Immigration and the Pursuit of Amenities

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Abstract

Immigrants to the United States live disproportionately in metropolitan areas where nominal wages are high, but real wages are low. This finding is justified in a spatial equilibrium model, as these areas offer more desirable quality-of-life amenities. Relative to natives, immigrants do sacrifice more to be in larger, coastal cities and also sort towards areas that are hilly, sunny, less-educated and subject to greater land-use regulations. Immigrants are coming more from countries that are coastal, cloudy, and less violent. Moreover, they choose cities that resemble their home countries in terms of winter temperature, safety, coastal proximity, and education level.

1 Introduction

Economists naturally see immigration from the perspective of labor markets. In particular, they focus on immigrant workers moving from places where their productivity is low, to places where it is higher. Such moves, in principle, increases world income, generating a surplus that is split between migrants and capital owners.

At the same time, economists studying domestic migration have put considerable attention on workers' willingness to forego higher wages in pursuit of non-market amenities, e.g. Roback (1982), Albouy (2008), and Diamond (2016). Many migrants may simply seek a milder climate (Sinha et al., 2018). Others with to be near mountains or a coast. Still others could seek just a safer place to live. Such amenity induced moves may not increase world income, yet (absent externalities) they should improve increase well-being.

How amenities might determine international migration has received little attention. Most attention has been given to how international migration might be affected by climate *change* – e.g., Black et al. (2011) and Missirain and Schlenker (2017). Yet, we do not know of studies that examine how level differences in climate determine international migration, which seems like a natural complement. Nor do we know of other studies on how amenities affect international migration.

Here, we examine amenity-induced immigration primarily from an urban perspective by considering the kinds of cities migrants to the United States tend to inhabit. In addition, we consider the amenities of the countries immigrants originate from, and see if this has any connection with the amenities immigrants choose in their destination city.

It is appropriate to examine city choices within the United States through a model of spatial equilibrium with multiple worker types, e.g, Roback (1988), Albouy (2013), and Moretti (2013). In this model, workers reveal the amenities they seek not only through their sorting behavior, but through how much they pay, or "sacrifice," to live in an area. This sacrifice may take the form of paying higher rents or receiving lower wages. We then compare both sorting and willingness-to-pay measures of immigrants to that of natives, particularly natives who have migrated across state lines. This helps determine how much immigrants locate for amenities relative to income, and whether they differ at all relative to natives.

To examine the second of issue of what kind of countries immigrants leave behind, we incorporate amenity measures into a "push" model of emigration. This model examine how amenities may change rates of emigration to the U.S. along with income and distance. We then extend the model to incorporate destination cities, to see if immigrants seek amenities similar or different from their country of origin.

While we confirm previous research that immigrants sort towards places where nominal incomes are high, we find – more surprisingly – they sort even more towards places where real wages are low. Real wages are low, while nominal wages are high because of particularly high costs-of-living. In contrast, native migrants who relocate across states go to places with low real wages and low nominal wages, where productivity is lower.

Second, immigrants and natives show similar willingness-to-pay to be in the same metro areas. Immigrants sacrifice slightly more in terms of wages to be in cities that are larger, and more coastal. Not surprisingly, they live in cheaper neighborhoods within those cities. However, immigrants' sorting behavior is quite different: they go towards metro areas characterized by sun, hills, high population, lower education, high land-use regulation, and near immigrant ports of entry. Native migrants, on the other hand, sort towards metros that are warm, non-coastal, small, and more educated. For example, immigrants go towards places like Los Angeles, while natives move towards place like Fort Collins or Knoxville.

Third, conditional on income and distance, immigrants are more likely to come from countries that are coastal and cloudy, such as the Netherlands. The U.S. receives immigrants more from countries with low violence. These findings should be interpreted cautiously because of potential omitted variable biases.

More reliable evidence is available on how immigrants sort to cities, as the method we use allows us to control for country-of-origin fixed effects. The evidence points to immigrants largely moving to cities that resemble their home countries along four dimensions: coastal proximity, mild winters, safety, and education levels. In no case do we see immigrants going towards the opposite.

2 Willingness to Pay, Sorting, and Amenities

To determine how much immigrants and natives value local amenities we use two measures. The first is a willingness-to-pay measure, following Rosen (1979), Roback (1982), amended for federal taxes by Albouy (2008). The second depends on sorting, in the spirit of spatial selection models such as McFadden (1978), Gyourko et al. (2013), Bayer et al. (2007).

2.1 Willingness-to-Pay in a Spatial Equilibrium Model

Consider a population of perfectly mobile homogeneous households that must choose a city j to live and work. In that city, they buy traded and local goods, where the latter has a price that differs across space, p_j, such as housing costs and restaurant prices. Labor markets also offer different wage levels w_j, which may compensate them for higher prices, or worse amenities. The willigess-to-pay for those amenities that household exhibit in city j is then given by how high prices are relative to after-tax income:

$$W\hat{T}P_j = s_p\hat{p}_j - (1-\tau)s_w\hat{w}_j \tag{1}$$

This expression uses log deviations from the national average, expressed with the hat-notation $\hat{x}_j = dx_j/\bar{x}$, where $\bar{x}$ is the national average. The weights on prices and wages, s_p and s_w are the share of income spend on local goods, and the share of income from labor. τ is the marginal tax rate on labor earnings.

When households are perfectly mobile and have similar tastes, the $W\hat{T}P_j$ measure can be used to estimate households' valuation of amenities. If two different cities are occupied, it is because households are indifferent between them: any differences in real income must be compensated for by amenities, and vice versa. Any imbalance would cause households to move towards the better city until the two became equal again, or the worse city empties out.

2.2 Household Sorting with a Simple Friction

The sorting argument rests on the idea that the number of households that choose one city over another provides information about the value of a city's amenities. To do this, researchers assume that households i have idiosyncratic tastes for each city that have a smooth random distribution. This model implies the more households prefer city 1 over city 2, the greater the number of households we should see in city 1 over city 2. This ratio is rarely infinite, because someone in city 2 has a particular reason for staying there, even if wages or amenities would otherwise bring them to city 2.

Allowing these idiosyncratic tastes for cities requires adding a quantity measure, N, to the price measures in the $W\hat{T}P_j$. Based on a simplified version of a discrete choice model, we infer that the value of amenities in a place, i.e., the quality of life it offers, is given by the willingness-to-pay measure plus a term for how much more population we see relative to the average.

$$\hat{Q}_j = s_p \hat{p}_j - (1-\tau) s_w \hat{w}_j + \psi \hat{N}_j \quad (2)$$

$$= W\hat{T}P_j + \psi \hat{N}_j \quad (3)$$

The parameter ψ determines how much sorting behavior should be considered relative to willingness-to-pay. It is based on just how heterogeneous idiosyncratic tastes are: the more heterogeneous, the higher ψ. If one solves for $\hat{N}_j$, this expression also gives a downward sloping demand curve to live in city j, $\hat{N}_j = \left(\hat{Q}_j - W\hat{T}P_j\right)/\psi$, where the slope of the curve is given by ψ.

Unfortunately, the parameter ψ cannot be observed directly, but must be estimated or calibrated. With all of the proper weights on relative prices, wages and population, one could then infer in principle how much households are willing to pay for different amenities on the margin. Like with other city-level wage and housing-price equations, this technique is subject to problems with omitted variables, specification errors, and simultaneity issues.

2.3 How Immigrants and Natives Reveal Preferences Differently

Our subject of interest here has more to do with how immigrants value amenities differently from natives, not only how much they value them absolutely per se. To model this, let the superscript I denote variables for immigrants, and B for native born. If the two have different preferences to amenities, they can receive different quality-of-life benefits for each city. According to our two measures, the quality of life received by immigrants relative to natives should be reflected by differences in willingness-to-pay and in sorting:

$$\hat{Q}_j^I - \hat{Q}_j^B = W\hat{T}P_j^I - W\hat{T}P_j^B + \psi^I \hat{N}_j^I - \psi^B \hat{N}_j^B \tag{4a}$$

$$= s_p^I \left(\hat{p}_j^I - \hat{p}_j^B\right) + \left(s_p^I - s_p^B\right) \hat{p}_j^B \tag{4b}$$

$$- (1-\tau^I) s_w^I \left(\hat{w}_j^I - \hat{w}_j^B\right) - \left[(1-\tau^I) s_w^I - (1-\tau^B) s_w^B\right] \hat{w}_j^B \tag{4c}$$

$$+ \psi^I \left(\hat{N}_j^I - \hat{N}_j^B\right) + \left(\psi^I - \psi^B\right) \hat{N}_j^B \tag{4d}$$

The later part of equation breaks apart the the sub-components of the willingness-to-pay measure into its constituent data. First, are differences in local good prices, $\hat{p}_j^I - \hat{p}_j^B$. This may come from immigrant residential segregation or landlord discrimination. Second, immigrants may stronger or weaker tastes for the local good, reflected in different expenditure shares $s_p^I - s_p^B$. Stronger tastes would mean putting greater weight on local housing costs.

