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Abstract

Previous research on migration has focused more on the effect of wage differences between the destination and the origin on migration and less on how non-pecuniary attachments workers have to their current location may affect their migration decisions. In this paper, we examine how the presence of a strong social network and desirable location amenities in the current location may deter individual migration across U.S. metropolitan areas. Our empirical results show that, controlling for wage and housing cost differences between metropolitan areas, workers with strong attachments to their current location are significantly less likely to move. Interestingly, the effects of a strong social network and desirable location amenities on individual migration decisions are more important than the effect of wage or housing cost differentials between the destination and the origin.

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1. Introduction

The human capital theory of migration suggests that a worker chooses to move to another location only if the additional lifetime benefits from moving exceed individual mobility costs. According to this general framework, holding individual mobility costs constant, workers with higher returns from migration (i.e. higher wages in the destination) are more likely to move than their peers. This idea has found substantial support by numerous research papers (Mincer, 1978; Robinson and Tomes, 1982; Keith and McWilliams, 1999; Yankow, 1999; Dahl, 2002).

Previous research on migration has focused more on the effect of wage differentials between the destination and the origin on migration and less on how non-pecuniary attachments workers have to their current location may affect their migration decisions. For example, workers who enjoy an expanded social network in their current location may be less likely to migrate than others. It may also be true that, ceteris paribus, individuals in locations with desirable amenities are less willing to migrate than those in undesirable locations.

The negative effect of strong local ties on individual migration is hardly a new concept. Sjaastad (1962) argues that individual migration decisions are greatly affected by the strength of the social network individuals enjoy in their current location and by other location characteristics. Speare et al (1989) present evidence that individuals with friends and relatives in their current location, are less likely to move than their counterparts, while Michaelides (2009) shows that locally born workers or married workers with locally born spouses are less mobile than their peers. There is also strong evidence that workers in desirable locations are significantly less likely to migrate than their peers (Fields, 1979, Cushing, 1987, Clark and Hunter, 1996; Rupasingha and Goetz, 2004; Huffman and Feridhanusetyawan, 2007; Chen and

Rosenthal, 2008). Although previous research recognizes that a strong social network and desirable location amenities in the origin may be significant migration deterrents, there is limited empirical work that examines their effect on migration, controlling for wage and housing cost differences between the origin and the destination.

In this paper, we examine the degree to which a strong social network and desirable location amenities may influence individual migration between metropolitan areas. To do so, we use the 2000 U.S. Decennial Census, a dataset that has been widely used by previous research to examine the determinants of migration. This data enables us to identify which workers have an expanded social network in their current location, namely locally born workers and married workers whose spouse is locally born. In addition, this data identifies the metropolitan area of residence of respondents, enabling us to link it to other data sources that contain measures of location amenities. Using this information, we estimate a structural migration model which produces the effect of local ties on migration decisions, controlling for wage and housing cost differences between the destination and the origin. Our results show that workers with a strong social network (i.e. locally born workers and married workers whose spouse is locally born) and workers in metropolitan areas with desirable amenities are significantly less likely to move than their counterparts. In fact, our empirical results suggest that these non-pecuniary attachments have a much more significant effect on individual migration decisions than do wage and housing cost differences.

2. Conceptual Framework

Workers may face two types of mobility costs, pecuniary and non-pecuniary. Pecuniary costs are associated with the actual move and do not generally persist after the move to another location is completed. Non-pecuniary (or psychic) costs, in contrast, may persist even after the move is completed, leading to lower utility levels over the lifetime of the worker. The best example, perhaps, of a persistent non-monetary mobility cost is the loss of the social network the worker enjoys in his current location. Workers with an expanded social network in their current location (e.g. locally born workers or married workers whose spouse was locally born) would be less willing than their counterparts to move to another location, controlling for the associate benefits of migration. Another example of non-pecuniary mobility costs is the loss of desirable amenities workers enjoy in their current location.

To test if ties to the current location are important deterrents of migration, we employ the classic migration decision framework, in which individual migration decisions depend on wage and housing cost differences between the origin and the best alternative destination and on individual mobility costs.[1] In this context, worker wages in the origin and in the destination indicate the wages the worker would receive over his lifetime in each location. Similarly, the average housing cost in the origin and the destination indicate the housing cost the worker would pay in each location over his lifetime. Mobility costs include the non-pecuniary costs a worker suffers over his lifetime if he decides to move; in this case, the loss of the social network and the amenities he enjoys in his current location.

Let wages for worker *i* in location *K* be W_i^K and the wages of the same worker if he moved to the best alternative destination be $\tilde{W}_i^K$. Similarly, let H^K and $\tilde{H}^K$ be the average housing cost in the current and in the alternative location, respectively. The individual mobility costs for worker *i* are denoted by C_i, which includes the monetary value of the loss of the social network and of

[1] See Borjas (1999) for a detailed discussion of the migration decision framework.

the amenities the worker enjoys in his current location. Under these assumptions, the migration probability for worker *i* is:

$$M_i^K = \Pr(\tilde{W}_i^K - W_i^K - \tilde{H}^K - H^K - C_i > 0) \quad (1)$$

In words, the probability of moving from location *K* for worker *i* (M_i^K) increases in the wage differential between the destination and the origin ($\tilde{W}_i^K - W_i^K$) while it declines in the housing cost differential between the destination and the origin ($\tilde{H}^K - H^K$) and in the worker's individual mobility costs (C_i). Worker *i* will choose to move only if the benefits of moving (i.e. wage differential minus housing cost differential) exceed his mobility costs. To estimate the effect of wages, housing costs, and mobility costs on the probability of moving, we need to construct appropriate measures of each and estimate the structural model implied by Equation 1.

A standard issue when estimating migration decision models is that origin wages (W_i^K) are observed for workers who stay in their current location (non-movers), but are unavailable for workers who moved out of the location (movers). By the same token, there is no direct measure of best alternative destination wages ($\tilde{W}_i^K$) for non-movers. A straightforward way to construct origin and destination wages for non-movers and movers is to estimate two separate wage equations, one for each group. Using the predictions from the two wage equations, we can construct the predicted origin and destination wages for all workers in the sample. The problem with this approach, however, is that it ignores the *migration selection bias*: if movers earn higher wages than non-movers in both the origin and the destination, the predicted origin wages would underestimate the origin wages for movers.[2] Similarly, the predicted destination wages would overestimate the destination wages for non-movers.

