
ity scores when we use a standard force-based network layout algorithm [11]. We also observe that the clusters bear similarity to country groupings according to Huntington’s “civilizations” [9]

## Spatial and Social Clustering

Spatial proximity between individuals is both cause and consequence of the formation of social ties, and the clustering of migrants within distinct communities (immigrant neighborhoods) is a well-documented phenomenon. To analyze the extent to which social and spatial clustering of migrants co-occur we also computed the *index of dissimilarity*, a measure of geographic heterogeneity of the immigrant populations.

Let  $p_i(x)$  denote the ratio of people from country  $x$  living in the geographical unit  $i$  (e.g., a city) of a given host country  $h$ . A city is included in our analysis if there are at least 30000 people on Facebook living in that city. By definition,  $\sum_{i \in h} p_i(x) = 1$ . The index of dissimilarity of immigrants from  $x$  living in the host country  $h$  is defined as  $\frac{1}{2} \sum_{i \in h} |p_i(x) - p_i(h)|$ . The index of dissimilarity can be interpreted as the ratio of the immigrant population that would have to move to a different geographic unit in order to achieve the same geographical distribution of the host population.

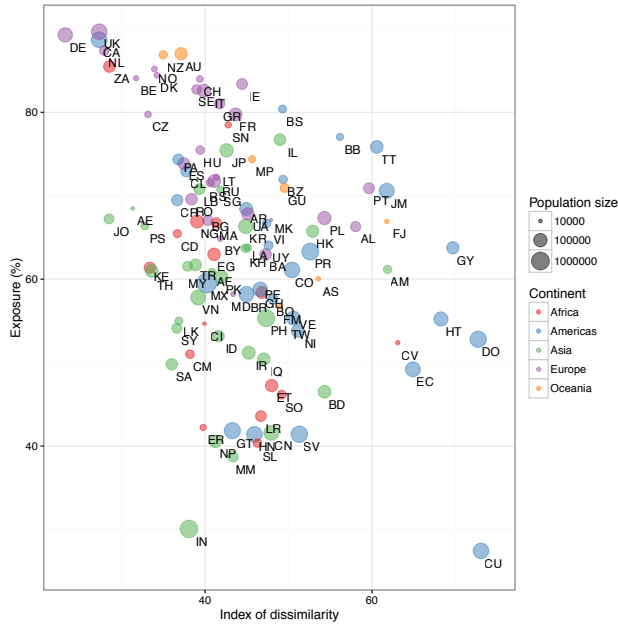
Fig. 7 shows a moderately negative correlation between integration (exposure ratio) and the index of dissimilarity within the United States ( $\rho = -0.42$ ). Typically immigrant groups with high integration, e.g. migrants from Germany, Great Britain, South Africa, Canada and Australia, are dispersed geographically. People from Cuba, the immigrant group with the lowest level of exposure in the United States, are also the most geographically concentrated. India is an outlier in this trend because it has a low index of dissimilarity, meaning that people from India are highly dispersed throughout the United States, but are less integrated than other communities with a similar level of dispersion. The relationship between the countries’ index of dissimilarity and exposure ratio shows a rough clustering of countries based on the continent of the country.



**Figure 6: Network visualization of countries with greatest friendship affinity between immigrant populations. Layout is determined automatically using the force atlas algorithm in Gephi [4]. Coloring of the nodes is determined by the continent of the home country. The weight between two nodes is the conditional probability of observing a friendship between a target person’s home country given the source’s home country. To keep the graph readable, we only include edges with a weight above 0.005. The directions of the edges are indicated by clockwise arcs.**

Given that the spatial diversity index correlates strongly with integration, we next looked at the extent to which the composition of a city population relates to the exposure ratio for people living in the city. One would expect that in cities with large immigrant populations there would be many ties between immigrants, and immigrant networks would have fewer ties to locals. To examine this, we plotted across cities for different immigrant communities the relationship between the proportion of immigrant compatriots and the proportion of social networks composed of compatriots.

The general trend, seen in Figure 8, is a roughly log-linear relationship between the proportion of compatriots in the social networks of immigrants in those cities and the log-transformed percentage of city population that comes from the same home country. As soon as there are at least some compatriots living in the same city (e.g. compatriots comprise 1% rather than 0.1% of the city’s population), the proportions of compatriots in social networks jump 20% or more, depending on the home country. However, past a certain proportion of compatriots in the city, the proportion of compa-