Wage differences $\left(\hat{w}_j^I - \hat{w}_j^B\right)$ could come from either unobserved skill differences: e.g., English ability, whose retrun could vary across cities. It could also arise from employer discrimination. Differences in net of tax wage share of income $(1-\tau^I)s_w^I - (1-\tau^B)s_w^B$ also determine the weight put on wages. Households that have less non-labor income will be more dependent and more drawn to high-wage areas.

Finally, population differences $\left(\hat{N}_j^I - \hat{N}_j^B\right)$ reflect the sorting behavior. Its relative importance depends critically on ψ. The last term $\left(\psi^I - \psi^B\right)$ shows the differences in mobility cost or differences in heterogeneity parameter.

Since the preference heterogeneity parameter, ψ, is not observed directly in the data, we look at sorting behavior separately from differences in willingness-to-pay, acknowledging that both are signals of quality-of-life amenities. We also ignore differences between preference heterogeniety natives and immigrants for now.

Besides being interested in the overall role of amenities, we also want to consider tastes for particular amenities. To fix thoughts, suppose that the overall quality of life that each type gets from local amenities, q_j^k, where k indexes amenities, are determined by the following model:

$$\hat{Q}_j^I = \sum_k \pi_k^I q_j^k + \eta_j^I \tag{5}$$

$$\hat{Q}_j^B = \sum_k \pi_k^B q_j^k + \eta_j^B \tag{6}$$

The coefficient π_k^I (π_k^B) reflects the valuation of city amenity q_j^k in the city j by immigrants (natives). The analysis here is indeed tuned towards examining how immigrants and natives value the same amenities differently. Higher valuation of certain amenities by immigrants than native migrants ($\pi_k^I > \pi_k^B$) can be reflected in both willingness-to-pay and population (sorting) differences.[1]

2.4 The Implicit Role of Amenities in Previous Research

Relative to domestic residents, immigrants differ by not having a place of birth within the destination country. This means that they should have less ties to a particular location. As they have already sunk fixed costs of moving, Borjas (2001) argues that immigrants will seek out labor markets with the highest wages. Indeed, he argues immigrants reduced inter-regional wage differences across similarly-skilled workers across cities. In a more general model with amenities, the argument extends to markets offering the highest well-being, instead of wages.

Borjas' findings on wage convergence is at odds with Card (2001), who finds that immigrants exert only small downward pressure on wages, based on an instrument variable methodology.

[1]Note that there may be vastly more types, depending on the specific country of origin. The most straightforward way to test for heterogeneity in preferences is to divide immigrants into groups by the country of origin. If preferences are correlated with amenities in the country of origin, immigrants may sort into cities with similar natural amenities (for example, people from warm places may prefer cities with mild winters and can tolerate hot summers). The other possibility is that immigrants may seek ways to escape from unfavourable environment in the county of origin. We test this, interacting amenities in the country of origin and in the receiving city.

According to Card and Dinardo (2000), higher immigration levels do not result in native outflows either. However, Saiz (2007), using a similar methodology, finds that immigrants put upward pressure on housing rents. All of these studies use immigrant enclaves to predict where future immigrants will land, based on how previous immigrant have sorted.[2]

Together, these papers is that workers accept lower real wages in areas where the supply of immigrants has grown the most. Furthermore, these places have not seen a population. In the spatial equilibrium model, this decrease in real wages together with population growth is consistent with quality-of-life growing in these cities.

A question that remains as to whether quality-of-life is truly growing in these areas or not. In the negative case, it could be that real wages have fallen for all workers, without a rise in amenities. Workers have simply accepted lower wages because it is too expensive to move, or because they have strong ties, i.e., idiosyncratic tastes, for the area.

If quality of life in immigrant-receiving areas has risen, it would be interesting to know if immigrant enclaves simply predict growth in local quality of life, or if growing immigration has actually caused quality of life to rise in these areas.[3]

3 Data and Measurement

3.1 Household Data

We estimate wage and housing cost differentials for 2000 and 2014 separately, using the Integrated Public Use Microdata Series (IPUMS, Ruggles et al. (2017)). Our samples are the 5 percent sample

[2]The implicit assumption in using immigrants as an instrument for labor supply is that previous immigrants offer non-market benefits to immigrants from the same country. This could take the form of benefits idiosyncratic at the worker level, such as family ties. Or it could take the form of more general quality-of-life benefits. Immigrants may want to live in places with those who share their native tongue, dance to similar music, or celebrate the same holidays. They may also demand similar indivisible inputs, such as grocery stories or houses of worship. Or they may simply share tastes for climate, hills or coastline. For more on this instrument, see Jaeger et al. (2018)

[3]An issue we do not address is how immigrants might change local amenities. For instance, immigrant could have positive effects by enriching local culture or changing neighborhoods in ways natives value less Saiz and Wachter (2007). Some have examined possible impacts on crime Bell and Machin (2013). Others have considered whether immigrants with large put stress on local public service provision, such as schools, e.g. Hunt (2016).

of the 2000 Census (Long Form) and the pooled American Community Survey from 2012 to 2016, i.e., the "2014" sample. Our 276 "cities" in the 2000 and 2014 samples are based on 1999 OMB definitions of metropolitan statistical areas (MSAs).[4]

In accordance with the model, we derive wage and price differentials for each metro area for immigrants and natives separately, using a methodology similar to Albouy (2016). Wage differentials for each city are derived from individual-level regression of the logarithm of hourly wages, controlling for workers' characteristics:

$$\ln w_{ij} = X_i^w \beta + \hat{w}_j + \epsilon_{ij}^w \tag{7}$$

The regression controls for a broad set of individual-level characteristics (X_i^w), including education and experience[5]. The inferred wage differential in the city j is the fixed-effect coefficient, $\hat{w}_j$.

Similarly, the housing cost differentials are calculated using a household-level regression of the gross rents (imputed rents for owner-occupied units) on dwelling characteristics of housing units:

$$\ln p_{ij} = X_i^p \beta + \hat{p}_j + \epsilon_{ij}^p \tag{8}$$

The regression controls for tenure and a large set of housing characteristics, such as number of rooms, lot size and others (X_i^p)[6]. The fixed effect coefficient, $\hat{p}_j$, is the inferred housing differential.

3.2 Immigration and Native Migration Data

Natives are defined as US born population, including the territories, and those born abroad to US citizen parents. Immigrants here refer to the population born abroad who are not US citizens by birth.

[4]The MABLE/Geocorr2K Geographic Correspondence Engine (MABLE/Geocorr14 for 2010 Census geography) helps to consistently define MSAs.

[5]The full list of individual-level controls includes education, experience, interaction of education and experience, marital status, race and ethnicity, veteran status, industry, occupation, immigrant status, ability to speak English, female dummy and all other variables interacted with the female dummy.

[6]Other controls include the number of rooms, type and age of the building, lot size, dummies for commercial use and condominium, and unit amenities (plumbing, kitchen in the unit).

Table 1: Immigrant Share and Average Urban Amenities by Region

	US (avg.) (1)	All other countries (avg.) (2)	Canada (3)	Latin America (4)	West/North Europe (5)	East/South Europe (6)
Warm Winters	-4.30	-1.79	-8.09	-0.57	-5.43	-5.60
Mild Summer	-1.32	-1.73	-0.17	-1.91	-0.10	-0.33
Close to Coast	0.60	0.27	0.24	0.28	0.18	0.24
Average Slope	-4.05	0.46	0.11	0.45	0.50	0.35
Sunshine	1.69	0.66	0.37	0.76	0.33	0.59
Immigrant Share (2000)		11.05	0.26	5.36	0.66	0.98
Difference in Share (2014-2000)		2.21	0.00	0.40	-0.11	-0.16

	Oceania (7)	East/South Asia (8)	South Central Asia (9)	Middle East (10)	Sub-Saharan Africa (11)
Warm Winters	-1.49	-1.99	-0.81	-2.17	-0.26
Mild Summer	-0.84	-2.15	-2.73	-1.35	-1.27
Close to Coast	0.31	0.24	0.30	0.36	0.27
Average Slope	0.83	0.66	0.19	0.46	0.30
Sunshine	0.18	0.60	0.36	0.96	0.92
Immigrant Share (2000)	0.03	1.98	0.60	0.30	0.21
Difference in Share (2014-2000)	0.01	0.51	0.43	0.05	0.11

Notes: Measure of amenities (close to coast, average slope and sunshine) are different for column 1 and the rest of the columns. For the detailed explanation on the measures, refer to the Appendix.

The immigrant share of the total population is relatively small in some cities, especially if one breaks down this share by the country of origin. This leads to a substantial measurement error in the Census public use microdata files as they contain only a 5 percent sample. To mitigate this problem, we utilize the Census Summary File 3 of 2000 (about 1 in 6 households) and 2012-2016 ACS 5-Year Data from National Historical Geographic Information System (NHGIS, Manson et al. (2017)) to get the data on foreign-born population by country of origin. We were able to identify 65 countries of origin, or ”source countries,” in both sample periods; Appendix Table A.2 provides the full breakdown.