To mitigate the potential selection bias, we employ the *Heckman selection model*. This model enables the construction of consistent estimates of worker wages in the origin and the destination, by controlling for the potential migration selection bias in each wage equation (Heckman, 1979).[3] Using this model, we can construct a *selection term*, also known as *Mills Inverse Ratio*, one for non-movers and one for movers, which is included as a control in each wage equation. The inclusion of the selection term in the wage equation eliminates the effect of the migration selection bias, enabling the production of consistent estimates of predicted wages.

There are three steps we need to follow to implement this model. The first step is to estimate the *reduced form* migration model using probit. Let the wage equation for non-movers be:

$$W_i^K = X_i \beta^K + E(u_i^K \mid M_i^K < 0) \tag{2}$$

Equation 2 presents wages for non-movers as a function of observable characteristics (X_i) and the returns on those characteristics in location K (β^K); since origin wages are only available for non-movers, the error term is conditional on the decision not to migrate. Similarly, let the wage equation for movers be:

$$\tilde{W}_i^K = X_i \tilde{\beta}^K + E(\tilde{u}_i^K \mid M_i^K \geq 0) \tag{3}$$

Equation 3 indicates that wages for movers are a function of observable characteristics (X_i) and of their returns in the best alternative destination ($\tilde{\beta}^K$). The error term is conditional on the decision to move. Substituting Equations 2 and 3 into Equation 1, we produce the reduced form

[2] There is considerable evidence that mobile workers are generally more skilled than their peers, thus earn higher wages both in the origin and the destination; see for example, Keith and McWilliams (1999) and Dahl (2002).
[3] The Heckman model has been widely used by prior research to account for the selection bias in estimating wages caused by individual migration decisions (e.g. Robinson and Tomes, 1982; Borjas, 1987**).**

migration model, which is a function of individual characteristics, origin and destination housing costs, and mobility costs:

$$M_i^K = F(X_i, \tilde{H}^K - H^K, C_i) = F(Z) \qquad (4)$$

Assuming that *F(.)* is the normal cumulative distribution function, we can estimate Equation 4 using a probit model. The second step is to use the results of the probit model to obtain the predicted values of the normal density and the cumulative distribution functions, *f(.)* and *F(.)*, respectively. Using these predictions, we can construct the migration selection terms as follows:

Non-Movers: $\lambda_{NM} = \frac{f(Z)}{1-F(Z)} > 0$, Movers: $\lambda_M = -\frac{f(Z)}{F(Z)} < 0$ (5)

The final step is to estimate wage equations 2 and 3 by including the respective selection term as a control variable. By doing so, we control for the selection bias caused by the migration decision, enabling us to produce reliable predicted origin and destination wages for both movers and non-movers. If there is a positive migration selection bias (that is, if movers earn more in the destination than what non-movers would earn had they moved), then the coefficient of λ_M (which is negative by construction) in the wage equation will be negative and significant.

Using the predicted origin and destination wages, we can then construct the predicted wage differential between the destination and the origin for each worker in the data. To estimate the migration structural model presented in Equation 1, we also need an appropriate measure of housing costs differences between the destination and the origin, indicators of an expanded social network, and measures of local amenities. In the following section, we describe in detail how we construct these measures for our analysis.

3. Data Description

We use the 5% Public Use Micro Sample of the 2000 Decennial Census (2000 PUMS), which contains rich information on respondents' employment and demographic characteristics. In addition, the data reports the metropolitan statistical area (MSA) of residence of respondents in 2000 and 1995, enabling us to identify which respondents moved between MSAs in that period. The availability of the above information is the reason why the Decennial Censuses have been widely used by researchers to examine the determinants of migration (Rabianski, 1971; Navratil and James, 1982; Dahl, 1990; Longino, 1990; Chen and Rosenthal, 2008).

We constrain the sample to full-time employed males, ages 35 to 65, who lived in an MSA in 1995 – see Table 1 for a sample description.[4] In all, workers in the sample were living in 127 distinct MSAs in 1995. This data is well suited for the purpose of this paper since it enables us to construct individual indicators of a strong local social network, as well as measures of average housing costs, by MSA. Moreover, we can identify each of the MSAs in the data, so we can link this data to other data sources which describe location amenities.

3.1. Social Network Indicators

Using the PUMS 2000, we construct two indicators of a strong social network in the current location: (a) worker lives in his state of birth in 1995 (*State of Birth*) and (b) married worker lives in his spouse's state of birth in 1995 (*Spouse State of Birth*). The idea is that individuals

[4] The disadvantage of the data is that worker demographic and employment characteristics are only reported for 2000 and not for the period between 1995 and 1999. This issue is shared by previous research which used the U.S. Censuses as well as by research which used the Canadian Census (e.g. Robinson and Tomes, 1977) to estimate migration models. Although race, gender, ethnicity, and nationality do not change, other characteristics, like education and marital status may change over time. To increase the probability that these characteristics as of 2000 did not change between 1995 and 1999, we constrain the sample to individuals that are 35-65 years old; older workers are more likely to have the same industry, occupation, education, and marital status as in prior years.

who live in their own or their spouse's state of birth enjoy an expanded social network and are therefore less likely to move than others.[5]

To further support this point, we compare the migration propensities between all workers in the sample and those who lived in their state of birth or their spouse's state of birth. Table 2 shows that, in 1995, almost 41% of workers in the sample were living in their state of birth and more than 25% were living in their spouse's state of birth. The same table shows that almost 23% of the 241,821 individuals in the sample moved between MSAs from 1995 to 2000.[6] Migration propensity was substantially lower for workers who lived in their state of birth (12.2%) or their spouse's state of birth (13.6%), providing support to the idea that these workers may be less likely to migrate because of their attachment to their current location. So, *State of Birth* and *Spouse State of Birth* are reasonable indicators of attachment to the current location and will be used in our analysis to capture the effect of an expanded social network on migration.