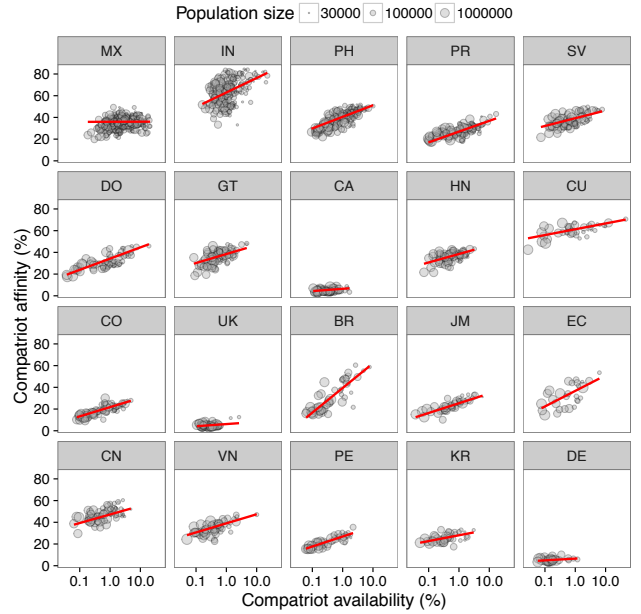
**Figure 7: Comparison of index of dissimilarity and exposure ratio for immigrant communities in the US. Spearman correlation is -0.42**

triotis in the social networks stops growing, and is complemented by locals and other immigrant groups.

While the overall log-linear trend is similar for many countries, the slope and intercept differ significantly, consistent with the observed overall compatriot affinity for different countries. Highly integrated communities, such as those from Canada, the UK, and Germany, will have a small intercept and nearly flat slope, meaning that having more compatriots living in the same town does not translate to having more compatriot friendships. In contrast, for immigrant communities whose migration is most recent, both the intercept and slope can be high. Such is the case with people who have moved from India. Their social networks in the US can have more than 50% compatriot ties on average, even when the overall Indian population in the city is a more modest 5%. Cuba is an interesting outlier. As mentioned, the immigrant community from Cuba tends to have a high index of dissimilarity, being concentrated in a few geographical locations. But even in cities where the community represents only a small fraction of the population, compatriot affinity remains high, despite Cuba having a relatively old average immigration year of 1998.

Mexico is another interesting example. Since the immigrant community from Mexico is large, many cities have high compatriot availability, and compatriot affinity tends to average at or above 20% within these cities. However, people from Mexico will typically have fewer than 50% of their social networks composed of compatriots even as the proportion of compatriots in the city exceeds 10% or 20%, consistent with their high exposure ratio and moderately recent year of immigration.

Overall, we see a strong relationship between the geographic heterogeneity of immigrant communities and the integration of their social networks. Communities that tend to spatially cluster also have more compatriot ties, since they have more opportunity to form such ties within cities. Note that this is a log-linear trend for all communities, meaning that e.g. the availability of compatriots



**Figure 8: Compatriot affinity and availability of US in-migrant communities. Horizontal axis is log-scaled. The solid line is the best fitting linear model using log-transformed compatriot availability.**

can increase tenfold while only fractionally increasing compatriot affinity. This leaves ample room for ties to locals and people from other immigrant communities.

## CONCLUSION

In this paper we presented the first large-scale analysis of immigrants' social networks in the United States. We found several interesting correspondences, for example, between the extent to which migrants are connected to other migrants, rather than people born in the US, and the migrant group's level of spatial clustering. Both the recency of migration and the migration type appear to play a role in the structure of immigrants' social networks. Our findings likewise suggest that migrant populations that are from culturally-proximate sources are more likely to have ties to locals than are individuals from culturally-distant regions.

As a first study, the data and methodology still have a number of limitations. Although we have shown that immigrant populations in our sample are roughly proportional to those found in a national census, people on Facebook are not necessarily a representative sample of the general population, and further analysis of biases between Facebook and offline data is warranted. Furthermore, we limited the analysis to immigrants who disclose their home town as part of their Facebook profile. Disclosing one's home town is a matter of self-expression and this behavior may have a non-trivial relationship with individuals' integration/assimilation behavior.

Crucially, we do not take into account the length of time since emigration or even whether the move is temporary or permanent. Due to economic and political conditions both within and between the United States and the home country, people from different nationalities may have immigrated at different times with different intended lengths of stay, which would affect their observed assimilation at this time point. In general there is a moderate correlation between proportion of home-country ties and proportion of com-



patriot ties. For the United States,  $\rho = 0.44$ . This suggests that individuals with stronger ties to their home country also tend to prefer to connect to compatriots. As the tie to home country weakens, so does on average the preference for compatriot friendships. Although not readily available in our data, time since emigration would make for interesting additional research. In addition, the high proportion of home-country ties suggests that social media is potentially playing a role in helping immigrants stay in touch with friends and family in their home country. This would also be an interesting avenue of study.

In this paper all ties are treated equally regardless of frequency of interaction, but closeness of ties to different populations could yield additional insights. Finally, differences in assimilation by age and gender could also be fruitful avenues for future work.

Despite the above-mentioned limitations, this paper presents the first glimpse into the potential of using online social network data to understand the integration of immigrant communities.

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