Table 1 shows how the share of immigrants has grown from 11.1 percent to 13.3 percent of the population. More than half of the immigrants come from Latin America and the Caribbean. Europeans make up less than 2 percent, and are declining in number. Asians constitute about 3 percent, and their shares are growing rapidly.

One of the questions we raise in this paper is whether the sorting behavior of natives and immigrants differ. We collect data on native migrants - natives who live outside the state of birth. Native migrants make up roughly 30 percent of the the native population. Also, they are older and more educated, compared to non-migrants. Statistics on immigrants and migrants are shown in the appendix Table A.1.

3.3 Amenity Data

We collect data on natural and artificial amenities of U.S. cities and 64 identifiable source countries. Natural amenities are geographic and climate time-invariant characteristics that are favorable to inhabitants. Our domestic data, taken from Albouy (2016), include minus heating degree days (cool summers), minus cooling degree days (warm winters), sunshine (measured in percent from possible), proximity to coast, average slope, and latitude.[7] For non-natural, or "artificial" domestic amenities, we use the percentage of population with college degrees, and violent crime rates from the Uniform Crime Report from the FBI (United States Department of Justice, 2015). We also consider the supply restrictions in housing markets from the Wharton Residential Land Use Regulatory Index by Gyourko et al. (2008).

The data on natural amenities of immigrants' source countries come from multiple sources. Heating and cooling degree days data are taken from the Climate Analysis Indicators Tool (CAIT) of the World Research Institute, reorganized by ChartsBin Statistics Collector Team (2011). Sunshine data on source countries must come from multiple sources due to the limited availability, and are not exactly like our U.S. data. Our main source is World Meteorological Organization (2010), accessible through the UN data, and the remaining missing data are obtained from World Weather and Climate Information (2016).[8] Country-level average slope measure is the population weighted Terrain Ruggedness Index (hundreds of meters of elevation difference for grip points

[7]The degree days represent the days and energy needed to heat (heating degree days) or cool a home (cooling degree days) to human comfort level (65F). For our subsequent analysis, we refer to minus heating degrees days as warm winters and minus cooling degree days as mild summers.

[8]In some countries multiple city data is available, in this case we use population weighted average.

30 arc-seconds, weighted by country population), calculated by Nunn and Puga (2012). For the coastal proximity (Gallup et al., 1998), we use percent population near ice-free coast or rivers. Data on natural amenities abroad are summarized in Table 1.

For artificial amenities of source countries, we first utilize international homicide rates from United Nations Office on Drugs and Crime (2018) to measure of country-level crime. We use the average homicide rates (number of deaths per 100,000 population) from 1990 to 2000 for the 2000 sample period, and from 2012 to 2016 for the 2014 sample period. If homicide rates data are entirely missing for any of the periods, we impute them using the homicide rates from the closest years. In addition, we take the country-level organized violence data from Uppsala Conflict Data Program (Allansson et al., 2017).[9]

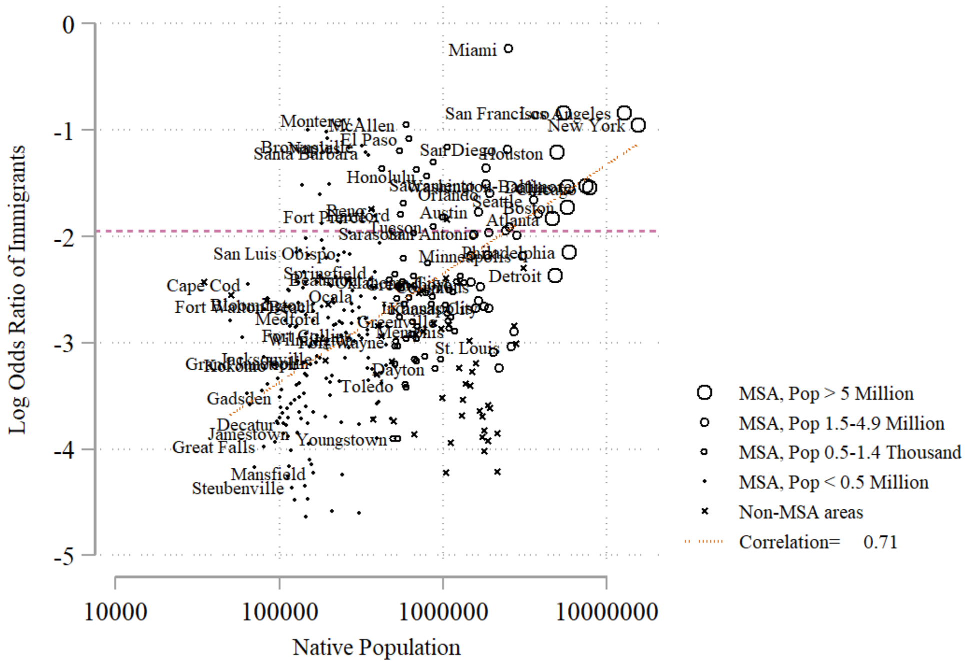
Finally, we include two distance variables. The first variable is the proximity of a country of immigrant origin to the United States, measured by the distance between the centroid of the country and the centroid of the US. This helps capture the mobility costs of immigration. The distance to the closest port of entry - the second distance variable - takes into account the fact that immigrants tend to settle near the place of arrival. We measure distances between the centroid of each MSAs and large ports of entry such as New York, California (San Francisco), Texas (Austin) Illinois (Chicago) and Florida (Miami) using US Census shapefiles, and take the smallest distance.

3.4 Measurement

We consider several measures of sorting. The most obvious one is a simple share of immigrants in MSA j. If N_j^I is foreign-born population and N_j^B is the native population, then the immigrant share is $s_j = N_j^I/(N_j^I + N_j^B)$. Alternatively, we use immigrant odds-ratio: $s_j/(1 - s_j) = N_j^I N_j^B$. This ratio directly compares the immigrant and native populations. Taking the logarithm provides the log odds: $\ln\left[s_j/(1 - s_j)\right] = \ln N_j^I - \ln N_j^B$. The log odds spans over the entire real line,

[9]Organized violence refers to events with more than 25 battle-related deaths, which include state-based conflicts (wars between two states), non-state conflicts (ethnic conflicts, drug wars), and one-sided violence (terrorism). Similarly to the crime measure, we use the average death rates (number of deaths per 100,000) from 1990 to 2000 for year 2000, and 2001-2014 for year 2014.

Figure 1: Immigrant Sorting to Large Cities (2014)



making it easier to model as a dependent variable then the share.

There are several ways to weigh the data. One is to weigh each city equally. This may lead to excess variance, as immigrant shares can be imprecise in small cities. Instead, we weigh regressions outcomes by the number of migrants, making them more representative of migrants' experiences.

4 Wage, Cost, and Location Differences of Immigrants and Natives

We document how wage, cost, and location choices differ for immigrants and natives in Figures 1 through 3, which is also summarized in Table 2. In Figure 1, we first show that immigrants disproportionately sort toward big cities with large population. The log odds of immigrants and native population are highly correlated, with correlation coefficient of 0.71. Large cities, such as New York and Los Angeles, may be more attractive to immigrants because those large cities generally have higher productivity that offers more employment opportunities to immigrants. Also, ethnic enclaves are usually located in big cities, where immigrants can easily form networks with members of their own ethnic groups.

Immigrants and natives pay similar housing costs on average. Figure 2(a) plots how the housing-cost index for immigrants and natives differ against the differences for natives. Analogously in (b), we plot expenditure shares of housing costs between immigrants against the shares for natives. The horizontal lines (mean of y axis) in (a) and (b) show immigrants and natives face similar costs on average, although immigrants spend a slightly larger share of their income. Across cities, immigrants face lower costs in more expensive, reflected in the negative slope in (a). Thus in more expensive cities, such as San Francisco and Honolulu, they pay less. Since this is probably not due to housing discrimination in favor of immigrants, it appears that immigrants live in cheaper neighborhoods within these metro areas. Figure (b) shows how this results in somewhat lower housing expenditures. Exact coefficients are shown in Table 2).

In Figures 2(c) and (d), we examine differences in (residualized) wages between and differences in the share of total income derived from wages. On average, immigrants have lower wages than natives, but derive a greater share of their income from wages. Examining the gradients it appears that immigrants are paid even less relative to natives, where native wages are high. Thus it appears that immigrants sacrifice more than natives in terms of wages to live in high-wage cities. These cities tend tend to be the largest.

While these differences are interesting, it should be kept in mind that the differences between immigrants and natives are still rather small relative to the overall differences between cities. As a result, immigrants and natives exhibit similar willingness-to-pay to be in the same metro areas, seen in Figure 3. While we will examine how these differences vary with amenities, the small differences underline the need to also examine sorting behavior.