3.2. Measure of Housing Costs, by MSA

The 2000 PUMS reports the value of the housing unit in which the respondent was living at the time of the survey. Using the housing values reported by *all* employed respondents who lived in an MSA in 2000, we calculate the average housing value for each MSA in the data. Table 3 reports the average housing value, by MSA, for select MSAs. The average housing value in an

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[5] *State of Birth* and *Spouse State of Birth* must satisfy two conditions to be used as proxies for local ties. First, they need to be highly correlated with the variable of interest (local ties). Second, their difference with the variable of interest must be uncorrelated with the error term in the regression. Although the first condition is met, there may be some concerns about the second condition. In particular, *State of Birth* may be positively correlated with unobserved skills that limit mobility (e.g., lack of opportunity). This argument was refuted by previous work, which showed that *State of Birth* is uncorrelated with worker skills, thus uncorrelated with the error term (Speare et al., 1982; Michaelides, 2009). In the empirical results, we note some sensitivity analysis that provides further evidence that *State of Birth* is uncorrelated with unobserved skills.

[6] An individual may also move from a MSA to a rural area that is not within the boundaries of a MSA. According to the US Census Bureau ("Migration and Geographic Mobility in Metropolitan and Non-Metropolitan America: 1995 to 2000", August 2003), only about 2% of 1995 MSA residents moved to a non-MSA area by 2000. This indicates that an even smaller proportion of MSA residents moved to a rural area that is not adjacent to their 1995 MSA of residence.

MSA is an indication of the housing costs an individual living in that MSA would pay over his lifetime. According to Table 3, for example, the average housing value in San Francisco ($593,128) was higher than that of Kansas City, MO ($357,071), indicating that the lifetime housing costs in San Francisco would exceed those in Kansas City.

Using the housing value information, we construct the housing cost differential between the origin and the destination, by following three steps. First, we estimate a housing value equation where the dependent variable is the logarithm of the house value and controls include: size of house and of the lot in which is built, house age, heating system, type of housing unit, ownership, and MSA fixed effects.[7] Second, we use the results to construct the predicted housing value, by MSA, holding house characteristics at their sample means. Table 4 presents the distribution of the average predicted housing value across MSAs. Controlling for housing unit characteristics, the MSA with the lowest and highest predicted housing value are, respectively, Duluth-Superior, MN ($226,735) and Stamford, CT ($737,156).

The housing cost differential for each individual living in an MSA in 1995 is simply the difference between the logarithm of the predicted housing value across all MSAs in 2000 minus and the logarithm of the predicted housing value in the individual's 1995 MSA.[8] This measure is an indication of the relative housing costs in the worker's current location compared to the housing costs in the remaining MSAs, and will be used in our analysis to capture the effect of the housing cost differential on migration.

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[7] In this regression, we use *all* employed individuals in the 2000 PUMS, who were living in 271 MSAs in 2000 (759,106 observations). Regression results for the housing value equation are reported in Table A in the Appendix.

[8] For example, Table 4 shows that the predicted housing value across all MSAs is $413,036 and the predicted housing value in Orlando, FL is $397,658. The housing cost differential for a worker living in Orlando, FL in 1995 would be equal to log(413,036)-log(397,658).

3.3. Location Amenities, by MSA

We construct ten measures for three types of location characteristics – weather, population, and public finance/local economy. These are the typical categories of location characteristics shown by recent research work to have an important role in migration decisions (Clark and Hunter, 1996; Rupasingha and Goetz, 2004; Huffman and Feridhanusetyawan, 2007; and Chen and Rosenthal, 2008). Table 5 describes the amenity measures and the data source from which they were extracted. Weather amenities include *Temperature*, *Snowfall*, *Precipitation Probability*, and *Probability Air Unhealthy*. Population amenities include *Crime Rate*, *Log Population per Square Mile*, and the *Pupil/Teacher Ratio*. Finally, public finance/local economy characteristics include *Public Sector*, *Tax Free State*, and *Unemployment Rate*.

In our empirical analysis, we use these measures to capture location characteristics that may affect worker migration decisions. We expect that desirable amenities would have a negative effect on moving, while undesirable location characteristics would have a positive effect. Our expectation is that individuals value mild weather conditions, so migration probabilities would decrease in *Temperature*, but would increase in *Snowfall*, *Precipitation Probability*, and *Probability Air Unhealthy*. We also expect workers to value low crime, low population density, and higher school quality, so migration probabilities would be higher for workers in MSAs with high crime rate, high per square mile population, and high pupil/teacher ratio. Finally, we expect workers to value living in a labor market with low public sector presence, no state income tax, and low unemployment rate; migration would thus increase in *Public Sector* and *Unemployment Rate*, but decrease in *Tax Free State*.

4. Empirical Results

Using the data described in the previous section, we estimate the effect of local ties (*State of Birth*, *Spouse State of Birth*) and amenities on the probability of moving, controlling for wage and housing cost differences across locations. First, we estimate the Heckman selection model in order to construct reliable measures of worker wages in the origin and the destination. This involves estimating the reduced form probit (Equation 4) and the wage equations for movers and non-movers (Equations 2 and 3, respectively). Second, we use the constructed wage differences together with the measures of local ties and housing cost differences to estimate the structural probit model (Equation 1). Finally, we use the structural probit results to delineate the effect of each key characteristic on the probability of moving.

To test the sensitivity of the regression results, we conduct the analysis using three different specifications: (a) controls for wage differences but not for housing costs differences or for amenities; (b) controls for wage and housing cost differences, but not for amenities; and (c) controls for wage differences, housing cost differences, and amenities. All specifications include available demographic and employment characteristics such as age, education, gender, race, and industry and occupation affiliation.

4.1. Selection Model Regression Results

We first estimate the reduced form probit (Equation 4), where the dependent variable is the probability of moving between MSAs. Since the reduced form probit does not control for wages, the estimated effect of each characteristic includes its direct effect on the probability of moving and its indirect effect through wages. Table 6 reports the marginal probability effect of each characteristic on the probability of moving for the reduced form probit equation.

Specification 1 (no housing cost differences, no amenities) results indicate that workers living in their state of birth and married workers living in their spouse's state of birth are 15.6 and 9 percentage points less likely to move than their peers, respectively. In specification 2, which controls for housing cost differences but not for amenities, the marginal probability effects of *State of Birth* and *Spouse State of Birth* are relatively unchanged, -15.8 and -9.4 percentage points, respectively. As expected, the housing cost differential (*LogH Difference*) has a significantly negative effect on migration. In specification 3, which controls for housing cost differences and for local amenities, the *State of Birth* and *Spouse State of Birth* marginal effects are -15.4 and -9.4 percentage points, respectively.[9] In addition, the effect of *LogH Difference* remains negative and statistically significant. Desirable location amenities in the origin (e.g. *Temperature*, *Tax Free State*) have a significant negative effect on moving, while undesirable amenities (e.g. *Snowfall*, *Crime Rate*, and *Unemployment Rate*) have the opposite effect.