Figure 2: Difference in Housing Costs and Wages between Natives and Immigrants (2014)

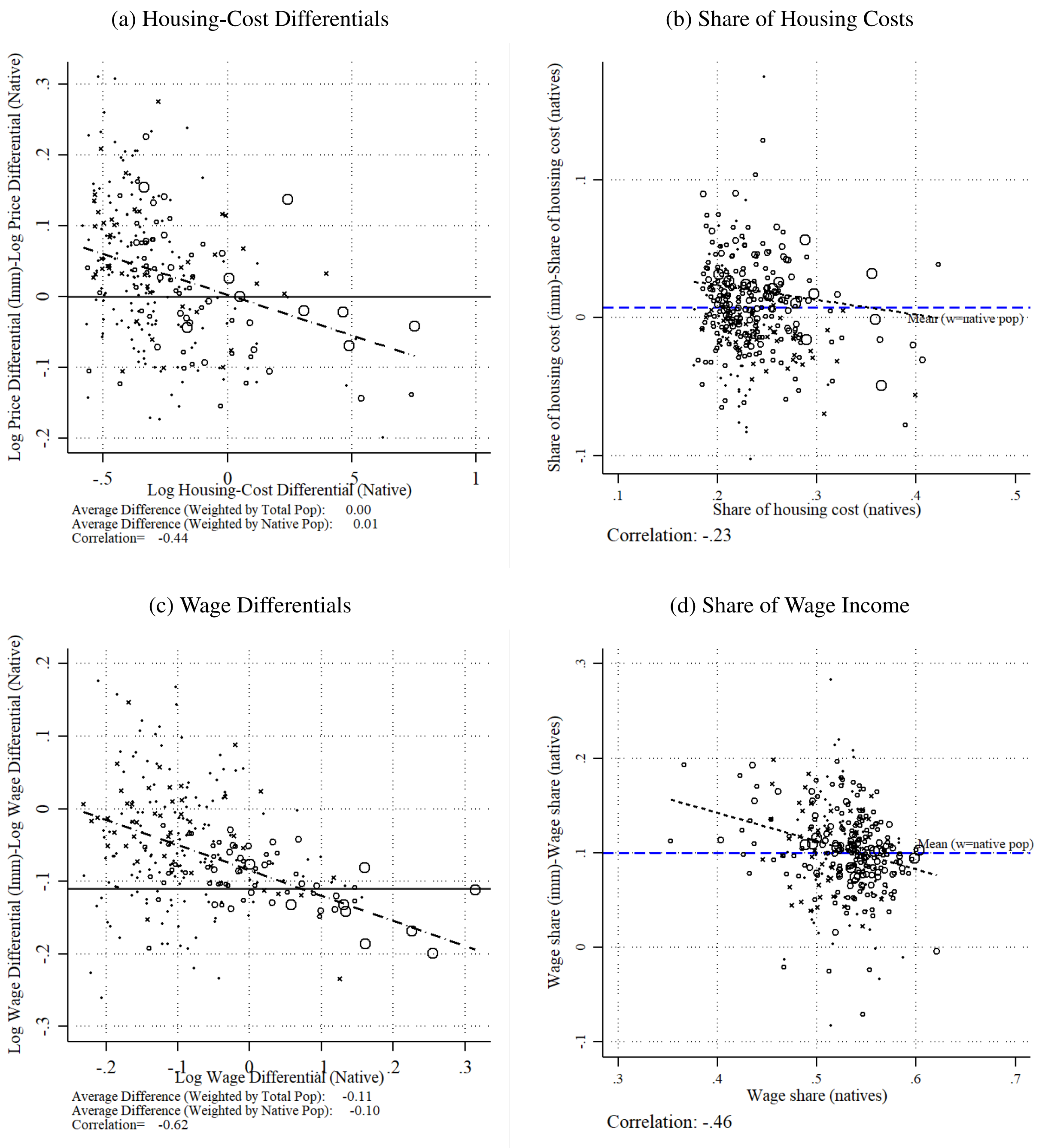
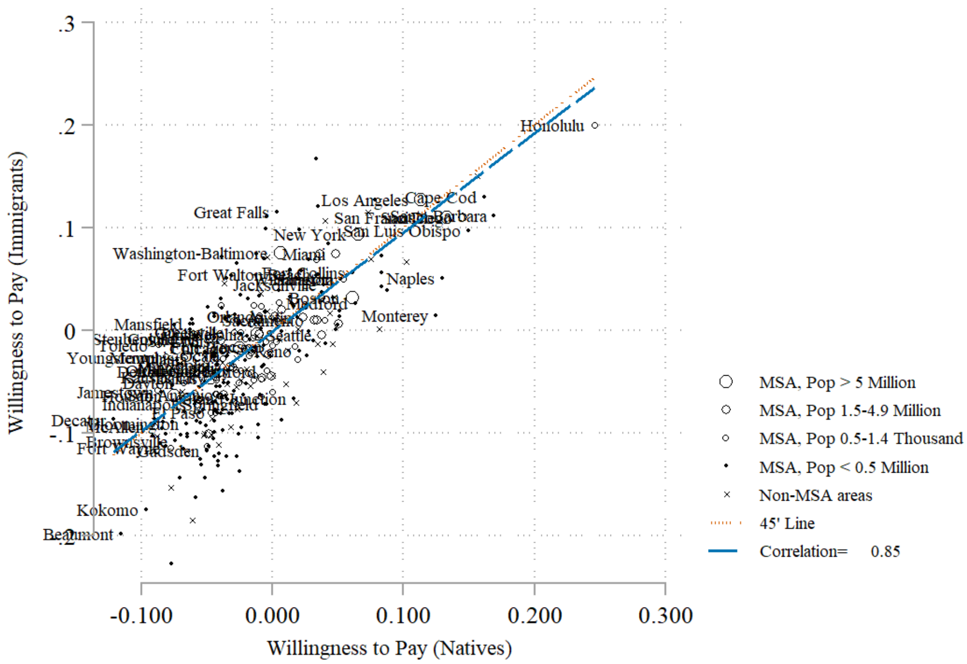


Table 2: Household Data Summary Statistics, Pooled 2000-2014

	Weighted by native pop.	Weighted by immigrant pop.	Correlation with the same measure for natives
Share of cross-state migrants			
Immigrant share			
Housing cost differential			
immigrants	0.05	0.2	.96
	(0.29)	(0.31)	
natives	0.03	0.21	
	(0.31)	(0.32)	
immigrants-natives	0.02	-0.02	-0.41
	(0.09)	(0.07)	
Wage differential			
immigrants	-0.07	-0.03	0.86
	(0.1)	(0.1)	
natives	0.05	0.12	
	(0.12)	(0.12)	
immigrants-natives	-0.12	-0.15	-0.59
	(0.06)	(0.06)	
Housing cost as a share of income			
immigrants	0.24	0.27	0.91
	(0.05)	(0.06)	
natives	0.23	0.26	
	(0.05)	(0.05)	
immigrants-natives	0.01	0.01	-0.16
	(0.02)	(0.02)	
Wage share of income (after tax)			
immigrants	0.64	0.64	0.78
	(0.04)	(0.03)	
natives	0.54	0.54	
	(0.03)	(0.04)	
immigrants-natives	0.10	0.10	-0.53
	(0.03)	(0.02)	
Willingness-to-pay			
immigrants	0	0.03	0.82
	(0.06)	(0.06)	
natives	0	0.03	
	(0.06)	(0.06)	

Notes: Standard errors in parentheses. We pool the 2000 and 2014 (2012-2016) data.

Figure 3: Willingness-to-Pay of Natives and Immigrants (2014)



5 Are Immigrants Pursuing Income, Affordability, or Amenities?

5.1 Sorting by prices and wages

To see whether wages or amenities are more important in determining immigrant ssorting behavior, we estimate the following ”horse-race regressions”:

$$y_j = \beta_p \hat{p}_j + \beta_w \hat{w}_j + \phi_t + \upsilon_j \quad (9)$$

$$= \beta_{WTP} W\hat{T}P_j + \beta_A \hat{A}_j + \phi_t + \upsilon_j \quad (10)$$

where the outcome variables are s_j, the share of immigrants in city j, and $\ln\left(\frac{s}{1-s}\right)_j$, the logarithm of odds of immigrants share. The first regression uses the price and (nominal) wage differentials as the explanatory variables.

Table 3: Immigrant Sorting by Prices, Wages and Urban Attributes

	Immigrant Share		Log Odds Ratio of Immigrant	
	(1)	(2)	(3)	(4)
Housing Cost	0.31***		1.98***	
	(0.07)		(0.44)	
Wage	-0.51*		-2.37	
	(0.27)		(1.65)	
Willingness to Pay		0.94***		5.74***
		(0.26)		(1.65)
Trade-Productivity		0.00		0.98
		(0.18)		(1.08)
R2	0.38	0.38	0.35	0.36
Year Fixed Effects	Y	Y	Y	Y

Notes: Robust standard errors are clustered by MSAs. Regressions weighted by metro immigrant population. Urban attributes are calculated using the methodology by Albouy (2016), restricting samples to immigrant population.