Using the reduced form probit results, we construct the selection term for non-movers and movers, as shown in Equation 5, which are included as controls in their respective wage equations. Table 7 summarizes the regression results of the wage equations for the two worker groups, which include as controls all available demographic and employment characteristics, as well as MSA fixed effects.[10] In all three specifications, the selection term coefficient for movers is significantly negative. Since by construction, the selection term for movers is negative, these results indicate that there is a positive migration selection bias; movers earn higher wages than

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[9] As indicated, there is some concern that *State of Birth* may be negatively correlated with unobserved worker skills. If so, the negative coefficient of *State of Birth* captures lack of opportunity to migrate rather than local ties. To refute this point, we estimated all specifications excluding education and marital variables. If *State of Birth* is negatively correlated with worker skills, then the coefficient of *State of Birth* should be even lower when we omit education and marital variables. Our results show that the *State of Birth* coefficient is not statistically different from those presented in Table 6 once we omit education and marital variables – these results are available upon request. In addition, omitting *State of Birth* from the specification does not statistically affect the coefficient of *Spouse State of Birth*.

[10] MSA fixed effects capture wage differentials across MSAs that relate to differences in the cost of living or to differences in baseline productivity.

non-movers in both the origin and the destination.[11] The remaining variables have typical effects on wages in all specifications.

As previously described, we use the estimated wage equations to construct the predicted origin and destination wages for each individual in the sample. This enables the construction of *LogW Difference*, which is the difference between the logarithm of destination wages and the logarithm of origin wages. We include this variable in the structural probit model to capture the effect of wage differences between the destination and the origin on the probability of moving.

4.2. Structural Probit Regression Results

Table 8 presents the regression results for the structural probit model, for each of the three specifications (no housing costs, no amenities; housing costs, no amenities; and housing costs, amenities). In specification 1, the marginal probability effect of *State of Birth* and *Spouse State of Birth* is 15.5 and 9.1 percentage points, respectively, and is statistically significant at the 1% level. The wage differential between the destination and the origin, as captured by *LogW Difference*, has a significant positive effect on the probability of moving. This indicates that workers who would gain a higher destination-origin wage difference are more likely to move relative to their counterparts.

In specification 2, where we also control for housing cost differences (*LogH Difference*), the effect of *State of Birth* and *Spouse State of Birth* increase slightly to -15.7 and -9.4 percentage points, respectively. *LogW Difference* has a significant positive effect on moving, while *LogH Difference* negatively affects moving. The latter result verifies that housing cost differences between the destination and the origin is an important consideration in moving decisions; workers in MSAs with low housing costs are less likely to move compared with their peers.

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[11] This is also verified by the p-value of the Likelihood Ratio Test, reported in the bottom row of Table 7. The null hypothesis that there is no positive migration selection bias for movers is rejected in all three specifications.

Specification 3 results indicate that *State of Birth* and *Spouse State of Birth* are strong deterrents of migration even after controlling for wage and housing cost differences and for local amenities. Wage and housing cost differences also remain significant determinants of moving decisions. In addition, desirable local amenities (*Temperature* and *Tax Free State*) have a significant negative effect on moving, while undesirable location characteristics (e.g. *Precipitation Probability*, *Crime Rate*, and *Unemployment Rate*) positively affect migration.

Overall, the results in Table 8 illustrate the connection of an expanded social network, wage and housing cost differences, and amenities with migration decisions. Workers with a strong social network in their current location are significantly less likely to move than others. Workers who would gain higher wages in the destination are more likely to move, while workers who would face higher housing costs in the destination are less likely to move than others. Location amenities also have an important role in migration decisions; workers in more desirable locations are significantly less likely to move, after controlling for local ties, wage differences, and housing cost differences.

4.3. Interpretation of the Results

Understanding the relative importance of local ties, wages, housing costs, and amenities on migration decisions based on the empirical results as presented in Table 8 is not straightforward. In this section, we delineate the importance of each on the probability of moving using the regression results from the three specifications in Table 8. In particular, we calculate the predicted effect on the probability of moving of each of the following: (a) worker living in his state of birth, (b) married worker living in his spouse's state of birth, (c) an increase in local wages by 10%, and (d) a decrease in local housing costs by 10%. These effects are calculated holding all other worker characteristics and location amenities at their sample means. Table 9 presents the results of this exercise.

Workers who live in their state of birth are around 15.5 percentage points less likely to move than their counterparts, holding wages, housing costs, and amenities equal. In other words, a local worker is around 15.5 percentage points less likely to move than a non-local worker who lives in the same MSA and who would gain the same wage differential and suffer the same housing cost differential if he moved to another location. By the same token, a married worker who lives in his spouse's state of birth is around 9.3 percentage points less likely to move than single workers or married workers who live outside their spouse's state of birth.

Table 9 also shows that, holding all else equal, a 10% increase in local wages reduces the probability of moving by 2.4 percentage points (specification 3). Although this is a significant effect on the probability of moving, its size lacks considerably the size of the effect of *State of Birth* and *Spouse State of Birth*. To emphasize this point, let us note that the marginal negative effect of being local on the probability of moving is equivalent to the effect of an increase in local wages by more than 50%. Similarly, the negative effect of working in the spouse's state of birth is equivalent to that of an increase in local wages by more than 35%.

A similar result applies for housing cost differences. A 10% decrease in local housing costs reduces the migration probability by 1.7 percentage points (specification 3). This effect is important but not nearly as substantial as the effect of a strong social network in the current location, as captured by *State of Birth* and *Spouse State of Birth*. In particular, the negative effect of *State of Birth* and *Spouse State of Birth* is equivalent to a decrease in local housing costs by nearly 70% and by nearly 50%, respectively.