The explanatory variables in the second regression are "urban attributes," derived from these two differentials: willingness to pay (or quality of life under perfect mobility), $W\hat{T}P_j$, from equation (1), and trade productivity, $\hat{A}_j$. These urban attribute map directly from the wage and price differences based on (1) and a formula for trade-productivity. As explained in Albouy (2016), trade productivity is a weighted average of wages and housing costs (used to proxy for firm land costs). Using a weights based on cost shares (adjusted for housing production), the formula is $\hat{A}_j = 0.72\hat{w}_j + 0.11\hat{p}_j$.

The results in Table 3 imply that immigrants sort more towards places with high housing-costs than with high (nominal) wages. The coefficients on the cost-differential is positive and significant, whereas the coefficients on the wage differential is even negative, albeit marginally.

These results in columns 2 and 4, with willingness-to-pay and productivity indicate that immigrants are sorting to unaffordable places *real* wages are low. Meanwhile the relationship with productivity is indistinguisable zero. This runs contrary to the hypothesis that immigrants seek merely places that offer high wages. Without referring to quality-of-life amenities, these results would look mysterious and counter-intuitive.

To compare sorting behavior of immigrants with natives, we estimate the same regressions

Table 4: Cross-State Migrant Sorting by Prices, Wages and Urban Attributes

	Native Migrant Share		Log Odds Ratio of Native Migrants	
	(1)	(2)	(3)	(4)
Housing Cost	0.14*		0.65	
	(0.08)		(0.41)	
Wage	-0.60***		-2.89***	
	(0.21)		(1.05)	
Quality of Life		0.60**		2.84**
		(0.27)		(1.37)
Trade-Productivity		-0.41***		-2.03***
		(0.13)		(0.67)
R2	0.13	0.13	0.12	0.13
Year Fixed Effects	Y	Y	Y	Y

Notes: Robust standard errors are clustered by MSAs. Regressions weighted by metro native migrant population. Urban attributes are calculated using the methodology by Albouy (2016), restricting samples to native migrant population.

on native cross-state migrants in Table 4. The share of native migrants is less strongly towards housing costs differentials. Rather, they sort toward places with lower real wages *and* nominal wages. Relative to immigrants, native migrants sort less towards high willingness-to-pay areas, and away from productive areas.

Since immigrants exhibit large heterogeneity, we next examine the differences in the sorting pattern of immigrants by their country of origin. We split the sample of immigrants in nine groups by the country (region) of origin: Canada, Latin America, Western and Northern Europe, Eastern and Southern Europe, Oceania, Eastern and Southern Asia, South Central Asia, Middle East and Northern Africa, and Sub Saharan Africa[10]. Table 5 summarizes the estimation results of Equation (10) on those nine sub-samples.

The results suggest a certain level of heterogeneity across the regions. Immigrants from Latin America, who constitute a largest part in the US immigration population, pursue urban amenities and sort to unaffordable cities far more than immigrants from any other region. At the same time, Latin American immigrants is the only group that lives in areas with lower trade productivity. This is closely related to the result in Table A.3 that shows how immigrants from Latin America

[10]For the detailed composition of the regions, see Table A.2

Table 5: Country of Origin Differences in Immigrant Sorting (measured by log odds) by Urban Attributes

	Canada (1)	Latin America (2)	West/North Europe (3)	East/South Europe (4)	Oceania (5)	East/South Asia (6)	South Central Asia (7)	Middle East (8)	Sub Saharan Africa (9)
Quality of Life	1.32	7.15***	3.62***	-0.92	6.04	6.42***	0.85	3.34	-2.67
(Immigrants)	(1.14)	(2.48)	(0.82)	(2.48)	(4.52)	(1.55)	(0.93)	(2.60)	(2.20)
Trade-Productivity	0.46	-3.22*	1.41***	5.93***	2.17	3.52***	4.61***	2.14*	4.66***
(Immigrants)	(0.76)	(1.82)	(0.36)	(1.63)	(1.80)	(0.74)	(0.53)	(1.16)	(1.38)
R2	0.04	0.18	0.52	0.40	0.25	0.69	0.63	0.29	0.29
Average Immigrants (in thousands)	721	17,601	1,780	2,375	187	6,619	2,554	1,075	1,017
Year Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y	Y

Notes: Robust standard errors are clustered by MSAs. Regressions weighted by total immigrant population from each source country. Detailed composition of regions is in Table A.2. Urban attributes are calculated using the methodology by Albouy (2016), restricting sample to foreign born population.

generally sort into coastal cities with mild weathers and low percentage of population with college degree.

Immigrants from Western and Northern Europe generally seek higher quality of life (measured by willingness-to-pay), whereas those from Eastern and Southern Europe go after trade productivity. Population born in East and South Asia (including immigrants from China and South Korea) pursue both of the urban attributes. A good example is a high concentration of immigrants from East and South Asia in California - the state with low affordability and high trade productivity. Immigrants from South Central Asia (India, Pakistan and other countries), also seek high trade-productivity (resulted from the highly educated Indian population), but do not seem to sort in unaffordable places with favourable natural amenities (Table A.3). Similarly, African immigrants, whose educational attainment is high due to ”human capital flight” from their countries of origin, also live in relatively highly productive cities.

5.2 Willingness to Pay and Sorting for Particular Amenities

We illustrate the value of individual city amenities (Z_{1j},...,Z_{Aj}) to natives and immigrants. In particular, we regress the log odds ratio and willingness-to-pay measure on the city amenities, separately for natives and immigrants:

$$v_{jt} = \sum_{a} Z_{jat}\pi_{av} + \phi_t + \epsilon_{jvt} \tag{11}$$

where $v \in \{\ln(\frac{s^B}{1-s^B}), \ln(\frac{s^I}{1-s^I}), W\hat{T}P^B, W\hat{T}P^I\}$. The effects of a 1 unit increase in an amenity, π_{av}, are compared across nativity. Since these are cross-sectional regressions that are subject to omitted variables, simultaneity and multicollinearity, one should not interpret the coefficients as causal estimates.

Table 6 shows the value of artificial and natural amenities to natives and immigrants, estimated using Equation (11). Artificial amenities are related to local inhabitants, including metropolitan population and the share of adults with college degree. We also include the Wharton Residential

Table 6: Immigrant Share and Amenities

	Log Odds Ratio of Natives (1)	Log Odds Ratio of Immigrant (2)	Willingness -to-Pay (Natives) (3)	Willingness -to-Pay (Immigrants) (4)
Logarithm of Metro Population	-0.127***	0.287***	-0.003	0.015***
	(0.033)	(0.024)	(0.003)	(0.004)
Percent College Degree	4.457***	-1.172*	0.290***	0.323***
	(0.737)	(0.710)	(0.059)	(0.062)
Wharton Land Use Regulatory Index	0.010	0.166***	0.007**	0.003
	(0.044)	(0.055)	(0.003)	(0.005)
Warm Winters	0.102**	0.030	0.014***	-0.005
(base 65, minus heating degree days)	(0.046)	(0.058)	(0.004)	(0.006)
Mild Summer	-0.466***	-0.117	0.035***	0.028***
(base 65, minus cooling degree days)	(0.104)	(0.120)	(0.006)	(0.009)
Sunshine	0.249	1.981**	0.240***	0.151*
(out of percent possible)	(0.682)	(0.925)	(0.045)	(0.084)
Close to Coast	-0.005	0.010	0.002***	0.005***
(miles, minus square root of distance to coast)	(0.008)	(0.008)	(0.001)	(0.001)
Average Slope of Land	0.014	0.130***	0.007***	0.007***
(percent)	(0.023)	(0.029)	(0.002)	(0.002)
Latitude	0.078***	-0.011	0.000	-0.008***
(deegrees)	(0.023)	(0.034)	(0.002)	(0.002)
Close to Ports of Entry	-0.029***	0.030***	0.001	-0.000
(miles, minus square root of distance)	(0.005)	(0.005)	(0.001)	(0.001)
R2	0.52	0.80	0.72	0.72
Year Fixed Effects	Y	Y	Y	Y

Notes: Robust standard errors shown in parentheses. Regressions are weighted by the total metro population for column 3. For other columns, regressions weighted by metro immigrant population.

Land-Use Regulatory Index (WRLURI) of Gyourko et al. (2008), which controls for differences in unobserved housing productivity.

Natural amenities are climate and geography which do not change over time. They include mild weathers, sunshine, proximity to coast, slope of land and latitude. We additionally consider distance to ”ports of entry,” or gateway cities with large immigrant population: New York, San Francisco, Chicago, Miami and Austin. Columns 1 and 2 exhibit the relationship between the amenities and sorting (log odds), separately for natives (Column 1) and immigrants (Column 2). Columns 3 and 4 display how the individual amenities are inter-related with willingness-to-pay of natives (Column 3) and immigrants (Column 4).

There is a stark contrast in how natives and immigrants value the artificial amenities. The estimates in the first row show that natives sort into less-populated cities, whereas immigrants prefer more populated cities (as also shown in Figure 1. Moreover, immigrants have higher willingness to pay for large metropolitan population compared to natives. It is possible that the immigrants' preference to large cities is related to the fact that immigrant enclaves are located in the populated cities, where immigrants can easily form networks with their own ethnic groups.