We also use the regression results from specification 3 of Table 8 to delineate the effect of local amenities on the probability of moving. In particular, we calculate the predicted migration probability for the average worker in each MSA, based on the MSA's location amenities and holding all other characteristics at their sample means. The difference between an MSA's predicted migration probability and the mean predicted migration probability for the whole sample is the effect of local amenities on the probability of moving from the MSA. That difference is then decomposed in three components, each representing the contribution of a group of amenities on the probability of moving. The three groups of amenities are: (a) weather amenities – includes *Temperature*, *Snowfall*, *Precipitation Probability*, and *Probability of Unhealthy Air*, (b) population characteristics – includes *Crime Rate*, *Log Population per Square Mile*, and *Pupil/Teacher Ratio*, and (c) public finance, economy – includes *Public Sector*, *Tax Free State*, and *Unemployment Rate*.

Table 10 presents the results of this exercise for the MSA with the lowest predicted migration probability (Austin, TX), the 20 MSAs with the largest population in the U.S., and the MSA with the highest predicted migration probability (Buffalo-Niagara Falls, NY). Austin, TX is the most amenable MSA in the sample since it has the lowest predicted migration probability (17.8%). The migration probability of the average worker is 5 percentage points lower in Austin, TX than what it would be in the remaining MSAs in the sample, holding social network indicators, wage differences, and housing cost differences constant. This difference is attributed mainly to desirable weather amenities (-2 percentage points) and to local economic conditions (-2.2 percentage points); Austin, TX features mild weather with low precipitation probabilities while it is in a state with no local income tax and a limited public sector. In contrast, the migration probability for the average worker would be 27.4% in Buffalo-Niagara Falls, NY, 4.6 percentage points higher than the sample mean. This differential is mainly attributed to the undesirable weather conditions of this MSA (4.4 percentage points).

The differences in the average predicted migration probability across the 20 largest MSAs show the importance of weather characteristics on migration decisions. For example, the average worker would be 3.4 and 2.5 percentage points less likely to move out of Phoenix, AZ and San Diego, CA, respectively, due to the desirable weather conditions in these two MSAs. In contrast, undesirable weather characteristics increase the migration probability by as many as 2.5 percentage points in Pittsburgh, PA. Local economic conditions also have an important effect on migration propensities. Among the 20 largest MSAs, the effect of public finance/economy characteristics on the migration probability varies from -2.2 percentage points (Dallas-Fort Worth, TX) to 1.9 percentage points (Riverside-San Bernardino, CA). The effect of population characteristics on migration is smaller but significant nevertheless. Among the 20 largest MSAs, this effect varies from -1.8 percentage points (Minneapolis-St. Paul, MN) to 0.9 percentage points (Los Angeles-Long Beach, CA).

Overall, our results suggest that location amenities are very significant considerations in individual migration decisions. The migration probability for the average worker is 17.8% in Austin, TX (the most amenable MSA in the sample), whereas it is 27.4% in Buffalo-Niagara Falls, NY (the least amenable MSA in the sample). Considering that the average migration probability in the sample is 22.8%, location amenities may reduce or increase individual migration by as many as 5 percentage points. This is equivalent to a change in local wages by almost 20% or to a change in local housing costs by almost 30%.

5. Conclusion

It is well established that worker migration decisions are greatly affected by wage differences between the destination and the origin. In particular, the higher is the wage differential between the destination and the origin the more likely workers are to migrate controlling for individual mobility costs. Researchers have argued that non-pecuniary mobility costs, such as an expanded social network and desirable location amenities, may be important deterrents of migration, leading workers to stay in low-wage locations instead of moving to high-wage destinations. There is very limited research, however, on the extent to which local ties may deter migration, controlling for wage and housing cost differences between the destination and the origin.

This paper fills some of this gap. We construct two indicators of an expanded local social network (worker lives in his state of birth, worker lives in his spouse's state of birth) and ten measures of location amenities (weather, population, and local economy). In addition, we produce appropriate measures of destination-origin differences in worker wages and in housing costs. Using this information, we estimate a structural model of individual migration. Empirical results show that workers with strong attachments to their current location – those with an expanded social network or those living in amenable MSAs – are significantly less likely to move than their peers. Results also confirm previous research which showed that migration is more prevalent among workers who would achieve higher lifetime earnings from moving and is less prevalent for workers who would pay higher housing costs if they decided to move.

Although low wages and high housing costs in the destination are important deterrents of individual migration, their effect is not nearly as substantial as the negative effect of local ties on migration decisions. Workers living in their state of birth are more than 15 percentage points less likely to move relative to their counterparts, whereas a 10% increase in local wages or a 10% decrease in local housing costs only reduces migration probabilities by 2.4 or 1.7 percentage points, respectively. This implies that the negative effect of being local on migration is equivalent to the effect of earning almost 50% higher wages. Similarly, being local has the same negative effect on migration as a reduction in local housing costs by nearly 70%. We also find that married workers who live in their spouse's state of birth are 9.4 percentage points less likely to migrate than their peers. The negative effect of moving from the worker's spouse state of birth is equivalent to the effect of earning more than 35% higher wages or paying nearly 50% lower housing costs in the current location. Location amenities also play an important role in individual migration decisions. The presence of desirable/undesirable location amenities may, ceteris paribus, reduce/increase individual migration propensities by as many as 5 percentage points. This is equivalent to a change in origin wages by almost 20% or to a change in local housing costs by almost 30%.

Our findings shed more light on the importance of local ties in migration decisions. Although wage and housing cost differences are significant determinants of individual migration, the level of attachment workers feel to their current location appears to be a more significant consideration in individual migration decisions. Based on these results, we conclude that the importance of local ties, on account of an expanded social network or desirable amenities, should not be understated in future work that examines the determinants of worker migration.

TABLES

Table 1: Sample Description

	Sample Proportion / Mean (st.dev.)
Education	
Less High School	10.6%
High School Diploma	43.3%
Associate Degree / Some College	7.3%
College Degree	23.0%
Post-Graduate Degree	15.8%
Age	44.2 (7.2)
Married	72.2%
Never Married	16.8%
Number of Children	1.2 (1.3)
Family Size	3.0 (1.6)
Race	
White	88.6%
Black	8.7%
Other Race	12.7%
Hispanic	10.3 %
Disability	10.3%
Veteran	24.0%
Foreigner	8.4%

Note: Sample includes full-time employed males, ages 35-65, living in a metropolitan area in 1995. Observations: 241,821.

Table 2: Migration Probabilities and Attachment to Current Location

	Total	Movers (%)
All	241,821 (100%)	22.7%
State of Birth	98,539 (40.7%)	12.2%
Spouse State of Birth	61,696 (25.5%)	13.6%

Note: *State of Birth* = individual living in his state of birth in 1995. *Spouse State of Birth* = married individual living in his spouse's state of birth in 1995. Sample includes full-time employed males, ages 35-65, living in a metropolitan area in 1995. Observations: 241,821.

Table 3: Average Housing Unit Value, by MSA, Select MSAs

	Mean (St. Dev.)
All MSAs	$442,417 (376,611)
San Francisco, CA	$593,128 (343,197)
Los Angeles, CA	$582,806 (385,873)
New York City, NY	$528,059 (369,294)
Boston, MA	$473,955 (340,390)
Houston, TX	$416,243 (402,178)
Miami, FL	$411,146 (397,674)
Chicago, IL	$406,603 (342,653)
Phoenix, AZ	$397,788 (370,019)
Cleveland, OH	$386,950 (362,058)
Nashville, TN	$381,495 (361,471)
Kansas City, MO	$357,071 (359,899)
Detroit, MI	$348,398 (317,097)
Youngstown, PA	$331,768 (369,443)
Tuscaloosa, AL	$321,291 (368,273)
Sumter, SC	$316,418 (380,751)
Grand Rapids, IA	$311,579 (322,095)

Note: Sample includes all workers living in an MSA in 2000. Observations = 759,106.

Table 4: Distribution of Average Predicted Housing Value across MSAs

	Across MSAs
Mean	$413,036
Standard Deviation	$90,639
Minimum (Duluth-Superior, MN)	$226,735
10^{th} Percentile (Sheboygan, WI)	$313,163
25^{th} Percentile (Syracuse, NY)	$350,188
50^{th} Percentile (Orlando, FL)	$397,658
75^{th} Percentile (Las Vegas, NV)	$469,166
90^{th} Percentile (Bridgeport, CT)	$530,039
Maximum (Stamford, CT)	$737,156

Note: Reported are distribution values across the 271 MSAs in the 2000 PUMS.

Table 5: Description of Metropolitan Area Amenities

	Description	Source	Mean (St. Dev.)
Temperature	Average daily temperature	National Climatic Data Center	58.7 (7.9)
Snowfall	Annual inches of snowfall, average values, 1971-2000.	National Climatic Data Center	18.1 (21.1)
Precipitation Probability	Proportion of days with more than 1 inch of precipitation, 1971-2000.	National Climatic Data Center	.276 (.103)
Probability Air Unhealthy	Proportion of days with unhealthy air quality, 1995.	US Environmental Projection Agency, City Air Quality Data	.015 (.026)
Crime Rate	Violent crimes per 100,000 residents.	State and Metropolitan Area Data Book, 1997-98: Table B-5	.004 (.006)
Log Population per Square Mile	Logarithm of the population per square mile.	State and Metropolitan Area Data Book, 1997-98: Table B-2	6.46 (.89)
Pupil/Teacher Ratio	Pupil to teacher ratio: Average values of elementary/secondary school universe, 1995-2000.	Common Core of Data, National Center for Education Statistics	19.4 (6.6)
Public Sector	Proportion of earnings by the public sector.	State and Metropolitan Area Data Book, 1997-98: Table B-7	15.1 (5.7)
Tax Free State	=1 if no state income tax, 0 otherwise	Federation of Tax Administrators	.176 (381)
Unemployment Rate	Unemployment rate in 1996	State and Metropolitan Area Data Book, 1997-98: Table B-8	5.2 (1.8)

Table 6: Reduced Form Probit Regression Results, Marginal Probability Effects

	(1) No Housing Costs, No Amenities	(2) Housing Costs, No Amenities	(3) Housing Costs, Amenities
State of Birth	-.1556 (.0020)**	-.1578 (.0018)**	-.1539 (.0018)**
Spouse State of Birth	-.0900 (.0020)**	-.0940 (.0020)**	-.0941 (.0020)**
LogH Difference	--	-.1048 (.0028)**	-.1290 (.0029)**
Temperature	--	--	-.0004 (.0002)*
Snowfall	--	--	.0006 (.0001)**
Precipitation Probability	--	--	.0726 (.0136)**
Probability Air Unhealthy	--	--	.3575 (.0453)**
Crime Rate	--	--	.2241 (.0594)**
Log Population per Square Mile	--	--	.0025 (.0010)**
Pupil/Teacher Ratio	--	--	.0007 (.0001)**
Public Sector	--	--	.0005 (.0001)**
Tax Free State	--	--	-.0098 (.0029)**
Unemployment Rate	--	--	.3903 (.0543)**
Age	-.0043 (.0015)**	-.0043 (.0015)**	-.0042 (.0015)**
Age Squared	.0000 (.0000)	.0000 (.0000)	.0000 (.0000)
Less High School	-.0371 (.0032)**	-.0392 (.0031)**	-.0405 (.0032)**
Associate Degree/Some College	.0332 (.0036)**	.0342 (.0036)**	.0351 (.0037)**
College Degree	.0729 (.0024)**	.0785 (.0024)**	.0797 (.0024)**
Post-Graduate Degree	.1063 (.0028)**	.1145 (.0029)**	.1145 (.0029)**
Black	-.0477 (.0028)**	-.0475 (.0028)**	-.0519 (.0028)**
Other Race	-.0217 (.0027)**	-.0119 (.0028)**	-.0169 (.0028)**
Hispanic	-.0182 (.0032)**	-.0169 (.0033)**	-.0291 (.0032)**
Married	.0655 (.0032)**	.0625 (.0033)**	.0627 (.0033)**
Never Married	-.0199 (.0032)**	-.0233 (.0032)**	-.0240 (.0032)**
Family Size	-.0246 (.0019)**	-.0232 (.0019)**	-.0233 (.0019)**
Number of Children	.0180 (.0021)**	.0166 (.0021)**	.0162 (.0021)**
Foreigner	-.0430 (.0032)**	-.0400 (.0032)**	-.0384 (.0033)**
No English	-.0555 (.0046)**	-.0543 (.0047)**	-.0539 (.0047)**
Disabled	-.0153 (.0028)**	-.0154 (.0028)**	-.0156 (.0028)**
Veteran	.0475 (.0022)**	.0447 (.0022)**	.0415 (.0022)**

Note: Dependent variable is the probability of moving. Reported are probit-estimated marginal probability effects, with standard errors in parenthesis. Occupation and industry indicators are included in all specifications but not reported. Statistical significance: * = at the 5% level, **= at the 1% level.