The second row of Table 6 shows that natives sort into cities with higher share of college graduates, while immigrants exhibit the opposite pattern. The negative results on immigrants, however, are largely driven by Hispanic immigrants with lower educational attainment (Table A.3)[11]. On the other hand, both immigrants and natives seem to have a similar response in willingness-to-pay to education level: a 10-percentage point increase in the share of college-educated adults is associated with a 3 percentage point increase in willingness-to-pay. In addition, unlike natives, immigrants sort into more land-regulated places. Those regulated cities tend to have higher housing costs (Albouy and Ehrlich (2017)), and we have already shown that immigrants are apt to reside in cities with higher housing prices.

We also find significant differences between natives and immigrants in the valuation of natural amenities. From rows 4 and 5 of Table 6, it is evident that natives sort into places with more warm winters and less mild summer, even after controlling for latitude. Immigrants, on the other hand, they are less sensitive to mild or extreme weathers like natives. Instead, they tend to sort into sunny and hilly places. Yet, both natives and immigrants have positive relationships between their willingness-to-pay measures and natural amenities: mild winters or summer, sunshine, proximity to coasts and average slope.

Finally, we consider whether proximity to immigrants' "ports of entry" relates to sorting and the willingness-to-pay of natives and immigrants. As expected, immigrants liver closer to the gateway cities, while natives live away from them. Nonetheless, this proximity is not significantly associated with willingness-to-pay for either natives or immigrants.

[11] Other immigrants either sort into highly educated areas, or the coefficient for percent of people with college degree is insignificant

6 Amenities Lost, Found, and Recovered

6.1 Predicting Migration with Amenities in Source Countries

In this section, we determine the ”push factors” that make immigrants move from their home countries. These push factors may include unfavorable natural environment (such as extreme summers or winters), artificial disamenities, such as poverty and high crime rates. We build a simple empirical model (push regression) that predicts migration to the United States using the amenities in source countries:

$$\ln(N_t^k) = \sum_a \pi_a Z_{at}^k + \tau_t + \epsilon_t^k \tag{12}$$

where N_t^k is the logarithm of the number of total US immigrants from country k in time t, and Z_a^k are amenities of country k that can be considered as ”push factors” of emigration. Similar to the city-level amenities in the previous section, we consider artificial amenities (and disamenities) (country population, per capita GDP, organized violence and homicide rate) and natural amenities (warm winters, mild summers, proximity to coast, average slope and sunshine). Refer to Section 3.3 for the description and data source.

Table 7 depicts how the amenities in source countries affect the decision to immigrate to the United States. We estimate Equation (12) with the outcome variable at two levels. Column 1 shows the estimation result at the country level, where the outcome is the number of immigrants in the United States that varies by the source country only. In column 2, the outcome is the number of immigrants by countries in each MSA, therefore it varies at both country of origin and MSA level. The results across columns are analytically similar, with generally smaller standard errors for the MSA level analysis in column 2.

Not surprisingly, the size of a source country is positively associated with the number migrants: a 10 percent increase in population leads to a 5-6 percent increase in the number of immigrants in the United States. The relationship between the output in source countries and immigration

Table 7: Push Factors of Immigration at the Country of Origin Level

Dependent Variable: Logarithm of Immigrant Population	Country Level (1)	MSA Level (2)
Logarithm of Country Population	0.63***	0.49***
	(0.07)	(0.06)
Logarithm of Per Capita GDP	1.80**	2.29***
	(0.89)	(0.79)
Logarithm of Per Capita GDP2	-0.11**	-0.14***
	(0.05)	(0.05)
Organized Violence	0.02	0.02
(Number of Deaths Per 100,000)	(0.03)	(0.02)
Homicide Rate	-0.02**	-0.02***
(Number of Deaths Per 100,000)	(0.01)	(0.01)
Logarithm of Distance to USA	-1.59***	-1.63***
	(0.14)	(0.12)
Warm Winters	0.02	0.00
(Minus Heating Degree Days)	(0.07)	(0.05)
Mild Summer	-0.27	-0.22
(Minus Cooling Degree Days)	(0.18)	(0.15)
Close to Coast	0.74*	0.92***
(Percent Pop 100km from Coast)	(0.40)	(0.32)
Average Slope	0.46	0.22
(Population Weighted TRI)	(0.33)	(0.29)
Sunshine	-3.66**	-2.72*
(Percentage of Sunshine Time)	(1.79)	(1.44)
R2	0.89	0.85
Number of MSAs		276
Number of Countries	65	65
MSA Fixed Effects	N	Y
Year Fixed Effects	Y	Y

Notes: In column 1, the outcome varies on the country of immigrant origin level only. In column 2, the outcome varies on country of immigrant origin and MSA levels. Robust standard errors are clustered by source countries in column 1 and clustered by MSAs and source countries in column 2. Regressions weighted by total immigrant population from each source countries in column 1 and immigrant population from each source countries in each MSAs in column 2.

is non-linear with an inverse U-shape: the estimated coefficient of per capita GDP is positive, and the coefficient of the squared per capita GDP is negative. That is, low income households in developing countries have poverty constraints that deter migration, so higher GDP is related to higher migration rates. However, once per capita GDP reaches the threshold of 3,500 dollars, the relationship changes its direction: incentives to migrate decrease as income in the source countries increases.

Organized violence, including state-based, non-state based conflicts and one-side violence, does not seem to be related to the number of immigrants in a statistically significant way. The positive coefficient (estimated imprecisely though) means that higher rates of organized violence may create incentives to out-migrate. On the other hand, the coefficient for homicide rate is negative and statistically significant: a higher homicide rate in source countries leads to lower immigration. This demonstrates that migrants are not fleeing from insecurity of their home countries; rather, immigrants are coming from countries that are safer.

Distance between the source countries and the United States is a strong predictor of immigrant population in the US, where a 10 percent increase in distance is associated with a 16 percent decrease in the number of immigrants. In fact, many immigrants in the United States are from Latin America (especially Mexico), which is close to the US borders. For natural amenities, we find suggestive evidence of ”climate refugees,” where source countries with extreme summers and less sunshine duration tend to send out more migrants. In addition, coastal countries, which traditionally have had more interactions with other countries, are likely to have larger immigrant population in the United States.

6.2 Amenities Recovered

When immigrants make decisions about which city they want to live in, amenities in their home countries may affect this choice. For instance, they may choose to reside in cities that have similar amenities with their home countries. Alternatively, if immigrants suffered from certain unfavorable conditions in their home countries (such as severe winters), they may seek the opposite in the US

Table 8: Immigrant Shares, and Interactions between City and Country Amenities

Dependent Variables: Log Odds Ratio of Immigrant	(1)	(2)
Percent College Degree	9.12***	6.35***
	(2.34)	(2.11)
Violent Crimes	0.03***	0.03***
	(0.01)	(0.01)
Warm Winters	0.04**	0.04**
	(0.02)	(0.02)
Mild Summer	-0.05	-0.05
	(0.07)	(0.08)
Close to Coast	0.32**	0.33**
	(0.15)	(0.15)
Average Slope	0.15	0.15
	(0.13)	(0.13)
Sunshine	2.23	2.13
	(10.25)	(10.88)
R2	0.63	0.76
Number of Countries	65	65
MSA Fixed Effects	Y	Y
Year Fixed Effects	Y	Y
Country Amenities Controls	Y	
Country Fixed Effects		Y

Notes: Robust standard errors are clustered by MSAs and source countries. Weighted by the predicted number of immigrants from each source countries in MSAs.

(such as mild winters). To formally analyze this relationship, we interact amenities in the US cities and source countries and estimate the following regression:

$$\ln\left(\frac{s}{1-s}\right)^k_{jt} = \sum_a \gamma_a (Z^k_a \times Z_{ja}) + \phi_j + \phi^k + \phi_t + \epsilon_{ijt} \tag{13}$$

where Z^k_a and Z_{ja} are amenities from source country k and the US city j. We control for city fixed effects, ϕ_j, country fixed effects, ϕ^k, and time fixed effects, ϕ_t.

Since we have multiple dimensions (city, country and time) in our regression specification, there are multiple weights that can be utilized. Here, we use the "predicted" number of immigrants in city i from source country k in year t, $\hat{s_{jt}} = N_{jt} \times s_{kt}$. That is, we multiply the national share of immigrants from country k and the total population in city j. Therefore, we simultaneously put more weights on countries with higher number of immigrants and larger cities.

Table 8 reports the estimated γ_a, which are the interaction term coefficients of the US cities amenities and source countries amenities. Column 1 controls for individual country amenities, and column 2 controls for country fixed effects instead. Country fixed effects are going to absorb the time-invariant country characteristics (such as natural amenities). The results are analytically indistinguishable across the columns. Overall, immigrants seek urban amenities similar to those in their countries of origin. Again, the coefficients just represent correlations between amenities in source countries and destination cities, and should not be interpreted as causal relationships.