Table 7: Second Stage Wage Equations Regression Results

	(1) No Housing Costs, No Amenities		(2) Housing Costs, No Amenities		(3) Housing Costs, Amenities	
	Movers	Non-Movers	Movers	Non-Movers	Movers	Non-Movers
Selection Term	-.094 (.015)**	.010 (.007)	-.072 (.011)**	.010 (.007)	-.051 (.011)**	.009 (.008)
Age	.047 (.005)**	.028 (.002)**	.047 (.005)**	.028 (.002)**	.047 (.005)**	.027 (.002)**
Age Squared	-.000 (.000)**	-.000 (.000)**	-.000 (.000)**	-.000 (.000)**	-.000 (.000)**	-.000 (.000)**
Less High School	-.169 (.013)**	-.157 (.005)**	-.180 (.013)**	-.157 (.005)**	-.177 (.014)**	-.160 (.005)**
Associate Degree/ Some College	.034 (.011)**	.047 (.005)**	.045 (.011)**	.047 (.005)**	.052 (.012)**	.048 (.006)**
College Degree	.291 (.008)**	.256 (.004)**	.313 (.008)**	.255 (.004)**	.334 (.008)**	.257 (.004)**
Post-Graduate Degree	.434 (.010)**	.417 (.005)**	.466 (.009)**	.416 (.005)**	.488 (.010)**	.417 (.006)**
Black	-.186 (.011)**	-.189 (.005)**	-.200 (.011)**	-.189 (.005)**	-.207 (.012)**	-.191 (.005)**
Other Race	-.152 (.009)**	-.170 (.005)**	-.151 (.009)**	-.170 (.005)**	-.159 (.010)**	-.177 (.005)**
Hispanic	-.087 (.011)**	-.089 (.005)**	-.091 (.011)**	-.089 (.005)**	-.100 (.012)**	-.094 (.006)**
Married	.193 (.011)**	.200 (.005)**	.207 (.011)**	.200 (.005)**	.220 (.012)**	.202 (.006)**
Never Married	.059 (.011)**	.094 (.005)**	.052 (.011)**	.094 (.005)**	.047 (.012)**	.095 (.006)**
Family Size	-.008 (.007)	-.012 (.003)**	-.015 (.007)*	-.012 (.003)**	-.023 (.007)*	-.012 (.003)**
Number of Children	.036 (.007)**	.033 (.003)**	.041 (.007)**	.033 (.003)**	.048 (.008)**	.032 (.003)**
Foreigner	-.117 (.012)**	-.162 (.006)**	-.118 (.011)**	-.163 (.006)**	-.123 (.012)**	-.164 (.006)**
No English	-.180 (.020)**	-.199 (.005)**	-.191 (.020)**	-.199 (.008)**	-.202 (.021)**	-.203 (.008)**
Disabled	-.083 (.010)**	-.073 (.004)**	-.087 (.010)**	-.073 (.004)**	-.091 (.010)**	-.076 (.005)**
Veteran	-.070 (.007)**	-.018 (.003)**	-.056 (.007)**	-.019 (.004)**	-.047 (.007)**	-.016 (.004)**
Constant	9.760 (.124)**	9.942 (.060)**	9.621 (.123)**	9.941 (.060)**	9.563 (.132)**	9.854 (.071)**
Likelihood Ratio Test [p-value]	44.81 [.000]	2.26 [.133]	15.02 [.000]	3.12 [.077]	27.49 [.000]	1.32 [.250]

Note: Dependent variable is the logarithm of wages. Reported are linear regression estimates, with standard errors in parenthesis. Metropolitan area, occupation, and industry fixed effects are included in all specifications. Null hypothesis for Likelihood Ratio Test: no migration selection bias. Statistical significance: * = at the 5% level, **= at the 1% level.

Table 8: Structural Probit Regression Results, Marginal Probability Effects

	(1) No Housing Costs, No Amenities	(2) Housing Costs, No Amenities	(3) Housing Costs, Amenities
State of Birth	-.1546 (.0018)**	-.1567 (.0018)**	-.1528 (.0018)**
Spouse State of Birth	-.0906 (.0020)**	-.0940 (.0020)**	-.0935 (.0018)**
LogW Difference	.2240 (.0102)**	.2045 (.0101)**	.2540 (.0111)**
LogH Difference	--	-.0997 (.0028)**	-.1276 (.0029)**
Temperature	--	--	-.0007 (.0002)**
Snowfall	--	--	.0003 (.0001)**
Precipitation Probability	--	--	.0867 (.0136)**
Probability Air Unhealthy	--	--	.2441 (.0456)**
Crime Rate	--	--	.3095 (.1603)**
Log Population per Square Mile	--	--	.0059 (.0010)**
Pupil/Teacher Ratio	--	--	.0008 (.0001)**
Public Sector	--	--	.0005 (.0001)**
Tax Free State	--	--	-.0161 (.0029)**
Unemployment Rate	--	--	.5353 (.0545)**
Age	-.0091 (.0015)**	-.0080 (.0015)**	-.0093 (.0015)**
Age Squared	.0001 (.0000)**	.0000 (.0000)**	.0001 (.0000)**
Less High School	-.0320 (.0032)**	-.0331 (.0032)**	-.0303 (.0033)**
Associate Degree/Some College	.0335 (.0036)**	.0332 (.0036)**	.0312 (.0037)**
College Degree	.0593 (.0024)**	.0629 (.0025)**	.0539 (.0026)**
Post-Graduate Degree	.1038 (.0028)**	.1050 (.0029)**	.0955 (.0030)**
Black	-.0436 (.0029)**	-.0423 (.0029)**	-.0439 (.0029)**
Other Race	-.0209 (.0028)**	-.0118 (.0028)**	-.0187 (.0028)**
Hispanic	-.0148 (.0033)**	-.0135 (.0033)**	-.0246 (.0032)**
Married	.0634 (.0032)**	.0585 (.0033)**	.0552 (.0034)**
Never Married	-.0147 (.0033)**	-.0179 (.0033)**	-.0145 (.0033)**
Family Size	-.0246 (.0019)**	-.0220 (.0019)**	-.0207 (.0019)**
Number of Children	.0166 (.0021)**	.0147 (.0021)**	.0129(.0022)**
Foreigner	-.0492 (.0031)**	-.0446 (.0032)**	-.0462 (.0033)**
No English	-.0571 (.0046)**	-.0538 (.0047)**	-.0529 (.0047)**
Disabled	-.0115 (.0028)**	-.0117 (.0029)**	-.0101 (.0029)**
Veteran	.0582 (.0023)**	.0505 (.0023)**	.0487 (.0023)**

Note: Dependent variable is the probability of moving. Reported are probit-estimated marginal probability effects, with standard errors in parenthesis. Occupation and industry indicators are included in all specifications, but are not reported. Statistical significance: **= at the 1% level.

Table 9: Marginal Probability Effects of Local Ties, Wages, and Housing Costs on Migration

	(1) No Housing Costs, No Amenities	(2) Housing Costs, No Amenities	(3) Housing Costs, Amenities
State of Birth	-15.5	-15.7	-15.4
Spouse State of Birth	-9.1	-9.4	-9.3
10% Increase in Local Wages	-2.1	-2.0	-2.4
10% Decrease in Local Housing Costs	--	-1.3	-1.7

Note: Marginal probability effects (in percentage points) are calculated using the regression results reported in Table 8. See text for more details.

Table 10: Effect of Amenities on Migration Probability, Select Metropolitan Areas

Mean Migration Probability= 22.8%	Migration Probability	Difference with Mean	Weather	Population	Public Finance, Economy
Austin, TX	17.8%	-5.0	-2.0	-0.8	-2.2
Phoenix, AZ	18.1%	-4.7	-3.4	-0.8	-0.6
Dallas-Fort Worth, TX	18.8%	-3.9	-1.5	-0.3	-2.2
Houston-Brazoria, TX	20.8%	-2.0	-0.5	-0.2	-1.3
San Francisco-Oakland-Vallejo, CA	21.1%	-1.7	-1.7	0.5	-0.4
San Diego, CA	21.1%	-1.7	-2.5	0.1	0.7
Miami-Hialeah, FL	21.3%	-1.5	-1.5	0.2	-0.2
Seattle-Everett, WA	22.0%	-0.8	0.9	-0.2	-1.5
Minneapolis-St. Paul, MN	22.0%	-0.7	2.0	-1.8	-0.9
Atlanta, GA	22.4%	-0.4	0.3	-0.1	-0.6
St. Louis, MO-IL	22.4%	-0.4	0.1	-0.2	-0.2
Riverside-San Bernardino, CA	23.6%	0.8	-0.2	-0.9	1.9
Boston, MA	23.8%	1.0	1.5	-0.2	-0.4
Philadelphia, PA	23.8%	1.1	0.7	0.1	0.3
Washington, DC	23.9%	1.1	0.2	0.7	0.2
Baltimore, MD	24.0%	1.2	0.6	0.0	0.7
Los Angeles-Long Beach, CA	24.4%	1.6	-1.2	0.9	1.8
Detroit, MI	24.8%	2.0	1.8	0.5	-0.3
Pittsburgh, PA	24.9%	2.1	2.5	-0.4	0.0
New York-Northeastern NJ	25.0%	2.2	0.9	0.4	1.0
Chicago-Gary-Lake, IL	25.1%	2.3	1.5	0.8	0.0
Buffalo-Niagara Falls, NY	27.4%	4.6	4.4	-0.1	0.3

Note: Marginal probability effects are calculated using the regression results of specification 3, as reported in Table 8. See text for more details. Austin, TX and Buffalo-Niagara Falls, NY are the MSAs with the lowest and highest predicted migration probability, respectively. Remaining MSAs are the top 20 MSAs in population size as of 2000.

APPENDIX

Table A: Housing Value Regression Results

Control Variable	Coefficient (St. Error)	Control Variable	Coefficient (St. Error)
Property: <1 acre	-.323 (.005)**	Heat: Utility Gas	.105 (.008)**
1 Bedrooms	.085 (.005)**	Heat: Tank Gas	.043 (.008)**
2 Bedrooms	.105 (.006)**	Heat: Oil, Other	.056 (.007)**
3 Bedrooms	.109 (.006)**	Heat: Coal/Coke	.068 (.007)**
4 Bedrooms	.200 (.007)**	Heat: Wood	-.038 (.031)
5+ Bedrooms	.334 (.007)**	Heat: Solar Energy	.119 (.014)**
No Kitchen	-.054 (.009)**	Mobile Home/Trailer	-.901 (.005)**
Total Rooms	-.112 (.003)**	Boat, Tent, Van, Other	-1.324 (.023)**
Total Rooms Squared	.018 (.000)**	Attached 1-Family House	-.022 (.005)**
Age: 2-5 Years	-.063 (.003)**	2 Family Building	-.229 (.007)**
Age: 6-10 Years	-.149 (.003)**	3-4 Family Building	-.231 (.007)**
Age: 11-20 Years	-.217 (.003)**	5-9 Family Building	-.225 (.007)**
Age: 21-30 Years	-.294 (.003)**	10-19 Family Building	-.227 (.007)**
Age: 31-40 Years	-.300 (.003)**	20-49 Family Building	-.251 (.007)**
Age: 41-50 Years	-.311 (.003)**	50+ Family Building	-.203 (.007)**
Age: 51-60 Years	-.332 (.004)**	Constant	11.812 (.012)**
Age: 61+ Years	-.290 (.003)**	MSA Fixed Effects	Yes**
Owned with Mortgage	.186 (.003)**	Observations	759,106
Rent	2.195 (.003)**	R-Squared	.7775

Note: Dependent variable is the logarithm of housing unit value. Linear regression estimates are reported with standard errors in parenthesis. Omitted categories: *Property>1 Acre*, *Studio*, *With Kitchen*, *Age: Less 2 Years*, *Owned with no Mortgage Obligation*, *No Heat*, and *Detached 1 Family House*. Statistical significance: **= at the 1% level.

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