We first look at whether immigrants from countries with higher tertiary educational attainment also sort into cities with high share of college degree holders. The country-level data on secondary education attainment are limited, so we proxy this by using the US data on the share of adults with at least college degree for each immigrant group. The positive and statistically significant coefficients of the first row show that immigrants from high level of educational attainments sort into US cities with more college educated adults. Moreover, immigrants from countries with low homicide rates tend to live in cities with low violent crime rates.

We also discover the similar pattern in natural amenities. It is shown that immigrants from countries with warm winters are likely to reside in US cities with warm winters. However, this pattern does not show up for mild summers. In addition, immigrants from coastal countries go to coastal cities in the United States. Finally, we also find some positive coefficients for average slope and sunshine, but their standard errors are too large to detect any statistically significant effects. Summarizing the results, immigrants largely move to cities that resemble their amenities in their home countries. By no means we see immigrants are sorting towards the opposite.

7 Conclusion

We have examined the role of wages, housing prices and local non-market amenities in sorting behavior of immigrants in the United States. City choices of immigrants differ from natives, and depend on many factors, including their region of origin and home country amenities – both natural (like climate and hilliness) and artificial (like education level and violence rate).

Immigrants sort into large cities with relatively high housing costs and high level of non-market amenities. Those places also have relatively low real wage due to high cost of living, which makes them unaffordable. Natives, on the contrary, migrate to smaller cities with low nominal wages and lower productivity.

Immigrants move into sunny, hilly, highly populated areas with generally lower education level of workers. However, preferences to specific amenities vary a lot across countries of immigrant origin. For example, immigrants from Australia and Oceania go to smaller cities with warm winters, whereas people born in Eastern and Southern Europe move to larger metro areas with cold winters. Natives, however, sort to warmer and smaller areas with more college educated workers.

While some disamenities, such as the lack of sunshine, are factors that push foreign-born population to move to the U.S, we find that immigrants usually go to the cities that resemble their origin: they move from coastal countries coastal areas, and from highly educated countries to highly educated cities. We did not find evidence that immigrants seek the opposite amenities.

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Appendix - For Online Publication

Table A.1: Native Migrants: Summary Statistics

	Cross-State Migrant		Lives in Birth state	
	2000	2014	2000	2014
Share in Native population	0.329	0.318	0.671	0.682
Share Male	0.489	0.488	0.491	0.495
Average Age	41.21	44.72	32.16	33.44
Share with Some College (25 or older)	0.494	0.560	0.403	0.501

Notes: Cross-state migrants are natives who live outside the birth state. Some college is defined as more than 12 years of schooling.

Table A.2: Composition of Regions

Region	Countries
Latin America	Argentina
	Bolivia
	Brazil
	Chile
	Columbia
	Ecuador
	Guyana
	Peru
	Venezuela
	Barbados
	Cuba
	Dominican Republic
	Jamaica
	Haiti
	Trinidad and Tobago
	Mexico
Canada	Canada
Western and Northern Europe	United Kingdom
	Ireland
	Sweden
	Austria
	France
	Germany
	Netherlands
Southern and Eastern Europe	Greece
	Italy
	Portugal
	Czech Republic
	Hungary
	Poland
	Romania
	Belarus
	Russia
	Ukraine
	Bosnia and Herzegovina
	Serbia
Oceania	Australia and Oceania
South Central Asia	Afghanistan
	Bangladesh
	India
	Iran
	Pakistan

Table A.2: Composition of Regions - Continued

Region	Countries
Eastern and Southern Asia	China
	Japan
	South Korea
	Cambodia
	Indonesia
	Laos
	Malaysia
	Philippines
	Thailand
	Vietnam
Middle East and Northern Africa	Iraq
	Israel
	Jordan
	Lebanon
	Syria
	Turkey
	Armenia
	Egypt
Sub-Saharan Africa	Ethiopia
	South Africa
	Ghana
	Nigeria
	Sierra Leone

Table A.3: Amenities and Log Odds Ratio of Immigrants by Subregions

	Canada	Latin America	West/North Europe	East/South Europe	Oceania	East/South Asia	South Central Asia	Middle East	Sub Saharan Africa
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Logarithm of Metro Population	-0.08	0.34***	0.02	0.22***	-0.12*	0.18***	0.26***	0.31***	0.16***
	(0.06)	(0.05)	(0.03)	(0.05)	(0.07)	(0.02)	(0.05)	(0.04)	(0.06)
Percent College Degree	0.49	-3.91***	2.92***	0.39	4.14***	3.46***	4.22***	-2.43	7.98***
	(1.29)	(0.85)	(0.52)	(1.45)	(1.00)	(0.45)	(0.76)	(1.99)	(1.90)
Land Use Regulatory Index	0.25***	0.11	0.05	-0.00	-0.11	-0.07*	-0.11*	0.10	0.14
	(0.07)	(0.07)	(0.03)	(0.08)	(0.08)	(0.04)	(0.06)	(0.09)	(0.12)
Warm Winters (Minus Heating Days)	-0.00	-0.26***	-0.04	-0.22***	0.53***	0.35***	0.19**	-0.04	0.02
	(0.06)	(0.09)	(0.04)	(0.08)	(0.09)	(0.04)	(0.08)	(0.06)	(0.08)
Mild Summer (Minus Cooling Days)	-0.48***	-0.28**	-0.16***	-0.39***	0.25	0.32**	0.09	0.33***	-0.29
	(0.07)	(0.14)	(0.06)	(0.10)	(0.21)	(0.13)	(0.12)	(0.11)	(0.19)
Sunshine (out of percent possible)	0.74	2.42**	1.22***	2.59**	5.07***	3.49***	1.44*	1.50*	-1.53
	(0.52)	(1.13)	(0.40)	(1.13)	(1.30)	(0.81)	(0.83)	(0.78)	(1.20)
Close to Coast	0.19***	0.21***	0.21***	0.35***	-0.07	0.09***	0.07	0.10**	-0.13**
	(0.04)	(0.05)	(0.02)	(0.05)	(0.06)	(0.02)	(0.04)	(0.05)	(0.06)
Average Slope of Land	0.12***	0.15***	0.08***	0.00	0.10	0.02	-0.08	-0.11*	-0.12**
	(0.01)	(0.05)	(0.02)	(0.04)	(0.08)	(0.03)	(0.05)	(0.06)	(0.06)
Latitude	0.07***	-0.12**	0.00	0.08**	0.22***	0.11***	0.07**	-0.03	0.06
	(0.02)	(0.05)	(0.02)	(0.04)	(0.04)	(0.03)	(0.04)	(0.03)	(0.04)
R2	0.50	0.69	0.70	0.75	0.68	0.89	0.75	0.59	0.66
Average Immigrants (in thousands)	721	17,601	1,780	2,375	187	6,619	2,554	1,075	1,017
Year Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y	Y

Notes: Robust standard errors are clustered by MSAs. Regressions weighted by total immigrant population from each source countries. For the detailed list of countries for each subregions, refer to Table AX. Urban attributes are calculated using the methodology by Albouy (2016), restricting samples to foreign born population.

Table A.4: Unweighted Push Regression

Dependent Variable: Logarithm of Immigrant Population	Country Level (1)	MSA Level (2)
Logarithm of Country Population	0.47***	0.52***
	(0.08)	(0.07)
Logarithm of Per Capita GDP	0.46	-0.64
	(0.75)	(0.77)
Logarithm of Per Capita GDP2	-0.03	0.04
	(0.04)	(0.04)
Organized Violence	-0.02	-0.02
(Number of Deaths Per 100,000)	(0.02)	(0.02)
Homicide Rate	0.00	-0.01
(Number of Deaths Per 100,000)	(0.01)	(0.01)
Logarithm of Distance to USA	-1.45***	-0.98***
	(0.24)	(0.30)
Warm Winters	-0.03	-0.06
(Minus Heating Degree Days)	(0.07)	(0.07)
Mild Summer	-0.11	-0.27*
(Minus Cooling Degree Days)	(0.15)	(0.16)
Close to Coast	0.69	0.23
(Percent Pop 100km from Coast)	(0.42)	(0.43)
Average Slope	0.33	0.42*
(Population Weighted TRI)	(0.25)	(0.23)
Sunshine	-2.17	-3.31**
(Percentage of Sunshine Time)	(1.78)	(1.49)
R2	0.52	0.65
Number of MSAs		276
Number of Countries	65	65
MSA Fixed Effects	N	Y
Year Fixed Effects	Y	Y

Notes: Robust standard errors are clustered by source countries in column 1 and clustered by MSAs and source countries in columns 3. Regressions weighted by total immigrant population from each source countries in columns 1 and immigrant population from each source countries in each MSAs in columns 3.

A Log-Linearized Conditions for Two Worker Types

A.1 Mobility conditions

We follow the same notation as in Albouy and Stuart (2015), henceforth AS For simplicity, assume there are two types of fully mobile households, referred to as a and b. The most interesting case is when some members of each type live in every city. Define $\tilde{s}_{wa} = (1-\tau_a)s_{wa}$. We include a term ψ_{aa} to parameterize preference heterogeneity, and γ_{aa} for endogenous amenities (right now they are negative like in AS). We also include the terms ψ_a and ψ_b to parameterize the relationship between 10-year changes in overall density and QOL, and let $d\hat{N}$ denote the 10-year change in $\hat{N}$ (where $\hat{N}$ is defined below).

$$s_{ya}\hat{p} - \tilde{s}_{wa}\hat{w}_a = \hat{Q}_a - (\psi_{aa}+\gamma_{aa})\hat{N}_a - (\psi_{ab}+\gamma_{ab})\hat{N}_b - \psi_a d\hat{N}$$
$$s_{yb}\hat{p} - \tilde{s}_{wb}\hat{w}_b = \hat{Q}_b - (\psi_{bb}+\gamma_{bb})\hat{N}_b - (\psi_{ba}+\gamma_{ba})\hat{N}_a - \psi_b d\hat{N}$$

Clearly we may have an underidentification problem here: congestion and heterogeneity can be confused! We generalize this more with ψ_{aa}, ψ_{ab} and γ_{aa}, γ_{ab}, etc. These cross elasticities could get at disliking dissimilar people more (or less) or difficulties in separating families. We generally think $\psi_{aa}, \psi_{bb} > 0$, but $\psi_{ab}, \psi_{ba} < 0$. We expect $\psi_a, \psi_b > 0$; growing cities have higher QOL, all else equal.

We use population weights instead of income weights for this section. Let the share of total population which is of type a be $\nu_a = N_a/(N_a+N_b)$, with the other share $\nu_b = 1-\nu_a$. The math in the mobility section works identically with population weights. Let the share of total income accruing to type a worker be $\mu_a = N_a m_a/(N_a m_a + N_b m_b)$, with the other share $\mu_b = 1-\mu_a$. Define the following population-weighted averages

$$s_y \equiv \nu_a s_{ya} + \nu_b s_{yb},\ s_x \equiv 1 - s_y$$
$$\hat{Q} \equiv \nu_a\hat{Q}_a + \nu_b\hat{Q}_b,\ \tilde{s}_w \equiv \nu_a\tilde{s}_{wa} + \nu_b\tilde{s}_{wb},\ \hat{w} \equiv \nu_a\frac{\tilde{s}_{wa}}{\tilde{s}_w}\hat{w}_a + \nu_b\frac{\tilde{s}_{wb}}{\tilde{s}_w}\hat{w}_b$$

We may reformulate in aggregates and differences. We measure total population as the population weighted average,

$$\hat{N} = \nu_a\hat{N}_a + \nu_b\hat{N}_b, \Delta\hat{N} \equiv \hat{N}_a - \hat{N}_b$$

Quality of life is

$$\begin{aligned}\hat{Q} &\equiv \nu_a\hat{Q}_a + \nu_b\hat{Q}_b, \Delta\hat{Q} \equiv \hat{Q}_a - \hat{Q}_b \\ &\Rightarrow \hat{Q}_a = \hat{Q} + \nu_b\Delta\hat{Q}, \hat{Q}_b = \hat{Q} - \nu_a\Delta\hat{Q}\end{aligned}$$

Ignoring endogenous amenities/congestion (they map identically), the difference in QOL is

$$\hat{Q}_a - \hat{Q}_b = (s_{ya}-s_{yb})\hat{p} - (\tilde{s}_{wa}\hat{w}_a - \tilde{s}_{wb}\hat{w}_b) + (\psi_{aa}-\psi_{ba})\left(\hat{N}_a - \hat{N}_b\right) + (\psi_{aa}-\psi_{bb})\hat{N}_b$$
$$+ (\psi_{ab}-\psi_{ba})\hat{N}_b + (\psi_a - \psi_b)d\hat{N}$$

The term $(\psi_{aa}-\psi_{ba})\left(\hat{N}_a - \hat{N}_b\right)$ captures relative utility losses from heterogeneity and separation.

$(\psi_{aa} - \psi_{bb})\,\hat{N}_b$ captures differences in heterogenity (e.g. moving costs). $(\psi_{ab} - \psi_{ba})\hat{N}_a$, is what I would call from "differing affections)

Adding the two quality of life terms yields

$$\hat{Q} = s_y\hat{p} - \tilde{s}_w\hat{w} + (\psi_{aa} + \psi_{bb})\hat{N} + \hat{N}_a(\mu_b\psi_{ba} - \mu_a\psi_{bb}) + \hat{N}_b(\mu_a\psi_{ab} - \mu_b\psi_{aa}) + (\nu_a\psi_a + \nu_b\psi_b)d\hat{N}$$

A useful simplification to nullify any level effects is to impose

$$\psi_{aa} = \psi, \psi_{ab} = -\psi, \psi_{bb} = \frac{\nu_a}{\nu_b}\psi, \psi_{ba} = -\frac{\nu_a}{\nu_b}\psi$$

See in the parameterizaiton secton for more.

B Parameterization

B.1 Base values

Here are some guesses based mainly off earlier work. Honestly, we don't have great information on these. Type a is college labor, type b is non-college.

$$\begin{aligned} \mu_b &= 0.55 \\ \nu_b &= 0.698 \\ s_{ya} &= 0.324, s_{yb} = 0.385 \\ \tilde{s}_{wa} &= 0.460, \tilde{s}_{wb} = 0.577 \\ \psi &= 0.05, \psi_\Delta < 0? \\ \gamma &= 0.02, \gamma_\Delta < 0? \end{aligned}$$

We can also choose to have relative labor proportions equal in both X and Y sectors to keep that from affecting results until we have more information on the split. To do this, we impose that

$$\theta_a^* = \mu_a\frac{s_{wa}}{s_w}, \theta_b^* = \mu_a\frac{s_{wb}}{s_w}$$

Then using base values of θ_N, ϕ_N from before, impose

$$\theta_a = \theta_a^*\theta_N, \theta_b = \theta_b^*\theta_N, \phi_a = \theta_a^*\phi_N, \phi_b = \theta_b^*\phi_N,$$

B.2 Simplifying assumptions

We now derive a convenient parametrization for cross-type QOL effects. We assume that $\psi_a = \psi_b \equiv \psi$ to simply the term $d\hat{N}$. If we assume that

$$\begin{aligned} \nu_a\psi_{aa} &= -\nu_b\psi_{ba} \\ \nu_a\psi_{ab} &= -\nu_b\psi_{bb} \end{aligned}$$

then we have

$$\hat{Q} = s_y \hat{p} - \tilde{s}_w \hat{w} + \psi d\hat{N}$$
$$\Delta\hat{Q} = (s_{ya} - s_{yb})\,\hat{p} - (\tilde{s}_{wa}\hat{w}_a - \tilde{s}_{wb}\hat{w}_b) - \frac{\psi_{ba}}{\nu_a}\hat{N}_a + \frac{\psi_{ab}}{\nu_b}\hat{N}_b$$

Further assuming that

$$\nu_a \psi_{ab} = \nu_b \psi_{ba}$$

(which implies that $\nu_a \psi_{aa} = \nu_b \psi_{bb}$, given the previous assumptions) yields

$$\hat{Q}_a - \hat{Q}_b - = (s_{ya} - s_{yb})\,\hat{p} - (\tilde{s}_{wa}\hat{w}_a - \tilde{s}_{wb}\hat{w}_b) + \frac{\psi_{aa}}{\nu_b}(\hat{N}_a - \hat{N}_b) \tag{A.2}$$

The above restrictions on ψ imply

$$\psi_{ab} = -\psi_{aa}$$
$$\psi_{bb} = \frac{\nu_a}{\nu_b}\psi_{aa}$$
$$\psi_{ba} = -\frac{\nu_a}{\nu_b}\psi_{aa} = -\psi_{bb}$$

so we only need to choose ψ_{aa}.

Plugging this into the original equations yields

$$\hat{Q}_a = s_{ya}\hat{p} - \tilde{s}_{wa}\hat{w}_a + \psi_{aa}(\hat{N}_a - \hat{N}_b) + \psi d\hat{N}$$
$$\hat{Q}_b = s_{yb}\hat{p} - \tilde{s}_{wb}\hat{w}_b + \psi_{bb}(\hat{N}_b - \hat{N}_a) + \psi d\hat{N}$$

We do not impose this convenient parametrization in the matrix below.

For the parameters governing the endogenous response of QOL to density, we consider three parametrizations:

- Feedback parametrization 0. No feedback: all $\psi = 0$
- Feedback parametrization 1: $\psi_{aa} = .07, \psi_{bb} = .03, \psi_{ab} = -.07, \psi_{ba} = -.03, \psi_a = \psi_b = .05$. This reflects the convenient parametrization derived above.
- Feedback parametrization 2: $\psi_{aa} = .07, \psi_{bb} = .03, \psi_{ab} = -.07, \psi_{ba} = .01, \psi_a = \psi_b = .1$. Here, college types improve city amenities slightly for high school types. We probably want to increase ψ_{aa} here or not use this parametrization. As is, San Francisco is equally attractive for college and high school types in 2000. Graphs from this parametrization are not shown below.